

**BEFORE THE STATE OF MAINE  
BOARD OF ENVIRONMENTAL PROTECTION**

In re:	)	
	)	
KINGFISH MAINE, INC.	)	NATURAL RESOURCES
Jonesport, Washington County	)	PROTECTION ACT AND SITE
AQUACULTURE FACILITY	)	LOCATION OF DEVELOPMENT
L-28995-26-A-N (approval)	)	ACT PERMIT APPEAL
L-28995-4C-B-N (approval)	)	
L-28995-TH-C-N (approval)	)	
	)	
	)	
	)	
_____	)	

December 12, 2021

## INTRODUCTION

Appellant Sierra Club Maine appeals the permit issued under the Natural Resources Protection Act (NRPA) and the Site Location of Development Act (SLODA) permitting the construction of an aquaculture facility in Jonesport, Maine. This Permit authorizes Kingfish Maine, Inc. to construct two approximately 1,400-foot long intake pipes and two approximately 2,800-foot long outfall pipes that will impact 7,136 square feet of coastal wetland and 261,196 square feet of freshwater wetland, including 64,004 square feet of impact to wetland of special significance. Permit at 1. The issuance of the Permit is illegal for a variety of reasons under NRPA and SLODA.

## STANDING

As the nation's oldest environmental organization, Sierra Club amplifies the power of over 20,000 Sierra Club members and supporters in Maine along with the 31 Sierra Club members and supporters in Jonesport, Maine. Sierra Club Maine works to protect Maine's wilderness heritage, promote smart growth, and safeguard Maine's clean water and coastline.

The issuance of the Permit injures the recreational, aesthetic, and economic interests of Sierra Club Maine's members. For example, member Jim Merkel, enjoys visiting Chandler Bay for purposes of swimming, sailing, and fishing. *See* Attachment 1. Similarly, member Holly Faubel frequently goes to this area for birdwatching. *See* Attachment 2. Other members enjoy observing the natural beauty of this area and recreating. *See* Attachments 6-10. Issuance of the Permit

would result discharges into these waters members enjoy recreating in, injuring their interests in swimming, fishing, sailing, and gathering shellfish in these pristine waters. Issuance of the permit would also harm members' interests in observing wildlife and endangered species because it would degrade the habitat surrounding the facility, leading to fewer birds to observe. In sum, members' aesthetic, recreational, and economic interests will be harmed absent invalidation of this Permit.

## STATUTORY FRAMEWORK

### I. The Natural Resources Protection Act.

The Maine Legislature enacted the NRPA to regulate the alteration of resources of state significance, including coastal wetlands. 38 M.R.S. § 480–A (2005). In establishing the purpose of the NRPA, the Legislature acknowledged that “uses are causing the rapid degradation and, in some cases, the destruction of these critical resources.” *Id.* The Act is designed to “prevent the degradation of and encourage the enhancement of” critical water-related state resources. 38 M.R.S.A. § 480–A (2001). One of the Legislature's key findings in enacting the NRPA was “that the cumulative effect of frequent minor alterations and occasional major alterations of these [natural] resources poses a substantial threat to the environment and economy of the State and its quality of life.” *Id.*

The Act requires a permit from the Department of Environmental Protection (DEP) for any construction, repair, or alteration of any permanent structure “if the activity is located in, on or over any protected natural resource.” 38 M.R.S.A. § 480–

C(1) & (2)(D) (2001 & Supp.2002). The Board of Environmental Protection is statutorily granted the authority to approve or deny permits in certain circumstances, including when an application has generated substantial public interest. 38 M.R.S. § 341–D(2).

The NRPA establishes that the Board shall grant a permit when “it finds that the applicant has demonstrated that the proposed activity meets the following standards.” 38 M.R.S.A. § 480–D (Supp.1999). The statute then lists nine standards to be applied in reviewing a permit application, including unreasonable interference with existing scenic, aesthetic, recreational or navigational uses and harms to habitat or fisheries. *See* 38 M.R.S.A. § 480–D(3) (1989 & Supp.1999).

## **II. The Site Location of Development Act.**

The Site Location of Development Act (SLODA) vests the DEP with authority to “regulate the location of developments which may substantially affect the environment and quality of life in Maine.” 38 M.R.S.A. § 481. The purpose of SLODA is to “insure that such developments will be located in a manner which will have a minimal adverse impact on the natural environment within the development sites and of their surroundings and protect the health, safety and general welfare of the people.” *Id.*

To obtain approval for a project, a developer must demonstrate compliance with a number of statutory requirements, including a showing that the project will not adversely affect the natural environment, § 484(3). Chapter 375 of the DEP regulations provide that the “regulations describe the scope of review of the Board

in determining a developer's compliance with the 'no adverse effect on the natural environment' standard of the Site Location Law (38 M.R.S.A. Section 484(3)); the information which shall be submitted, when appropriate, within an application for approval; and, the terms and conditions which the Board may impose on the approval of an application to ensure compliance with the standard." 06-096 C.M.R. ch. 375 (2012) (summary).

### **STANDARD OF REVIEW**

NRPA and SLODA impose an affirmative obligation on DEP to set out in its decision detailed reasons for the denial or approval of an application and to state its reasons with sufficient specificity to permit understanding and meaningful review. 5 M.R.S.A. § 9061 (2002); *Christian Fellowship & Renewal Ctr. v. Town of Limington*, 2001 ME 16, ¶ 15, 769 A.2d 834, 839 (stating that "there cannot be meaningful judicial review of agency decisions without [adequate] findings of fact"). "An administrative decision will be sustained if, on the basis of the entire record before it, the agency could have fairly and reasonably found the facts as it did." *Seider v. Board of Examiners of Psychologists*, 2000 ME 206, ¶ 9, 762 A.2d 551, 555 (2000). Without adequate findings, a reviewing court cannot determine if the agency's findings are supported by the evidence. *See King v. Dist. of Columbia Dept. of Employment Servs.*, 742 A.2d 460, 465 (D.C.1999); *Kiawah Prop. Owners Group v. Pub. Serv. Comm'n of S.C.*, 338 S.C. 92, 525 S.E.2d 863, 865 (1999).

### **GROUND FOR THE APPEAL**

DEP failed to support its findings under NRPA and SLODA with substantial evidence, rendering its conclusions arbitrary and capricious.

**A. DEP's Finding that the Project Will Not Have an Unreasonable Adverse Effect on the Scenic Character of the Area Is Unsupported by the Record.**

First, DEP failed to base its conclusion that the proposed project will not have an unreasonable adverse effect on the scenic character of the surrounding area on substantial evidence. Permit at 3. To the contrary, this proposed project will harm the scenic character of the area by feeding the endemic cysts that cause visual algal blooms.<sup>1</sup> These blooms not only render the shorelines and waters unsightly and distressing visually but can contribute to respiratory health impacts to those in the affected areas.

[REDACTED]

[REDACTED]

[REDACTED] It is well known to the Department that this project will discharge high volumes of nitrogen over a longer period of time than 28 days and will degrade existing conditions in the Bays.

[REDACTED]

[REDACTED]

[REDACTED]

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<sup>1</sup> MEPDES Permit ME00037559 Proposed Draft Fact Sheet at 15, 22 (May 5, 2021).

<sup>2</sup> [REDACTED].

And there is no question that formation of visual algal blooms adversely affects the scenic character of the surrounding area. Without sufficient modeling to support its conclusion that the proposed project will not lead to algal blooms, DEP's conclusion lacks support and is arbitrary and capricious.

**B. DEP's Finding that the Project Will Not Have an Unreasonable Adverse Effect on the Wildlife and Fisheries of the Area Is Unsupported by the Record.**

Second, DEP failed to support its conclusion that the proposed project will not unreasonably harm any significant wildlife habitat with substantial evidence. To the contrary, the Maine Department of Inland Fisheries & Wildlife (MDIFW) has failed to adequately review the impacts of this proposed project on wildlife with regards to numerous species. For example, MDIFW responded to a December 14, 2020 letter from MDIFW Wildlife Biologist, Becca Settle with a map circling the Ballast Rock and Ballast Rock Ledge and Bar Island as areas of concern for wildlife, as well as the shorelands and mudflats in the immediate near-field, far field and adjacent shoreland areas.<sup>3</sup> These area "of concern" provide habitat for nesting, roosting, and migratory seabirds who utilize Ballast Rock, shorelands and mudflat areas. Nowhere does DEP or MDIFW explain its conclusion as to why the project will not unreasonably harm this habitat that the States agencies previously indicated was "of concern."

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<sup>3</sup> NRPA Application at 121-122,



Nor does DEP support its conclusion that the proposed project will not unreasonably harm the habitats of threatened and endangered species. Permit at 10. NRPA requires DEP to conclude that the proposed project will not unreasonably harm the habitat of threatened or endangered sea and shorebirds who feed and forage on the shoreland zone and islands in the near field, far field and adjacent areas. 38 M.R.S.A. § 480–D(3). Here, these threatened and rare species include: the threatened Razorbill Auk, the threatened Harlequin Duck, and the Purple Sandpiper which is a Priority 1 Species of Greatest Conservation Need (SGCN). These species are recognized and noted on the “Beginning with Habitat - High Value Species - Jonesport Map.”<sup>4</sup> These species have also been observed by wildlife experts consulted by Sierra Club to frequently feed and forage in all the estuarial waters, intertidal shorelands, and mudflats in the Chandler, Englishmans, and adjacent Machias Bays. Yet nowhere does DEP explain why the proposed project will not harm this habitat.

Furthermore, DEP failed to provide substantial evidence that this proposed project will not harm the bays and the estuarial eelgrass beds in the near field, far field, and adjacent areas, which support the 1-2 year endangered Atlantic Salmon juveniles feeding and seeking shelter, and the 2-3 year old returning runs of those same endangered salmon. But NRPA requires DEP to determine the project will not

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<sup>4</sup> NRPA Application at 119,

[REDACTED]



unreasonably harm aquatic habitat or “other aquatic life.” *See* 38 M.R.S.A. § 480–  
D(3). The eelgrass beds serve as important habitats for marine life. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

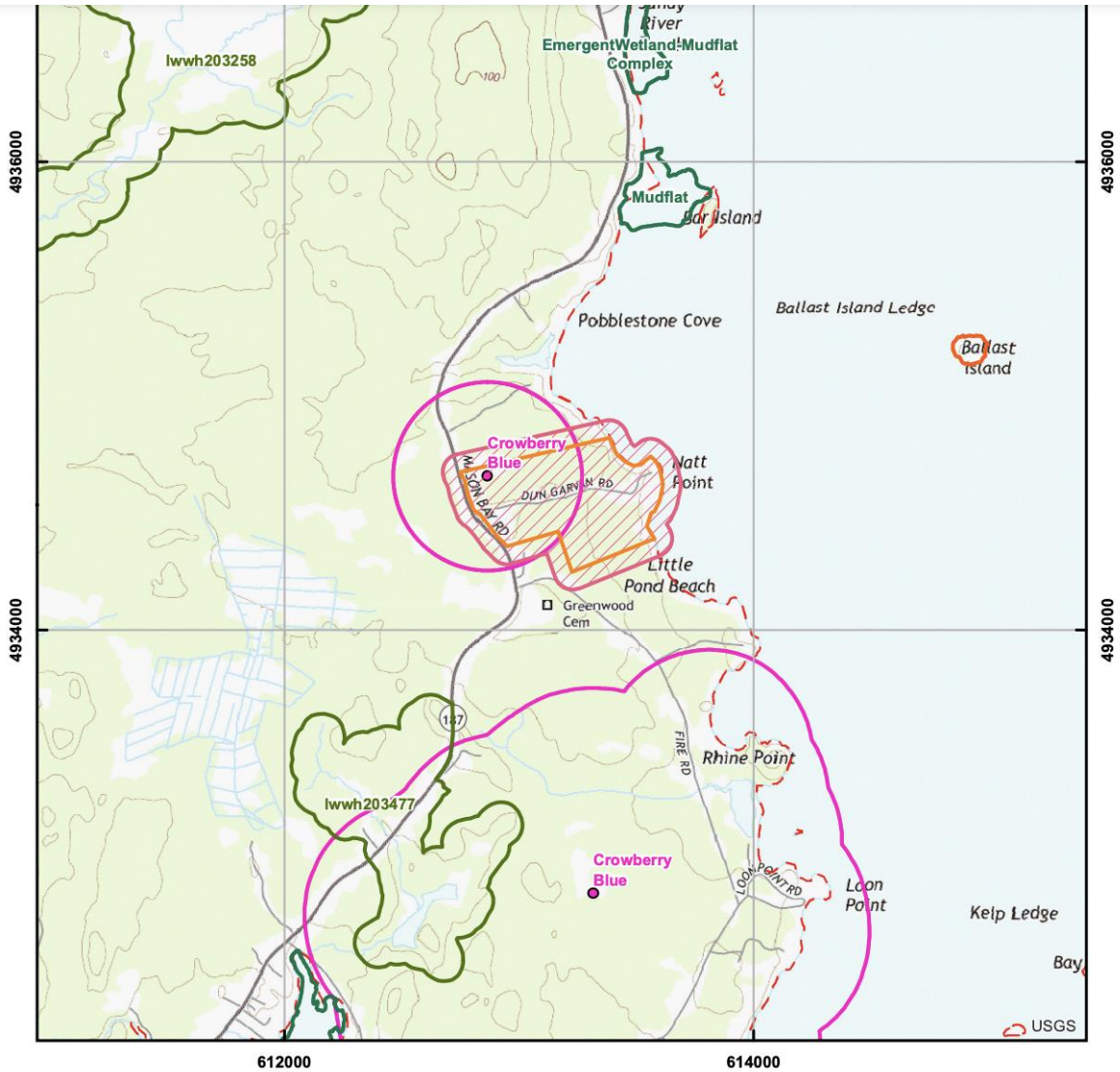
The eelgrass beds provide forage and food for the Razorbill and Harlequin Duck, both of whom nest and feed near the discharge location. In fact, the discharge location is adjacent to Ballast Ledge, a prime nesting site for many seabirds. The eelgrass beds are the nurseries for the small fish that migrating endangered salmon feed on while they grow out over the course of a year or two in these bay areas (Chandler, Englishman, Machias) before beginning their migration to more open

waters. Vast amounts of dollars and years of time have been spent on efforts to maintain and increase these endangered salmon.

But DEP fails to explain how the project will not unreasonably harm this habitat. Instead, the MEPDES explained that water quality *will* be diminished as it relates to eelgrass.<sup>5</sup> Despite this, the permit does not adequately address the full cost of water quality degradation as it relates to eelgrass and the resulting harm to habitat.

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<sup>5</sup> Maine Pollutant Discharge Elimination System Permit and Waste Discharge License for Kingfish Maine, Final Fact Sheet pg. 28, (2021).

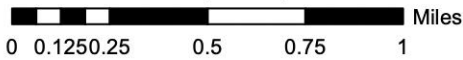


### Environmental Review of Fish and Wildlife Observations and Priority Habitats

Project Name: Kingfish Maine, Jonesport (Version 2)



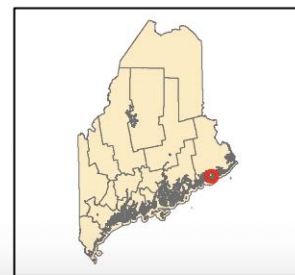
Maine Department of Inland Fisheries and Wildlife

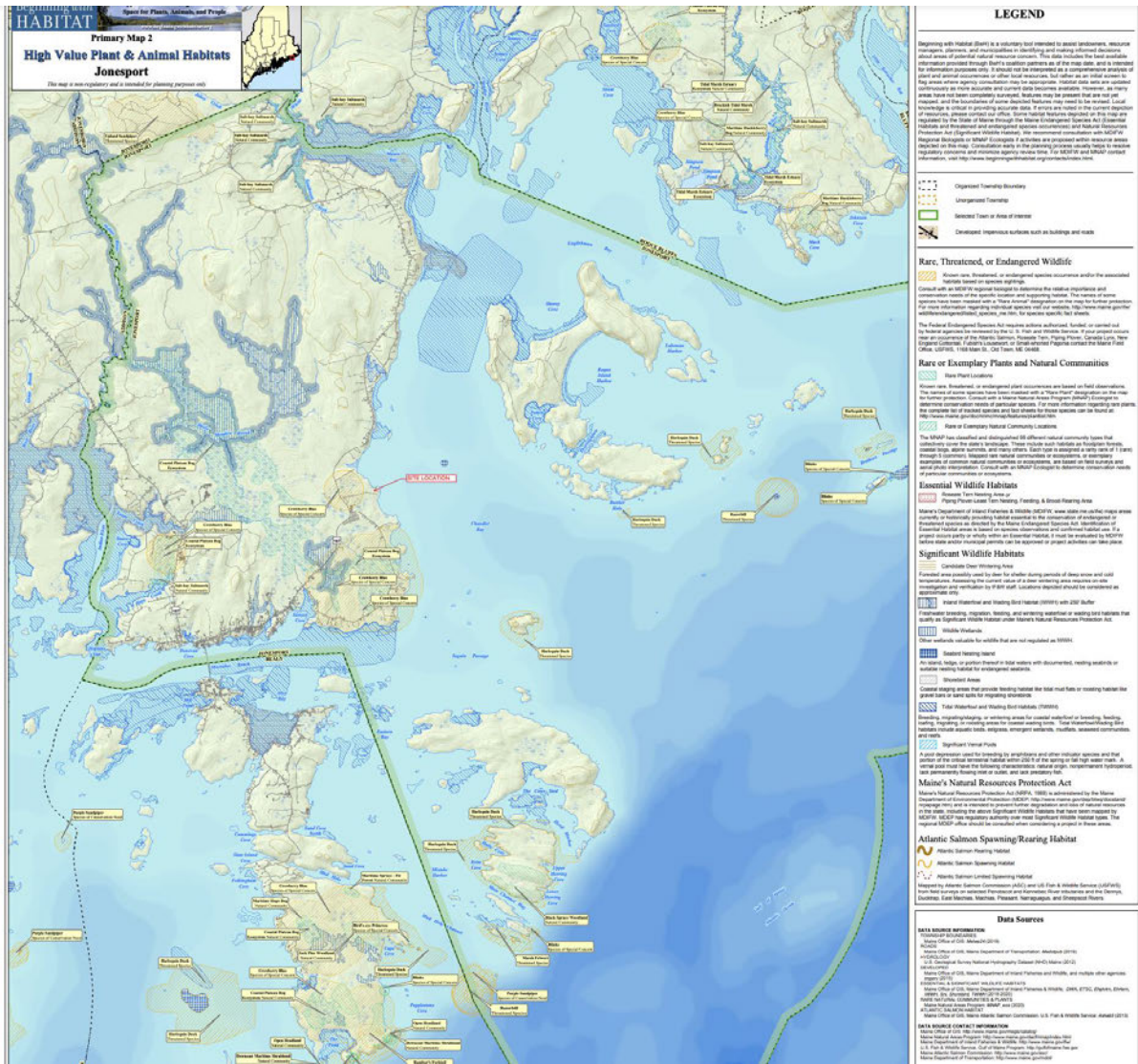


Projection: UTM, NAD83, Zone 19N

Date: 12/14/2020

ProjectPoints	Deer Winter Area	Roseate Tern
ProjectLines	LUPC p-fw	Piping Plover and Least Tern
ProjectPolys	Cooperative DWAs	Aquatic ETSc - 2.5 mi review
ProjectSearchAreas	Seabird Nesting Islands	Rare Mussels - 5 mi review
Maine Cliff and Talus Areas	Shorebird Areas	Maine Heritage Fish Waters
	Inland Waterfowl and Wading Bird	Arctic Charr Habitat
	2008 lwwh - Shoreland Zoning	Redfin Pickerel and Swamp Darter Habitats - buffer100ft
	Tidal Waterfowl and Wading Bird	Special Concern occupied habitats - 100ft buffer
	Significant Vernal Pools	Wild Lake Trout Habitats
	Environmental Review Polygons	





DEP also fails to provide sufficient evidence for its determination that the “project, as proposed, should not result in significant adverse impacts to marine resources, recreation, navigation, or riparian access.” Permit at 4. To the contrary, the fisheries, in particular the lobster, scallop, bait and recreational fin fisheries, and those ancillary businesses who depend on them will be significantly adversely impacted. The Department's own analysts found that the levels of nitrogen

discharged would degrade the waters to the point where the eelgrass beds, which are the nursery and habitat for all lobsters, scallops, clams, Jonah crab and juvenile fin fish in the area, would be degraded.<sup>6</sup> These estuarial nurseries are the source of the adult populations of these species which are commercially and recreationally fished.

Simply put, degrading the nurseries for the eggs and juvenile fish in the area degrades and diminishes the numbers, health and vibrancy of the commercially fished adult species. Additionally, the mid and upper water level vacuuming intake of 28 million gallons of the surface waters where all the eggs, larval, and juvenile shellfish and fin fish inhabit and feed on minute phytoplankton and zooplankton will severely damage these fisheries.

This not only affects the near and far field areas, as these estuaries are refreshed twice daily by incoming tides, this has the effect of drawing in those important life forms that occur in the adjacent and greater Machias Bay. It is unconscionable to allow this type of impact on much needed near shore fisheries. This is especially relevant at a time when deep water fisheries are being restricted, to needlessly be visited on those who live in and work the waterfronts in the Jonesport area.

Sierra Club Maine and interested parties have repeatedly brought alternative examples of commercially viable zero effluent Best Practices for fin-fish

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<sup>6</sup> Maine Pollutant Discharge Elimination System Permit and Waste Discharge License for Kingfish Maine, Final Fact Sheet pg. 28, (2021).

production. Likewise, there are closed loop marine based heat exchange systems that could be employed to augment the applicant's seasonal use of heat transfer systems. To date the Department has been unresponsive to these alternatives which would prevent violation of the Clean Water Act, NRPA, and SLODA.

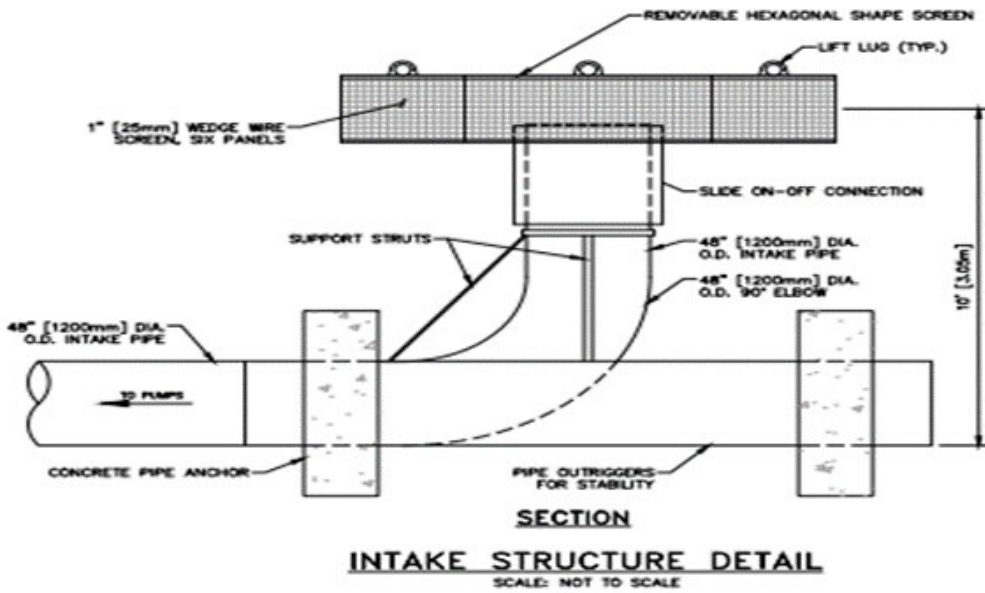
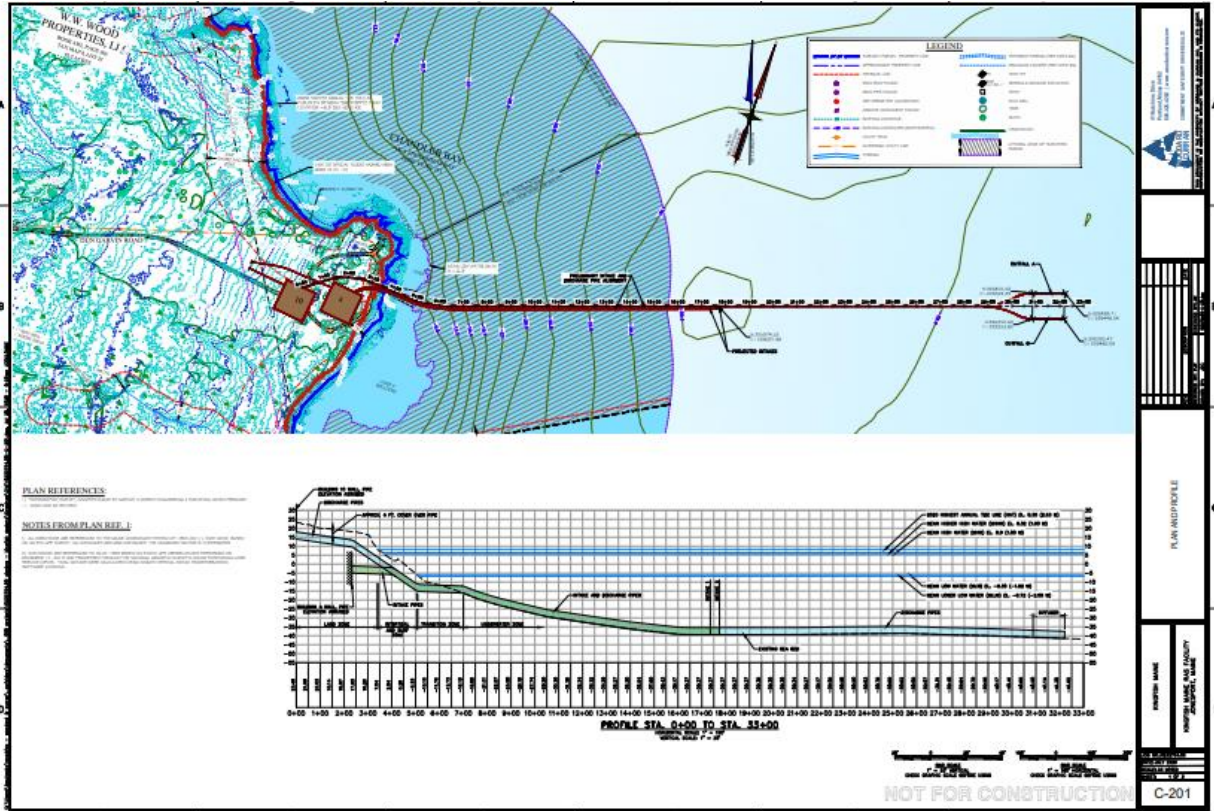
In the application submitted, the presences of breeding size lobster, scallops and Jonah Crab where clearly identified in a mere 2-hour ROV survey of just the pipeline area. However, NRPA does not limit itself to the pipeline area but to those areas included in the near and far fields, as well as the adjacent estuarial waters.

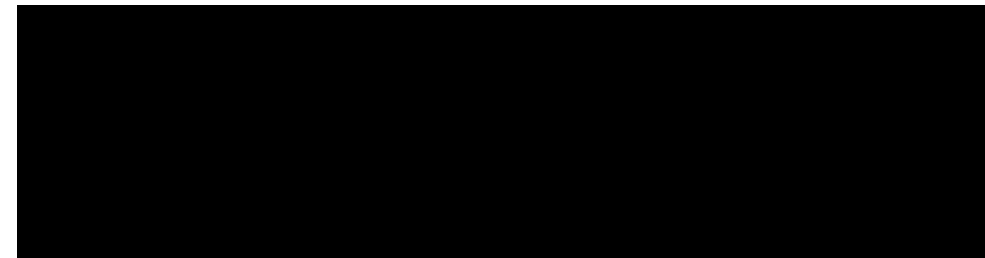
[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]. As previously brought to the Department's attention, along with lobsters, the scallops, mussels, and other shellfish spat and larva that are contained in the upper layers are impacted by the nitrogen discharge as well as the suctioning in of vast amounts of tidal upper layer waters. We have included graphics depicting the intakes which will decimate all upper and mid-water eggs, spat and juvenile fish carried in on the tides.





A lobster egg is about 1/16 of an inch when released. As it moves through its larval stages it is feeding, taking in calcium and molting its shell many times as it grows. During this time, it is carried on currents, tides and upwellings. During this time a juvenile lobster molts about 25 times until it becomes harvestable adult in 5-7 years.





Figure 1: Dive area covered based on average heading and maximum tether length.

ROV Survey Report  
Chandler Bay, Jonesport, Maine

Sheltering  
adult lobster,  
  
Possibly  
shedding or of  
breeding age

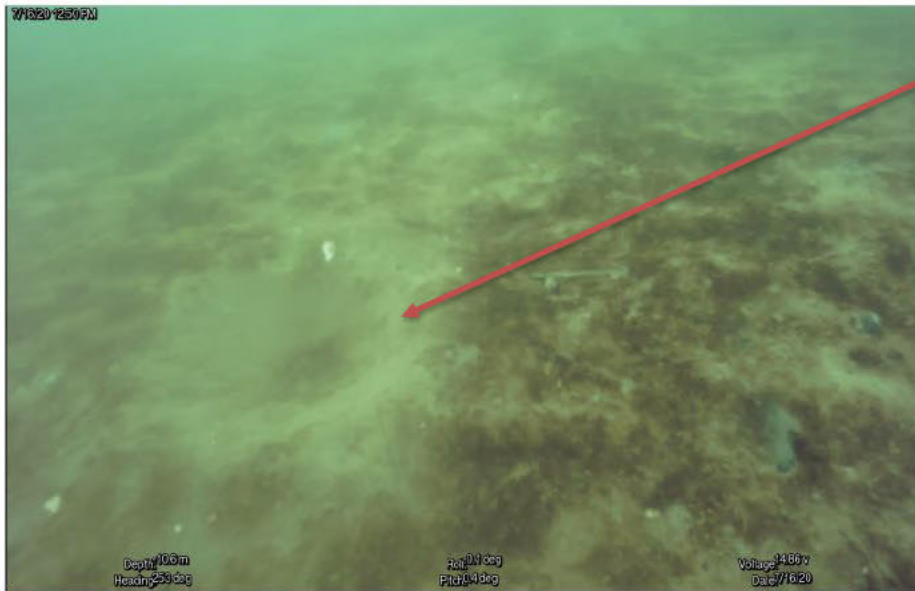


Figure 6: Dive 2.



Figure 7: Dive 2. Green laser points visible.

Kelp and seaweed nursery habitat which would be diminished by acidic waters. This habitat is expected to be similar throughout the estuary area and required for zooplankton and phytoplankton that feeds all ...from worms to whales and carried by the Maine Eastern Coastal Currents

**ROV Survey Report**  
Chandler Bay, Jonesport, Maine



Figure 10: Dive 3.

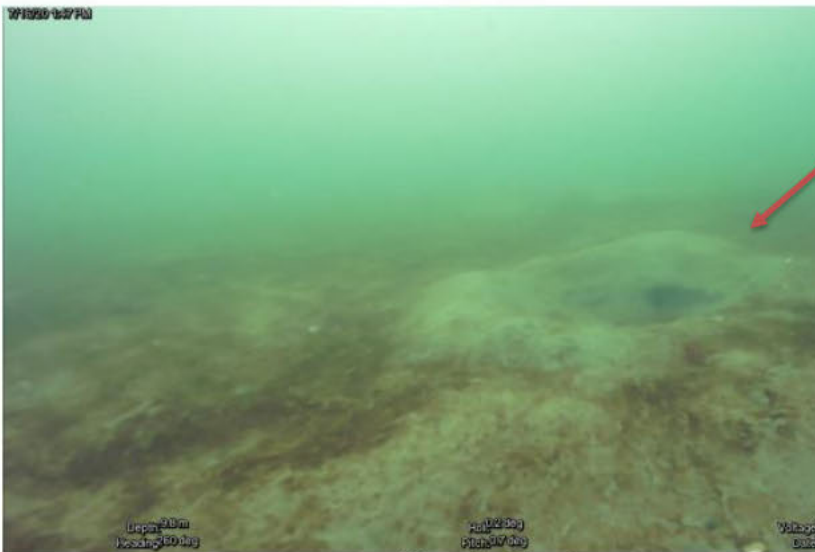


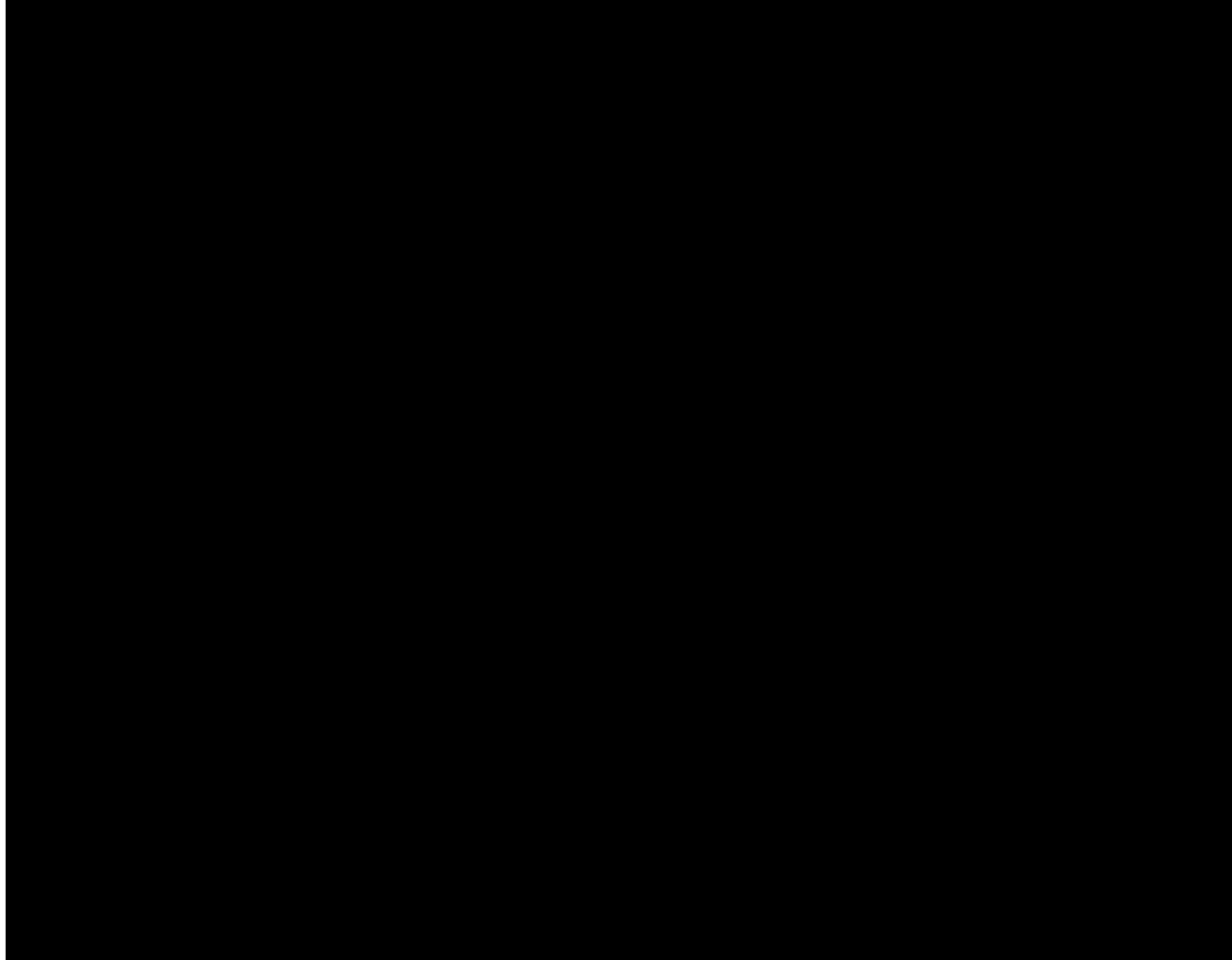
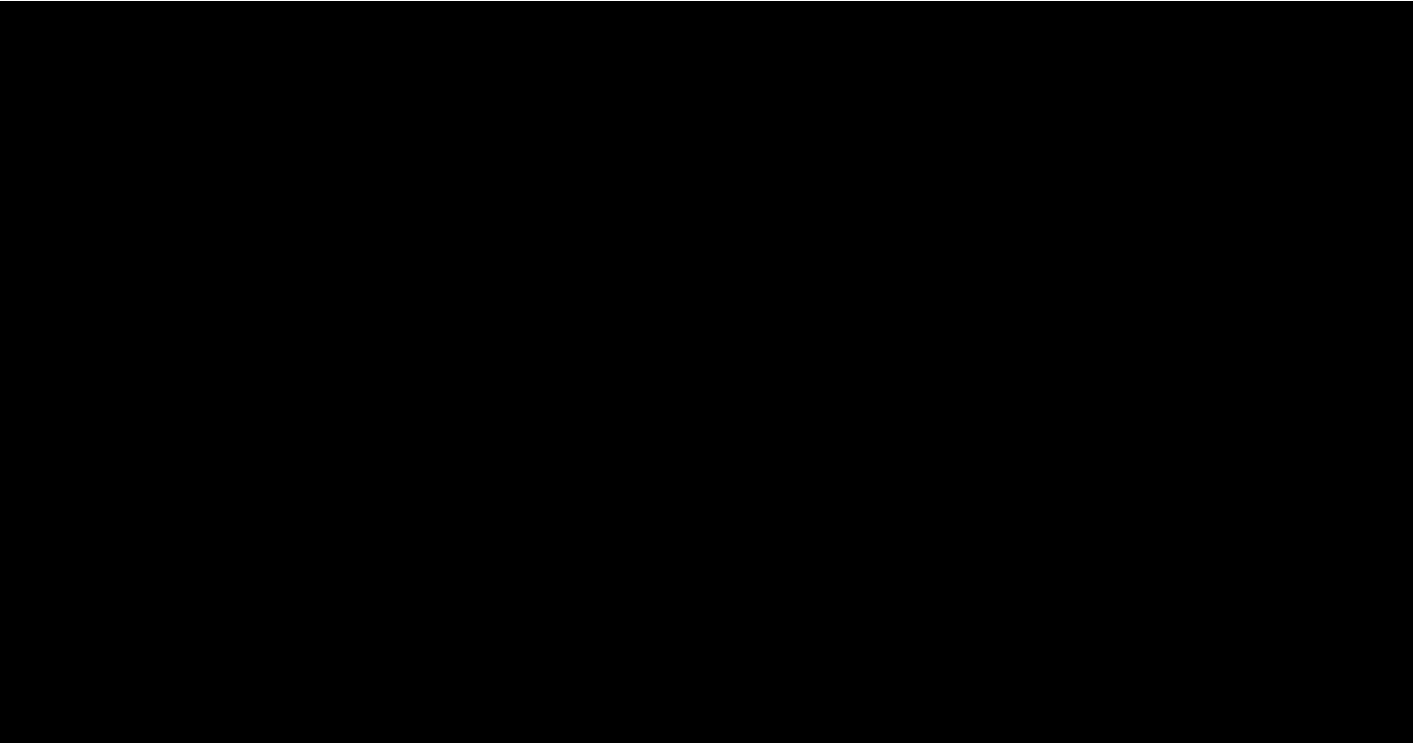
Figure 11: Dive 3.

Dive 3 – now looking in a different area, again showing at other adult lobster. Possibly sheltering during shedding or capable of breeding.

**C. DEP Failed to Provide Sufficient Evidence that the Project Will Not Unreasonably Harm Unusual Natural Areas.**

Third, DEP failed to adequately support its conclusion that the proposed development will not have an adverse effect on the preservation of any unusual natural areas either on or near the development site. Permit at 4. The SLODA regulations broadly define “unusual natural area” as “*any* land or water area, usually only a few acres in size, which is undeveloped and which contains natural features of unusual geological, botanical, zoological, ecological, hydrological, other scientific, educational, scenic, or recreational significance.” 06-096-375 Me. Code R. § 12. This definition includes the Sandy River Beach, a wide, pure white granite sand beach over 1/2 mile in length, frequented by Sierra Club Maine members, the likes of which is found nowhere else in the State of Maine. The Sandy River Beach lies in an area subject to algal blooms from this facility, yet DEP nowhere discusses adverse impacts of the project on Sandy River Beach.

DEP similarly fails to discuss impacts on Roque Island. This island is described in coastal guidebooks as the most beautiful Island in Maine, with multiple protected anchorages for recreational motor and sail boats. Yet DEP fails to even mention impacts on this Island, let alone support its conclusion with substantial evidence. The Rachel Carson, Petit Manan, Cross Island, and the Nature Conservancy’s Great Wass Island Refuge are also in proximity to Kingfish Maine yet go unmentioned in DEP’s assessment.



**D. The Record Contradicts DEP's Conclusion that the Proposed Project Will Not Impact Water Quality.**

[REDACTED]

[REDACTED]

[REDACTED] Sierra Club maintains [REDACTED]

[REDACTED] that the facility will significantly affect water quality for numerous reasons.

First, the total nitrogen of 1580 pounds per day exceeds the oxygen demand (64%, vs. the allowed 20%). As a result, this discharge violates the Antidegradation State law at 38 MRSA § 464(1), requiring sufficient water quality “to provide for the protection and propagation of fish, shellfish and wildlife and provide for recreation in and on the water.” Excessive nitrogen and oxygen depletion may lead to dead zones, red tides, shellfish closures, or reduced lobster harvests, an essential industry in Jonesport, *see* Attachment 3, in direct violation of DEP’s duty to provide for sufficient water quality for propagation of shellfish.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

- [REDACTED]
- [REDACTED].

- █ [REDACTED]
- █ [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

- █ [REDACTED]
- █ [REDACTED]
- █ [REDACTED]
- █ [REDACTED]
- █ [REDACTED]
- █ [REDACTED]
- █ [REDACTED]
- █ [REDACTED]
- █ [REDACTED]
- █ [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

DEP also failed to explain how the change in pH from the facility will ensure sufficient water quality for the protection of fish, shellfish, and wildlife. The MEPDES established a broad pH range limit of 6.0-9.0 standard units for the

effluent without any buffering agents listed to be applied to effluent prior to discharge,<sup>7</sup> and the response to comments indicated that no buffering would be applied.<sup>8</sup> [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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<sup>7</sup> Maine Pollutant Discharge Elimination System Permit and Waste Discharge License for Kingfish Maine, Final Fact Sheet pg. 22, (2021).

<sup>8</sup> Id. at 48.

<sup>9</sup> [REDACTED]

[REDACTED].

<sup>10</sup> Id.

<sup>11</sup> [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED].





In coastal areas, ocean acidification is compounded by nutrient pollution. Kingfish has responded to this issue by saying that their effluent is “buoyant” and therefore would not impact wild lobsters or other shellfish on the bottom.<sup>18</sup> Larval and juvenile lobsters, scallops and other shellfish use the upper portions of the water column while they feed, grow and develop sufficient shells prior to sinking to the bottom layers. Moreover, highly migratory shellfish such as scallops regularly, even as adults, feed and forage in mid layers of the water column.

In light of these impacts on water quality and on lobster propagation, DEP fails to explain how the facility aligns with the CWA requirement to protect lobsters, other shellfish, and wildlife. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED].

Kingfish has attempted to justify their failure to meet antidegradation laws on their experimental technology using fish sewage as carbon source for biofilters. By comparison, [REDACTED]

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<sup>18</sup> Maine Pollutant Discharge Elimination System Permit and Waste Discharge License for Kingfish Maine, Final Fact Sheet pg. 43, (2021).

[REDACTED]

Sierra Club appreciates the lower ecological footprint and reduction in cost and risks associated with substituting systems utilizing fish sewage as carbon source instead of methanol or acetic acid. However, the results are not impressive.

[REDACTED]

[REDACTED] These measures are insufficient to protect water quality.

**E. DEP Failed to Adequately Support its Conclusion of No Adverse Environmental Effects with Regards to Solid Waste Disposal.**

DEP failed to adequately support its conclusion that solid waste will be disposed of in a manner which ensures “no unreasonable adverse effects on the natural environment.” Permit at 8, 11. SLODA regulations require that applications for approval of a proposed development “must include evidence that affirmatively

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[REDACTED]

demonstrates the applicant has made adequate provision for solid waste disposal.” 06-096-375 Me. Code R. § 16. Here, no such evidence exists because Juniper Ridge Landfill does not yet have a special waste license to accept the waste. Permit at 8. This facility cannot and should not be permitted to be constructed without first obtaining a suitable licensed repository for its 25 tons of waste from the process water. Allowing the destruction of valuable wetlands, and construction of the facility to be undertaken when no licensed repository to take its waste product is reckless and jeopardizes the community of Jonesport.

As for fish processing byproducts, DEP also fails to support its claim that the waste will be disposed of at the Coast of Maine compost facility. Permit at 8. The Sierra Club believes the Department has erred in its assessment of the Coast of Maine compost facilities ability to properly dispose of 5 tons daily of waste product from unvaccinated fish raised on land in RAS. This waste must be autoclaved or heated to a degree that would kill all infectious pathogens from land raised fish who carry Infectious Pancreatic Necrosis virus as well as other pathogens. The low heat piles used by the Coast of Maine composting facility are not designed to handle this waste stream. Should this waste be mixed and bagged with the typical garden and lawn products that Coast of Maine produces contamination of surface waters of the State could easily occur due to run-off when used on residential land or agricultural fields. Maine has already experienced contamination of its fields from composted waste which contain environmentally damaging substances.

**F. DEP Failed to Require Best Management Practices to Minimize Wetland Impacts.**

The Department also erred in finding that no practicable alternative exists that would be less damaging to the environment and that the applicant “has avoided and minimized wetland impacts to the greatest extent practicable.” Permit at 10. Rather, the nitrogen pollution generated by this facility can be avoided by utilizing a zero effluent design of which there are numerous examples of in commercial use.<sup>21</sup> One such warm water zero effluent RAS design is currently underway in Millinocket, Maine. There are other commercial implementations for RAS fin-fish aquaculture in Nova Scotia, Canada via Sustainable Blue/Blue Tech International which is available under license.

The proposed \$1,110,083 dollar figure for the upland impacts in no way begins to compensate the local residents and fishing community for the degradation and impacts of its coastal waters and estuarial environment. These impacts, and environmental pollution and degradation would be addressed by adopting a zero effluent facility design. The Department erred in not requiring this Best Practice to be employed. The applicant has stated that they chose this particular location in Maine for access to its clean water. For the Department to then allow the applicant to unnecessarily pollute that same water which is currently in use by other

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<sup>21</sup> [REDACTED]  
[REDACTED]

stakeholders and may be used in the future by additional stakeholders is a violation of the NRPA, nonsensical, and a dereliction of the Departments dutiful obligation to the local stakeholders and the State.

**G. DEP Erred in Finding Compliance with the Clean Water Act.**

Sierra Club maintains that DEP erred in issuing a MEPDES and determining compliance with Sections 301, 302, 303, 306, and 307 of the Clean Water Act and applicable state regulatory requirements. DEP thus erred in finding “The proposed project will violate any state water quality law, including those governing the classification of the State’s waters.” Permit at 10. No pollutants, which include nitrogen, phosphorus, acidic water and lethal viral pathogens, which degrade these waters may be discharged into the waters of the United States. As this facility generates such pollutants modifications to this facility must be undertaken in order to avoid these violations.

**H. DEP Failed to Adequately Support Its Determination of Unreasonable Adverse Effects on Air Quality.**

DEP failed to adequately support its determination that the Department finds the project will not have an unreasonable adverse effect on air quality under Ch. 375, § 1. Permit at 10. Namely, DEP leaves out any discussion of the gas fired boiler that the applicant has included in the documentation for the NRPA licensing. Without evaluating the gas fired boiler, DEP failed to provide sufficient support for its conclusion.

Furthermore, DEP failed to adequately discuss adverse environmental effects from the emissions of eight diesel generators. Despite the proposed license conditions for its eight diesel generators, Kingfish was granted the ability to use its generators in a manner that would fall outside the category of minor source: “Kingfish may operate more than one generator at a time for occasional testing or other non-emergency purposes, and in the event of an emergency.” While the license restricts “peak shaving” use, the above language allows Kingfish to run multiple diesel generators, at any time for any reason *other* than emergency use. Which means that 8 diesel generators could be used at *anytime* to generate power. Yet nowhere does DEP discuss the emissions from such usage, let alone make a meaningful determination that these emissions will not significantly affect the air quality for all those in the surrounding area.

### **PUBLIC HEARING**

Sierra Club Maine requests a public hearing on this matter.

### **REMEDIES SOUGHT:**

1. That the DEP suspend this license in order to give the applicant time to incorporate a zero effluent design into its facility.
2. That the DEP review and modify this license to restrict the use of its diesel generators only for emergency use and specifically insert language in that modification which completely nullifies the use in the Air License listed above.

Respectfully,

A handwritten signature in blue ink that reads "James S. Merkel". The signature is written in a cursive style with a large initial "J" and "M".

Jim Merkel  
Sierra Club Maine



**SIERRA CLUB OF MAINE CHAPTER APPEAL TO THE KINGFISH  
MAINE INC. PERMIT ISSUED BY THE DEPARTMENT OF ENVIRONMENTAL  
PROTECTION ON NOVEMBER 12, 2021**

**DECLARATION OF STANDING**

**DECLARATION OF SIERRA CLUB MAINE, JAMES MERKEL**

I, JAMES MERKEL, declare that if called as a witness in this action, I would competently testify of my own personal knowledge as follows:

1. I am an elected Executive Committee member of Sierra Club Maine (SCM). I joined SCM because I am passionate about the health and wellbeing of the waters and lands of Maine. As the nation's oldest environmental organization, Sierra Club amplifies the power of over 20,000 Sierra Club members and supporters in Maine along with the 31 Sierra Club members and supporters in the Jonesport area in Maine.

2. Our members in the area surrounding the proposed Kingfish Maine site, own businesses such as a bed and breakfast and cottage rental operation, go fishing and clamming, hike and recreate in the Sandy River Beach area, study the endangered species of coastal Maine, Kayak and sail regularly and live or recreate on coastal islands such as Roque Island. All these activities, lives and livelihoods would be jeopardized by an industrial fin-fish operation the size of a Concentrated Animal Feeding Operation or CAFO in an otherwise relatively pristine location. Risks are real for toxic algae blooms, oxygen starved waters, diseases and viruses escaping into the marine environment, spoiling the traditional working waterfront

and the daily activities of our members. These hypothetical risks have already happened at similar facilities in 2021 including two mass die-offs, one in Florida and one in Denmark and an industrial fire that released toxic gases into the air and water requiring a response from the military when the police could not ensure the safety of residence. This happened at the fin-fish RAS facility immediately ahead of Nordic Aquafarms and Kingfish Maine in the pipeline of these untested systems. Industrial noise from air handlers and generators have plagued residents near Nordic's Frederistad facility causing them to write to me in Belfast warning of what was to come. The noise from Kingfish Maine will carry for miles across the water, especially at night. The silence for boaters and shore-front homes will be forever broken by an industrial hum.

3. Sierra Club Maine works to protect Maine's traditional working waterfront, wilderness heritage, promote smart growth, and safeguard Maine's clean water and coastline. Sierra Club submits this appeal on the grounds that the 6.5 MGD of fish culture or processed water is harmful to the ecology and economy of Maine's coastline. Along with the effects of the discharge in the immediate area, the decision to permit this discharge affects everyone in Maine, from those who enjoy Maine's waters to Maine's lobster and fishing industry, because of the far-reaching implications that the waste discharge could have. Sierra Club Maine requests the Department of Environmental Protection respects the goals and standards set out in *Maine Won't Wait, A Four Year Plan for Climate Action*, recognizes the threat that Kingfish's effluent will have on the ecology and economy of the Maine

coastline, and creates a new standard for land-based aquaculture based on the zero-effluent technology available to emit no pollution into receiving waters, in alignment with the Clean Water Act.

4. I am an avid sailor, cyclist, backpacker and expert in medicinal and edible plants including coast ecosystems and seaweeds and have taught many university classes since the mid 1990's related to sustainable living, including teaching sustainability courses at Unity College in Maine. I was elected to two terms as Santa Lucia Chapter Chairperson of the Sierra Club in California in the 1990's. In 1999 I joined a colleague in creating a six-credit masters-level course at the University of British Columbia where the students studied, interior forests, urban and coastal communities including the impacts that salmon aquaculture was having on wild salmon fisheries near Vancouver Island. In 2018 I began researching potential impacts of industrial-scale Recirculating Aquaculture System (RAS) fin-fish projects in Maine. With five fin-fish RAS proposed in Maine, I have worked with others to calculate and determine estimates for the cumulative impacts of electricity consumption, CO2 emissions, air pollutants and nitrogen releases into receiving waters. This information is condensed into a Sierra Club "White Paper on Industrial Finfish Aquaculture" that is attached to this appeal. Additionally, I've researched the social and economic impacts of "too-big-to-fail" corporate entities that use disproportionate assimilative capacities of air and water at the expense of small fisher men and women. Large foreign projects export profits to shareholders, while freely using Maine's electricity, carbon budget, clean air and water. Sierra

Club actively supports local sustainable businesses including small-scale zero-effluent aquaculture that employ more people and recycle dollars within communities.

5. As a sailor and researcher, each year I sail from Belfast Maine to Roque Island, Great Wass Island, Jonesport and the surrounding waters to learn about the marine environments and community challenges. I understand the massive scale of the proposed Kingfish facility and how it would forever alter the wildness, ascetics, community life and marine environments. Of particular concern to me are the excessive nitrogen released from Kingfish Maine Inc. With shellfish closures on either side of the chosen site, it is not a stretch that the 4-foot diameter effluent pipe, with 28 million gallon a day flow, of which 6.5 MGD of fish culture or processed water will further expand the existing shellfish closures in the area. The intake pipe will draw in and kill untold millions of eggs, larva and small floating marine organism. Red tides and die-offs could occur from Kingfish using 64 percent of available oxygen, an exemption from the 20% standard, issued with minimal public process. Viruses from the non-native species could be deadly to endangered Atlantic Salmon among other species of birds, fish and wildlife.

6. I also visit the nearby Sandy River Beach estuary and Great Wass Island Refuge held by the Nature Conservancy and care about their preservation and protection These peaceful relatively unspoiled places are important to me and my family. If the nutrient discharge from the facility were to contribute to algal blooms in these areas, my interests in recreating in these areas would be harmed.

7. As an avid boater, my father, a laborer and truck driver brought me to Jonesport as child. He had his first wooden lobster boat built on nearby Campobello Island by Clayton Fletcher in 1962, whose boats were used in Jonesport, a year before the international bridge was built. As a toddler I walked the many small shipyards and boat sheds of Downeast Maine's boat builders. The tides, piers, lobsters and tidepools of Jonesport captured every boyhood dream of paradise. I grew to a young man skilled in salt water fishing. Bobby Rich and Joel White on Mount Desert Island would build boats for my father, that our family of nine children would use to cruise the waters of Long Island when my father wasn't pushing a wheel barrel. After a successful career as an industrial electrical engineer with a top-secret clearance, I came back to raise my son in coastal Maine, because of its unspoiled areas, like the waters surrounding Jonesport. My family and I are vegetarians, but we make an exception for the local wild-caught lobster, shrimp, mussels, clams, Haddock and sardines. We know the major rivers of Maine have legacy mercury and other toxins from poorly regulated industry, so we seek our seafood from Jonesport, because of the absence of any major river outflow.

8. My partner and I specifically moved to Belfast Maine to have our first and only son, because of the Belfast COOP, MOFGA and the community that supports organic, fair trade, local and ethically raised food, and healthy, active lifestyles. Additionally, Belfast Harbor was a perfect place to sail, swim, fish and explore the many islands and harbors of Maine. When Nordic Aquafarms emerged from 6 months behind closed doors with my city council, the community was

outraged. Every public meeting was to capacity and overwhelmingly opposed. This made no difference. Decisions had apparently already been made, free of democratic engagement. This fish factory was going to change everything that drew us back to coastal Maine. The same beaches our son enjoys, will, if approved, have 7.7 MGD of effluent passing by on incoming and outgoing tides.

9. This permit will harm my interests and my family's interest in swimming, sailing, and fishing in Chandler Bay because as father and captain of our 28-foot Sabre, my job is to keep my family safe, and swimming near an industrial outflow of fish sewage is something I'd never subject my family to. We would not want to eat dulse, kelp, laver, mussels or clams that we gather. We would not want to visit Jonesport to eat seafood from local restaurants. We would no longer seek out lobster and other seafood caught in Jonesport area.

10. Our food is mostly homegrown organic and when we purchase fish, it must be ethically caught wild fish. We would never feed caged salmon to our family or friends.

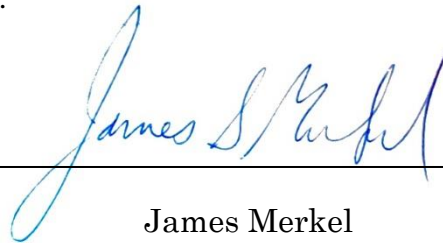
11. I had worked in large industrial facilities with systems very similar to land-based aquaculture, with large tanks, pumps, valves controllers and chemicals and came to understand through research that fully "closed" RAS systems were in use as polycultures around the world. However, the wave of five industrial aquaculture projects coming to Belfast, Bucksport, Millinocket, Frenchman's Bay and Jonesport, were first proposed as "open" RAS, totaling over 4 billion gallons a day of effluent into Maine's waters. Kingfish Maine alone, proposing to dump over

1500 pounds a day of nitrogen, equivalent to over half the nitrogen from Portland Maine's city sewer, into the clean and recovering waters that I love and regularly swim, fish, sail and relax in.

12. A decision from this Board to invalidate the permit issued under NRPA and SLODA would redress the injuries to my recreational and aesthetic interests in visiting Sandy River Beach, and swimming, fishing, and sailing in the waters near the proposed project.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 10th day of December, 2021.



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James Merkel

**SIERRA CLUB OF MAINE CHAPTER APPEAL TO THE KINGFISH  
MAINE INC. PERMIT ISSUED BY THE DEPARTMENT OF ENVIRONMENTAL  
PROTECTION ON NOVEMBER 12, 2021**

**DECLARATION OF STANDING**

**DECLARATION OF HOLLY FAUBEL, SIERRA CLUB MEMBER**

I, HOLLY FAUBEL, declare that if called as a witness in this action, I would competently testify of my own personal knowledge as follows:

1. I am a member of Sierra Club because I am committed to the cause of maintaining our coastlines natural resources, in particular the estuaries which are vital to the flora and fauna that make up Maines remarkable oceanic habitats

2. I have lived in Maine for over 20 years and am married to a native “Mainer” who was born and raised in Machias and whose family members have fished and worked the Down East waterfronts for generations. Together my husband and I own approximately 30 acres of land on Starboard/Ingalls Island, which we purchased to insure its wild and beautiful coastline and lands would be protected. It is located a few nautical miles from the site of the proposed Jonesport land-based RAS aquaculture facility. When visiting our numerous family members, I often eat lobster fished from the waters of Jonesport and Beals Island. I find it to be exceptionally good which I attribute to the exceptionally clean waters in this area. I am a Member of the Maine Lobsterman’s Association (MLA) and while I do not lobster fish commercially my family members do. I am a member of Downeast



Trout Unlimited and have cast fished when I get a chance. I sea kayak in the area and sail when I can.

3. I understand that DEP has permitted the facility to discharge pollutants that will degrade water quality and harm lobsters, and finfish in the area. If this happens, my interests in consuming these local seafoods as will be harmed because there will be fewer lobsters, shellfish, and finfish in the area.

4. Starboard/Ingalls Island is near Cross Island which has the highest quality waters in the State, they are termed "SA". These "SA" waters also are present along the shores of Beals Island Great Wass preserve. These waters are high in value to our lobstering industry as they have not been degraded by large industrial discharges of high nitrogen, phosphorus, high acidity and pathogen pollution as can be found in more populated areas. Preserving the quality of these waters, preventing their pollution, and seeing our eelgrass estuaries restored is a driving force in my life. While I am not a Marine Biologist by training, I have spent the last four years attending conferences on water quality, shoreline restoration and aquaculture seminars. I am an active member of the Global Aquaculture Alliance, the American Association for the Advancement of Science, and The American Fisheries Society.

5. As a retired Research and Development Applications Manager, International Marketing Manager, and a Business Development Manager for Intel Corporation, I have a strong background in both science and technologies development. In my last position at Intel, I was responsible for evaluating new

technologies and aligning them with Intel's strategic planning and for the Intel Capital investment group. It is that background, combined with a deep appreciation of Maine's natural environment that propels my continuing advocacy for closed Recirculating Aquaculture Systems. Maine is well situated to achieve much in this area; however, I have come to find that the current situation Statewide is highly concerning and nowhere more so than in Jonesport only a few miles from my "home waters". The level of due diligence that has been undertaken to date highly distressing to me personally.

6. I have recently had the opportunity to visit and enjoy the unique and remarkable Sandy River Beach at low tide. I have never, in all the years I have been visiting and staying in this area at both our family's seaside home and various BnB's in the area have ever seen or experienced walking on a beach like this in all of Maine or an estuary like that encompassed by Chandler and Englishmans Bays. In researching why, the Sand River Beach is so blazingly white with powder fine sand, I found that it was due to the fact it is made up of white granite sand. Looking at a map of Maine, I could find no is no other beach like this that I have seen other than one tiny pocket beach in Chandler Bay and the beach at Roque Island.

7. I have visited Sandy River Beach, and I plan to continue doing so. I understand that the Kingfish Maine facility will discharge pollutants that contribute to algal blooms that likely will affect this beach, both its aesthetic beauty

and the quality of its waters. If this happens, my interests in visiting this beach and enjoying the beauty of this natural area will be harmed.

8. I believe that the Department of Environmental Protection needs to help Kingfish Maine achieve success in this location for all stakeholders involved, and that includes myself. To do so requires the Department to help not only Kingfish Maine, but also the men and women who rely on this remarkably vital estuary to preserve and maintain its water quality, in particular these estuarial waters that all the local lobster, shellfish and finfish larva depend on. The proposed intake of shallow tidal waters in the upper and middle layers in this estuary is most distressing and will impact all the eggs, spat and larva in this estuary. To suck in that number of juvenile fish is simply a tragedy for the general environment and will lead to the diminishment of highly valuable fish that I frequently eat, which are caught locally.

9. This facility will also harm my interests in observing birds in the area. I am a contributing and active member of Maine Audubon. I frequently birdwatch in this area, and specifically look for the threatened Harlequin Duck, the threatened and very rare Razor Bill Auk (which I have yet to spot!), and the Purple Sandpiper, which is a Priority 1 Species of Greatest Conservation Need.

10. DEP's permitting of this facility, as proposed, will harm the habitat of these bird species I enjoy looking for and observing in the area. If the habitat were harmed, fewer birds would frequent the area, and my interests in observing them would be harmed.

11. As a very active and contributing member of the Downeast Salmon Federation I have been particularly distressed by the proposal to discharge 28 million gallons per day of water containing viral pathogens. These pathogens will not be addressed by the insufficient discharge sterilization methods that the Department is permitting for this facility. The Department may be relying on its experience with the few hundred pounds of breeding stock that are hatched and grown out at the University of Maine facilities. Whatever methodologies the UofM utilizes in its rearing of small numbers of breeding stock is in no way equivalent to the environmental impacts resulting from the liquid waste discharge from 8,000 tons of unvaccinated fish. There is absolutely no way to protect not only all the bait fish, recreational fish, or Endangered Salmon from an outbreak of virulent or mutant virus that would be unleashed in this area under pressure of pumps. That an outbreak will occur is only a matter of time. The wild fish have no built-up immunity to an event of this magnitude. There would be no way to remediate it. For this permit to be let with such a clear lose-lose risk needlessly in an estuary of this significance is egregious.

12. A decision from this Board to invalidate the permit issued under NRPA and SLODA would redress the injuries to my recreational and aesthetic interests in viewing wildlife, consuming local lobster, and visiting the beaches in this area.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 12th day of December 2021.

A handwritten signature in black ink, appearing to read 'Holly Faubel', positioned above a horizontal line.

Holly Faubel

**EASTERN MAINE CONSERVATION INITIATIVE (EMCI) APPEAL TO THE  
KINGFISH MAINE INC. PERMIT ISSUED BY THE DEPARTMENT OF ENVIRONMENTAL  
PROTECTION ON NOVEMBER 12, 2021**

**DECLARATION OF STANDING**

**DECLARATION OF EASTERN MAINE CONSERVATION INITIATIVE,  
ANASTASIA FISCHER**

I, ANASTASIA FISCHER, declare that if called as a witness in this action, I would competently testify of my own personal knowledge as follows:

1. I am the Board Chair of the Eastern Maine Conservation Initiative (EMCI – emcimaine.org). We maintain several easements, areas ecologically rare and vulnerable, on inner islands in Chandler Bay, Maine, across from the proposed Kingfish Maine aquaculture project. Our easements require regular monitoring to ensure the natural state of the sites is conserved, no new negatively impactful conditions have occurred, and the rare plants protected. Modeling of the dispersion of the effluents from the Kingfish Maine project has not effectively taken account of far-field impacts on the islands directly across from the plant; the locations of the sensitive areas we manage, and may significantly impact the ecological health of areas that we are legally bound to maintain. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

2. Moreover, as property holders in this direct area, while we are not land-abutters, we are water-abutters (directly across from this location) and were not notified by Kingfish Maine at the beginning of this project, as required by law, which significantly handicapped us in

registering as an intervener in a timely manner. This is a legal process manner and should have been addressed in the beginning of the Kingfish's applications.

3. Our organization includes 8 Board Members (3 of whom are residents of Knox County, ME) and Advisors (1 of who lives in Washington County), all committed to supporting environmental and historical research, conservation, and preservation efforts EXPLICITLY in the Downeast coastal region, east of Frenchman Bay. The mission of our organization is to help this region preserve its natural and cultural heritage, and over our 25 years of grant-making, the majority of programs we have supported have been in Washington Country, and specifically in Jonesport and Beals. As such, we have a strong commitment to—and concern about--the environmental health and sustainability of the immediate area where the Kingfish Maine aquaculture facility is planned, and the extent to which its effluents may negatively impact the environmental and economic viability of the area.

4. Additionally, the extensive network of scientists we have supported over the years in doing research in the area, have shared with us their concerns that various critical aspects of the local ecology will be negatively impacted by the Kingfish farm. One of their most significant concerns is the high likelihood of red tide algal blooms which will be extremely difficult—if not impossible--to eradicate once they are created “in-shore”. This would not only have a power, direct, negative impact on the local sea life, but would also effectively halt one of the major existing sources of income in this economically vulnerable region: bivalve harvesting. In this time and age, there are available zero-discharge aquaculture solutions that the Maine DEP (and DMR) should have required before approving this project; before approving a project that will most certainly have negatives impacts on the ecology and traditional economic viability of Chandler Bay. We request that the DEP and DMR explicitly address the risk of inshore algal blooms, and communicate this to the community of fishermen in the area effectively.

5. The Kingfish farm also threatens the wetlands ecology in an area that contains significant plant and animal species that have been identified as vulnerable by both state and federal agencies. While Kingfish Maine is making a considerable “In Lieu” payment for its impacts on this area, money will not restore an ecology, particularly a fragile one. The DEP is responsible for protecting the environment and agencies should not be receiving financial gain for allowing the depletion of our natural resources.

6. As a local landowner for over 50 years of an island in close proximity to the Kingfish farm (my immediate family owns Pig Island), and as President of US Harbors (a free coastal weather and tidal data service used by commercial and recreational fishermen and boaters), I am highly connected with the local community in Jonesport and Beals. Over the past 50 years I have directly observed the ocean environment in the area become increasingly fragile, with multitudes of species disappearing. The less diverse, the more threatened this environment becomes: it cannot tolerate further stressors, and the Kingfish Maine permit applications explicitly states that it will be forced to, if the farm proceeds.

7. Additionally, our organization is very concerned that the impacts of the Kingfish project have not been effectively communicated to the generations of fishermen that currently rely on the area for their livelihoods. None of the fishermen we have spoken to have been provided detailed—and understandable--information on the project, specifically about how it may possibly affect their fishing grounds: it is inappropriate for the DEP and DMR to have approved a project without direct consultation with this critical group of local stakeholders.

Possible impacts they may face include:

- [REDACTED]





**ROQUE ISLAND GARDNER HOMESTEAD CORPORATION**

**APPEAL OF**

**STATE OF MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION**

SITE LOCATION OF DEVELOPMENT ACT  
NATURAL RESOURCES PROTECTION ACT  
COASTAL WETLAND IMPACT  
FRESHWATER WETLAND IMPACT  
ADJACENT ACTIVITY

**WATER QUALITY CERTIFICATION FINDINGS OF FACT AND ORDER**

**FILED NOVEMBER 12, 2021**

IN THE MATTER OF  
KINGFISH MAINE, INC. Jonesport, Washington County AQUACULTURE FACILITY  
L-28995-26-A-N (approval)  
L-28995-4C-B-N (approval)  
L-28995-TH-C-N (approval)  
L-28995-2F-D-N (approval)  
L-28995-2G-E-N (approval)

**DECLARATION OF STANDING**

**DECLARATION OF ROQUE ISLAND GARDNER HOMESTEAD  
CORPORATION, ARIANA S. FISCHER**

I, ARIANA S. FISCHER, declare that if called as a witness in this action, I would competently testify of my own personal knowledge as follows:

1. I am the Chairman of the Board of the Roque Island Gardner Homestead Corporation (“RIGHC”). RIGHC owns Roque Island and eight adjoining islands, forming an archipelago lying between Chandler Bay and Englishman’s Bay in the Town of Jonesport, Maine (the “islands”). RIGHC is a family homestead corporation of which I am a member, and the islands in one form or another have been owned by my family since 1806 and continuously since 1820. Roque Island and surrounding islands comprise 1787 acres above mean high tide. For the

entirety of RIGHC's ownership, it has operated a traditional island farm, recalling historic Maine.

2. For many generations, members of my family been visiting and contributing to the islands, starting as infants, enjoying, protecting, and preserving the pristine environment in which the archipelago is located and operating a traditional island farm. I myself have been going since before I was one year old. I and the other members are passionate about the health and wellbeing of the waters and surrounding islands of the Jonesport area. RIGHC currently has over 103 members. Altogether there are over 400 direct descendants of Joseph Peabody and George Augustus Gardner, their spouses, significant others, relatives, and guests who use the island virtually year-round, along with hundreds of tourists and visitors who use the beaches, coves, and inlets around the islands. Indeed, every year, dozens of visitors come by boat to Roque Harbor's famous anchorage and beach from up and down the Atlantic Coast. Along with lobstering in the islands' water, local families picnic in Roque Harbor and use the beach throughout the summer months.

3. In addition, RIGHC has always employed people to operate the farm. Currently, between 6 and 8 employees live on Roque Island year-round, some of whom come from families living in the Jonesport area for many generations. These people, who are critical to RIGHC and the preservation of the islands and the traditional island farm, provide an important connection to our neighboring communities. They also extensively use Chandler Bay and the other waters around Roque Island for transportation and recreation, including boating, fishing and shellfish collecting.

4. Since around 1980, RIGHC has brought many scientists, researchers, and others to study the islands and the surrounding waters. RIGHC and Eastern Maine Conservation

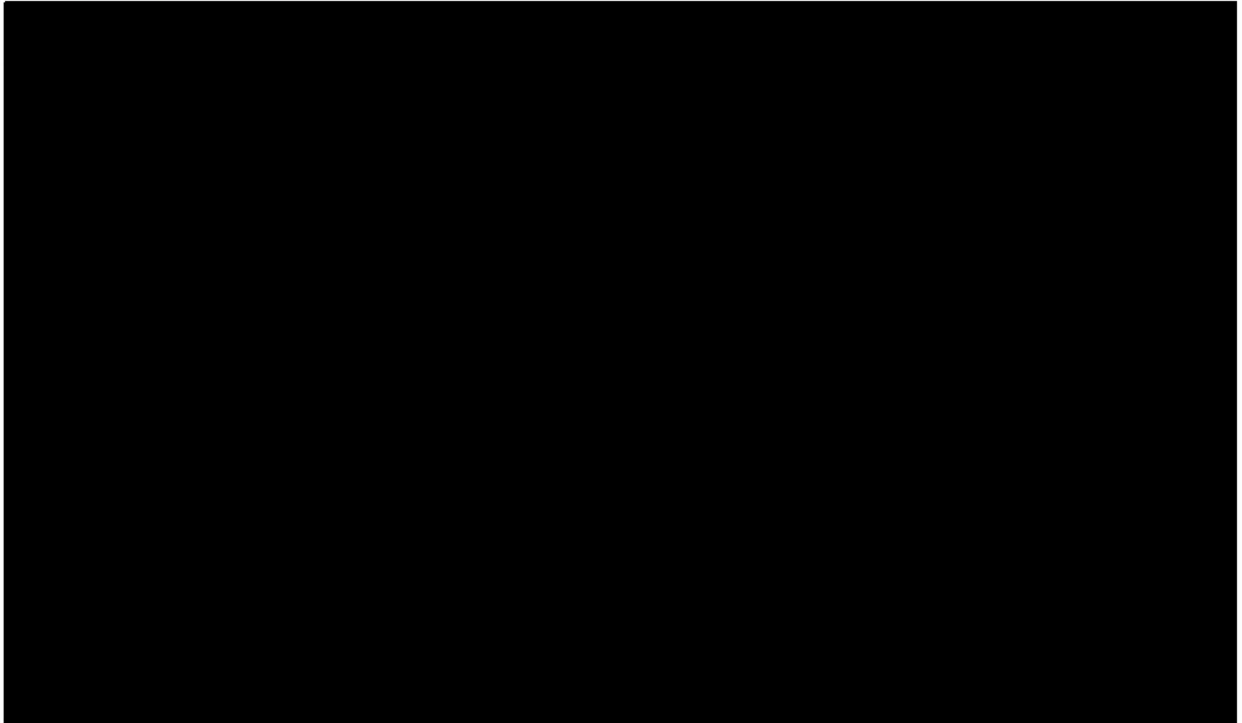
Initiative (“EMCI”) have been extremely active in preserving and protecting the islands and the surrounding waters, along with downeast Maine generally, and every year we invite people to conduct research on the islands. EMCI provides grants to people studying matters related to conservation in downeast Maine. In 1992, the RIGHC board of trustees adopted a Long-Range Conservation Plan and a Mission Statement stating that protection, preservation and conservation of the islands and surrounding waters was central to mission of RIGHC. And since then, RIGHC has been granted the Conservation Award of Excellence awarded by the Maine Conservation Rights Institute, honoring the family’s exemplary voluntary land management practices. RIGHC has also received a Special Commendation which was awarded by the U.S Fish and Wildlife Service for help in organizing a Neotropical Migrant Monitoring Program.

5. Below are some additional points with respect to the islands:

a. Because of the pristine quality of the island, Roque Island has served as a laboratory for scholars and students of natural history and marine science. We have a list of 75 scientists who have visited the Island and conducted research. Amongst them are a number of professors from the University of Maine, for whom the island is a welcome resource. (See attached).

b. RIGHC is in favor of aquaculture that is done in an environmentally responsible way. In the past, we have worked with a Great Eastern Mussel Farm that seeded mussels off of Roque Island in the 1990’s. Currently, Nautical Farms has a mussel and kelp farm in Shorey Cove off of Roque Island that we fully support. Information about Nautical Farms can be found at [REDACTED]

c. Roque Island has three clam flats where local clammers have dug for clams for generations. The clam flats are located at Clam Cove, Paradise Cove, and Patten's Cove (directly across from the Project site).



e. RIGHC's efforts to protect wildlife dates back to 1876, when it is cited in an article in *Field and Stream* magazine recording the bird population of the Island, including one of the first sightings of the Bald Eagle in a scientific publication in Maine.

f. Listening to the growing discussion and debate about Global Warming in the 1980's, RIGHC recognized the need for environmentally sound management and so commissioned the local Spencer Famous environmental consulting firm to prepare a study of our natural resources and design a plan for protecting and monitoring them.

g. By 1992 RIGHC had adopted a Long-Range Conservation Plan and a Mission Statement to implement them. Enthusiasm for the early efforts of the Spencer/Famous team fostered support of the RIGHC membership in systematic birdwatching, data

collection, creating specimen collections, developing a natural history museum, mapping, and related activities as the pace of Spencer/Famous study gathered momentum. It took 28 years to complete the Famous inventory. As extensive as the Famous survey is more needs to be completed on the marine natural resources front. Areas of particular concern in the marine environment are the eel grass beds on which so many species are dependent and the salt marshes. The potential for the Kingfish outflows to alter the water quality before it is properly studied and documented would be irresponsible to flora and fauna that flourish in its pristine circumstance and to the community that which derives its livelihood from those waters

h. With the help of RIGHC, scientific projects are being funded as various as herring spawning, thousand-year-old forests, migrating birds, native American archaeology, rockweed, coastal wildflowers, cleaning up salmon rivers, along with the cultivation of mussels and clams.

i. Appendix E provides a list of 75 distinguished scientists who visited the island, often conducted studies, and voluntarily shared their information. These lists will also be useful for consultation with other conservation organizations and land trusts. Attached is a pdf of Appendix E.

j. RIGHC is in favor of aquaculture that is done in an environmentally responsible way. In the past, we have worked with a Great Eastern Mussel Farm that seeded mussels off of Roque Island in the 1990's. Currently, Nautical Farms has a mussel and a MOFGA certified organic kelp farm in Shorey Cove off of Roque Island that we fully support.

Information about Nautical Farms can be found

at



k. Roque Island has three clam flats where local clammers have dug for clams for generations. The clam flats are located at Clam Cove, Paradise Cove, and Patten's Cove (directly across from the proposed Kingfish site).

l. Roque Island has three clam flats where local clammers have dug for clams for generations. The clam flats are located at Clam Cove, Paradise Cove, and Patten's Cove (directly across from the proposed Kingfish site).

m. Roque Island has been a prime fishing and foraging grounds for centuries, as witnessed by the number of native American shell piles on its shores. In the past, lobstermen established camps on various of the islands, and clammers have been harvesting shellfish from the same beds for generations. The shores continue to be actively fished for lobster by fisherman from several communities – Beals, Jonesport, Jonesboro and Roque Bluffs. And most recently, we have been the test site for small-scale farming of both mussels and kelp. Any alteration of the water quality that would adversely affect this harvesting would have grave consequences for those who have relied upon these waters for a livelihood.

n. Roque Island has been a renowned destination for boaters for generations – known for its natural splendor, pristine and navigationally challenging waters, unfettered wildlife, and unique one-mile-long unique white sand beach. It is truly one of the Maine coast's most unspoiled natural treasures. It has been able to remain so due to RIGHC's commitment to maintaining it as such.

6. I am making this Declaration in connection with the proposed Kingfish Maine Aquaculture Facility (the "Project"), by far the largest aquaculture project in Maine history, employing locally untested technology at a scale larger than anywhere in the world, to be built in

the pristine coastal environment of Chandler Bay, a significant portion of which RIGHC has been a steward for many generations, and which also has significant lobstering and shellfish harvesting activity conducted by people living on the mainland, and sport fishing and shellfish collecting by residents of and visitors to Chandler Bay.

7. The west shore of Roque Island lies approximately 1.87 miles from the proposed Kingfish Maine site but is much closer to the plumes showed on the applicant's own models of current-carried effluent, in the notoriously complex waters of the Chandler Bay. Notwithstanding the applicant's studies, tides (12-15 feet) and currents (4-6 knots) may very well carry the Project's effluent continuously to our shoreline and move it around to other bays and inlets in the islands. Prevailing southwesterly winds would amplify both industrial noise and odors emanating from the Kingfish Maine operation to our family housing compound and working saltwater farm directly to the northeast. Once built, the facility will be strikingly visible, day and night, from the entirety of the western shore of Roque and Little Spruce Islands, as well as other high points of land on the islands.

8. RIGHC believes that these activities, lives, and livelihoods could be compromised and even jeopardized by environmental degradation resulting from an industrial fin-fish operation the size of the Project being located in an otherwise pristine location. RIGHC believes that, unless and until the matter is further studied or direct experience is obtained from a similar facility, the enormous quantities of effluent from the Project create substantial risks of toxic algae blooms, possibly resulting in oxygen-starved waters. In addition, there is the risk of diseases and viruses escaping into the marine environment, spoiling the traditional working marine system of neighboring residents and the daily activities of our employees and family



members. In addition, the waters of the Gulf of Maine are already stressed by rising temperatures from climate change, posing the possibility that the effects of the Project will be magnified.

9. RIGHC has continuous records of fifteen years or so of harbor seal sightings on Ballast Island. RIGHC is concerned about any impacts that the outflows may have on their natural habitat there while potentially disrupting this ongoing study. There was a dual purpose of having year to year comparisons there and to correlate with sightings from other nearby seal haul-outs to establish usage needs and attractions of each site. In addition, RIGHC is concerned been concerned by the potential effects on nesting seabirds at Ballast Island.

10. Areas of particular concern in the marine environment are the eel grass beds on which so many species are dependent and the salt marshes. The potential for the Kingfish outflows to alter the water quality before it is properly studied and documented would be irresponsible to flora and fauna that flourish in its pristine circumstance and to the community that which derives its livelihood from those waters

11. RIGHC was not apprised of the Project in time to object to the Certification and Findings (including the MEPDES), as it has not been considered an abutter. Nevertheless, RIGHC is in fact a direct abutter via the fast moving and complex waters of Chandler Bay. The distance from the Project's effluent depends on how accurate the applicant's current models are. RIGHC is extremely concerned about the known potential effects the Project will have on the pristine and fragile waters and shores, as well as air quality, of our area, as well as effects as yet unknown.

12. RIGHC's fresh water comes from a spring that is at the tide mark on Chandler Bay across from the proposed Kingfish site. Any change to the water quality is a matter of grave concern.

13. Impacts of noise, from tractor trailer trucks and the facility itself, light pollution and potential for smell will adversely affect the entire region. Neighboring property risks being seriously devalued; tourism that gravitates to historical and preserved areas of the Maine coast could be materially impacted.

14. RIGHC requests a public hearing to review the potential impacts of the Kingfish project. Unanswered questions from our perspective include nitrogen levels affecting the ecosystem, water acidity, air quality, noise, light, models by which currents have been predicted, effluent composition.

15. RIGHC requests a full Environmental Impact Study to be conducted before the Certification and Findings become final.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 12th day of December, 2021.

A handwritten signature in black ink, appearing to read "Ariana S. Fischer", written over a horizontal line.

Ariana S. Fischer, Chairman

**SIERRA CLUB OF MAINE CHAPTER APPEAL TO THE KINGFISH  
MAINE INC. PERMIT ISSUED BY THE DEPARTMENT OF ENVIRONMENTAL  
PROTECTION ON NOVEMBER 12, 2021**

**DECLARATION OF STANDING**

**DECLARATION OF SIERRA CLUB MAINE MEMBER, JESSICA  
GOLDBLATT**

I, JESSICA GOLDBLATT, declare that if called as a witness in this action, I would competently testify of my own personal knowledge as follows:

1. I am a member of the Sierra Club as well as an owner of the Roque Island Archipelago of Jonesport, ME. Roque Island and its surrounding islands sit directly across Chandler Bay from the proposed Kingfish Maine fish farm and intake/discharge pipes. I was not given notice by Kingfish Maine and therefore was deprived of being an intervener in the early stages of Kingfish Maine's plans for this pristine part of Maine.

2. After reading the MPDES permit I was shocked to see that the receiving waters of Chandler Bay will be the dumping ground for Kingfish Maine's effluent, at a rate of introducing Nitrogen at 64% way over the 20% threshold of the Clean Water Act. This will greatly affect not only the local fishermen and women but also the Roque Island Archipelago pristine waters, marine life and even the water we drink on the island.

3. Roque Island has been in my family for 215 years, since the 1980's the Roque has been a resource for over 75 scientific studies. I am not only a steward of this beautiful chain of islands but have also spent summers, holidays and

sometimes Christmas on Roque for the past 51 years. My brother Nicholas Kearns and his wife Sofia Suarez and myself and my husband Nathaniel Goldblatt all got married on Great Beach.

4. In the summer and fall I dig for clams, pull mussels, fish, eat lobster fresh off a local lobsterman's boat, boat and picnic around the islands, sail, and have lobster/mussel/clam bakes on the magnificently white sandy Great Beach. The clams, mussels and lobsters found on shores of Roque itself and in the traps as far as the eye can see will be negatively impacted by the effluent proposed by Kingfish Maine.

5. The thought of destroying these pure ocean waters and many of the beautiful creatures that call the Roque Island Archipelago home for the profit of a Dutch Fish Farm is soul sickening to me. I love to watch the porpoises jump in Chandler Bay on a calm day while the lobster boats pull their traps. There are also several spots where seals can be visited around the islands, one of which is directly across from the proposed Kingfish site. Watching ospreys fish is always a delight. To disturb these animals habitat, marine biology and ecosystem that Roque has protected for generations would be detrimental for all of Maine and for my personal interests in observing wildlife and recreating in the area.

6. The invalidation of the NRPA permit by the DEP will remedy the harm to both the aesthetic and recreational interests of myself, my husband Nathaniel Goldblatt and my greater Roque Island family.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 12th day of December, 2021.

A handwritten signature in cursive script, appearing to read "Jessica Goldblatt".

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Jessica Goldblatt

SIERRA CLUB OF MAINE CHAPTER APPEAL TO THE KINGFISH  
MAINE INC. PERMIT ISSUED BY THE DEPARTMENT OF ENVIRONMENTAL  
PROTECTION ON NOVEMBER 12, 2021

DECLARATION OF STANDING

DECLARATION OF SIERRA CLUB MAINE, LINDSAY SMITH

I, LINDSAY SMITH, declare that if called as a witness in this action, I would competently testify of my own personal knowledge as follows:

I enjoy visiting Roque Island 3 times per year and am concerned that the Kingfish Maine project will harm my experience of the pristine Maine landscape. I spend significant time on boats and beaches in Chandler Bay and enjoy seeing the seals. I also appreciate that the plant life in the intertidal zone is very important to the unique ecosystem of Roque Island. I am concerned about the harm that the nitrogen expelled from the Kingfish Maine project will have on these important local species I enjoy observing. Invalidation of the DEP permit granted to Kingfish Maine will remedy the potential harms to my aesthetic and recreational interests outlined above.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 12th day of December, 2021.



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Lindsay Smith

Richard Aishton on behalf of Roque Island Gardiner Homestead Corporation (RIGCH) APPEAL TO THE KINGFISH MAINE INC. PERMIT ISSUED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION ON NOVEMBER 12, 2021 DECLARATION OF STANDING DECLARATION OF EASTERN MAINE CONSERVATION INITIATIVE.

I, Richard W. Aishton, declare that if called as a witness in this action, I would competently testify of my own personal knowledge as follows:

My name is Richard Aishton. I hold a Ph.D. in the field of environmental dynamics and work in Jonesport and the surrounding region. As an environmental practitioner field experience throughout most of the Northern Hemisphere the Kingfish Maine proposed installation raises serious concerns and red flags.

1. According to NOAA the Gulf of Maine is warming at an alarming rate (See Kasprzak “Blue Deserts”). I was project leader for a project that calculated the income derived from the lobster catch in Zone A, Districts 3 & 4 (Beals Island and Jonesport). The income generated over a 12 month period (2020) was \$34 million. The idea of circulating 28 million gallons of effluent PER DAY into Chandler is risky at best, considering the potential damage this could cause to the fragile marine ecosystem that supports most of the economy of Beals Island and Jonesport.
2. . The nitrogen content is extremely problematic and other effects are difficult to predict and it may take years to manifest negative consequences – a kind of marine version of Easter Island.
3. Further, there are 4 species of animals, 2 threatened, 1 endangered and 1 categorized as priority 1 Species of Greatest Conservation Need (SGCN), which feed, nest and migrate in close proximity to the proposed installation.<sup>1</sup>
4. The most effective step that can be taken is to require an EIS or to require Maine to construct a zero-effluent RAS (Recycling Aquaculture System). [ That would likely solve most any problem right from the outset.]
5. As an environmental practitioner schooled in the practical application of ecosystem dynamics this proposed farm is extremely dangerous. Ecosystems are fickle and no one can accurately predict what outcomes will be without extremely rigorous study – such as that from an EIS. If not required your department will engage in an environmental crapshoot that could be avoided by requiring the EIS or RAS. It is not in Maine’s best interest to continue to prioritize economic development over maintaining environmental integrity. There is too much at risk to be casual about permitting without adequate preparatory scrutiny.

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<sup>1</sup> Threatened: Harlequin Duck, Razorbill Auk; .... Endangered: Atlantic Salmon; ..... SGCN: Purple Sandpiper

I join with the Sierra Club Maine to request the Department of Environmental Protection respects the goals and standards set out in Maine Won't Wait, A Four Year Plan for Climate Action, recognizes the threat that Kingfish's effluent will have on the ecology and economy of the Maine coastline, and creates a new standard for land-based aquaculture based on the zero-effluent technology available to emit no pollution into receiving waters, in alignment with the Clean Water Act.

I declare under penalty of perjury that the foregoing is true and correct. Executed this 11th day of December, 2021 .Richard W. Aishton, Consultant for RICGH.

Respectfully Submitted



Richard W. Aishton, Ph.D.  
Steuben, Maine



SIERRA CLUB OF MAINE CHAPTER APPEAL TO THE KINGFISH  
MAINE INC. PERMIT ISSUED BY THE DEPARTMENT OF ENVIRONMENTAL  
PROTECTION ON NOVEMBER 12, 2021

DECLARATION OF STANDING

DECLARATION OF SIERRA CLUB MAINE, JASON HERRICK

I, JASON HERRICK, declare that if called as a witness in this action, I would competently testify of my own personal knowledge as follows:

I enjoy visiting Roque Island 3 times per year and am concerned that the Kingfish Maine project will harm my experience of the pristine Maine landscape. I spend significant time on boats and beaches in Chandler Bay and enjoy seeing the seals. I also appreciate that the plant life in the intertidal zone is very important to the unique ecosystem of Roque Island. I am concerned about the harm that the nitrogen expelled from the Kingfish Maine project will have on these important local species I enjoy observing. Invalidation of the DEP permit granted to Kingfish Maine will remedy the potential harms to my aesthetic and recreational interests outlined above.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 12th day of December, 2021.

A handwritten signature in black ink, reading "Jason Herrick", written over a horizontal line. The signature is cursive and fluid.

Jason Herrick

**SIERRA CLUB OF MAINE CHAPTER APPEAL TO THE KINGFISH MAINE INC.  
PERMIT ISSUED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION ON  
NOVEMBER 12, 2021**

**Declaration of Standing**

**Declaration of Holly O'Neal, Sierra Club Member**

I, HOLLY O'NEAL, declare that if called as a witness in this action, I would completely testify on my own personal knowledge as follows:

1. I am a member of the Sierra Club because I find conservation and environmental protection to be vitally important.

2. I am a resident of Jonesport, and I work as a stern-man on my boyfriend's lobster boat. We fish the Western Bay off Great Wass. Although I don't fish the fishing grounds that would be affected by the proposed Kingfish project, I stand in firm opposition to any entity that threatens the livelihood of fellow fishermen. The proposed intake and effluent are both concerning. The predicted nitrogen output exceeds ecologically healthy levels and could severely damage the estuary and the ecologically and economically important organisms that depend on it.

3. I enjoy eating seafood, such as scallops, from around the proposed project area. An impediment to the scallop industry would harm my interest in consuming local seafood.

4. I live on Mason Bay Rd. close to the proposed project area. I am concerned about noise pollution, air pollution, and smell pollution. I'm also anxious about how the addition of a major industrial complex could affect the safety of the road. It is windy and narrow, and I find it to be fairly dangerous already. I live on Mason Bay Rd. because I like peace and quiet of the area. A multi-million-dollar fish factory producing 6,000-8,000 metric tons of fish a year harms this residential interest.

5. I love the nature of my home. My love for it is integral to my happiness and sense of wellbeing. It brings an immense amount of meaning to my life. Potential ecosystem damage from Kingfish would harm my wellbeing. Of particular concern is Sandy River Beach. It is close to Kingfish and could be adversely affected. I've been visiting Sandy River Beach since I was a child. It is dear to my heart. I run on it multiple times a week. I like to walk it at night to see the moon on the waves. It is a steady swimming area for me through the summer and fall. Any interruption of this recreational access would harm my wellbeing. Any destruction of its natural beauty would also harm my wellbeing. Furthermore, the nature of this area has a right to thrive regardless of what meaning we humans derive from it. An infringement on this right is a violation of my principles.

6. A board decision to invalidate the permits under NRPA AND SLODA would rectify harms to my consumer, residential, spiritual, aesthetic, and recreational interests.

I declare under penalty of perjury that the foregoing is true and correct.

Executed the 13<sup>th</sup> day of December 2021.

*Holly O'Neal*

From: **S. Nicholas Papanicolaou** <[snpapanicolaou@gmail.com](mailto:snpapanicolaou@gmail.com)>

Subject: SCM Appeal

Hello,

My name is Nick Papanicolaou. I was trying to become a member of the Sierra Club. I am a part owner of the Roque Island Archipelago of Jonesport, ME. Roque Island and it's surrounding islands sit directly across Chandler Bay from the proposed Kingfish Maine fish farm and intake/discharge pipes. I was not given notice by Kingfish Maine and therefore was deprived of being an intervener in the early stages of Kingfish Maine's plans for this pristine part of Maine.

I was shocked to learn that the receiving waters of Chandler Bay will be the dumping ground for Kingfish Maine's effluent, at a rate of introducing Nitrogen at 64% way over the 20% threshold of the Clean Water Act. This will greatly effect not only the local fishermen but also the Roque Island Archipelago pristine waters, marine life and even the water we drink on the island.

Since the 1980's, Roque has been a resource for over 75 scientific studies. I am not only a steward of this beautiful chain of islands but have also spent summers, holidays and special occasions on Roque for the past 42 years.

In the summer and fall I dig for clams, pull mussels, fish, eat lobster fresh off a local lobsterman's boat, boat and picnic around the islands, sail, and have lobster/mussel/clam bakes on the magnificently white sandy Great Beach. The clams, mussels and lobsters likely will be negatively impacted by the effluent proposed by Kingfish Maine.

The thought of destroying these pure ocean waters and many of the beautiful creatures that call the Roque Island Archipelago home for the profit of a Dutch Fish Farm is soul sickening to me. I believe the whales, porpoises, seals, ospreys etc. will all be negatively affected by this proposal.

The invalidation of the NRPA permit by the DEP will both avoid the potential damage to the surrounding natural world and allow for a bright future of tourism to Maine's natural beauty sites.

Sincerely,

S. Nicholas Papanicolaou

**Subject:** Letter to DEP

My name is John Nicholas Kearns, and I am a member of the Sierra Club as well as an owner of the Roque Island Archipelago (Roque Island) of Jonesport, ME. Roque Island and its surrounding islands sit directly across Chandler Bay from the proposed Kingfish Maine fish farm and intake/discharge pipes. I was not given notice by Kingfish Maine and therefore was deprived of being an intervener in the early stages of Kingfish Maine's plans for this pristine part of Maine.

After reading the MPDES permit I was dismayed to see that the receiving waters of Chandler Bay will be the dumping ground for Kingfish Maine's effluent at a rate higher than the Clean Water Act. It is well established that Nitrogen pollution is detrimental to the marine environment. This effluent will greatly affect the local fisherman, including lobstermen and clam diggers. Furthermore the effluent will damage the marine environment in the Roque Island Archipelago, which is renowned for being pristine. Roque Island is immediately across from the proposed Kingfish Maine fish farm.

Roque Island has been in my family for 215 years. Since the 1980's the Roque has been a resource for over 75 scientific studies. Our family has taken our environmental responsibility seriously. I have been going to Roque Island all my life (48 years) and was married on Great Beach. While at Roque we regularly go fishing, dig for clams and collect mussels. The lobster shells and all the waste from our seafood is recycled into the soil and also fed to our animals. Roque is one of the last "saltwater" farms in the United States.

In the summer and fall my family and I spend much of our time in and on the water. We dig for clams, pull mussels, fish, and also eat lobster fresh off a local lobsterman's boat. I also kayak, sail, swim and Stand up Paddle board around the island and archipelago. In addition to enjoying fishing, my family are avid birdwatchers. There is a very wide variety of birds that rely on the fish and other marine life to sustain themselves. I have been very fortunate in my lifetime to watch the seal population expand as well as the Osprey and bald eagle population. These animals all depend on a healthy marine ecosystem.

The proposed effluent discharge will be very detrimental to the ecosystem around Roque Island. Excess nitrogen will hurt eelgrass and damage the environment for small marine life and lobsters. There will be knock on effects for birds, seals and other animals.

The invalidation of the NRPA permit by the DEP will remedy the harm to both the aesthetic and recreational interests of myself, my wife Sofia Suarez, my Son Marco Herrick Kearns, and my entire Roque Island family.

Regards,

John Nicholas Kearns

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+852 9158 9698

Attachment # 1 WHITE PAPER RAS 12.13.21

# White Paper on Industrial Finfish Aquaculture

**Sierra Club, Maine Chapter**  
**Draft Release Date: December 1, 2021**

**NOTE:** *This white paper is not establishing Sierra Club policy, rather, it is providing guidance to activists working on these issues in the state and around the world. The conclusions of this white are consistent with current Sierra Club policy. As a working draft, challenges or additions to the content are welcome. Send to jimimerkel@gmail.com.*

**Authors:** Jim Merkel, Annie Belt, Holly Faubel, Minot Weld, Anne Mossness, Kim Tucker, Amy Grant, Eleanor Daniels, Andrew Stevenson.

## Definitions

There are several types of aquaculture systems used for raising finfish:

- **Fully Closed** land-based Recirculating Aquaculture Systems or **RAS** are technologies that discharge **zero effluent** and require little to no additional “make-up” water once the tanks are full.
  - These systems are engineered as monocultures or polycultures.
  - Zero-discharge is considered the “**best practicable technology**” that can “**eliminate the discharge of pollutants into navigable waters,**” two requirements of the Clean Water Act and many state laws.<sup>1</sup>
  - These systems are operational and economically competitive.
- **Open** land-based RAS that release continuous effluent into the environment and depend on continuous new sea and /or fresh water. These systems are not recommended.
- **Nearshore and offshore net-pen** systems. These ‘open’ systems are the least costly, however, due to a history of escapes, entanglements, pollution and spread of disease, these systems are not recommended and should be phased out.
- **Floating** RAS that replaces net-pens with a fabric or hard shell for containment. These systems typically release large amounts of effluent and have extensive polluting at-sea infrastructure. These systems are not recommended.

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<sup>1</sup> [https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52\\_41a395272c3349fc943a4db99c7100f6.pdf](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52_41a395272c3349fc943a4db99c7100f6.pdf)

## Executive Summary

- The Sierra Club has adopted a precautionary principle on Feb. 17, 2001, which states:
  - When an activity potentially threatens human health or the environment, the proponent of the activity, rather than the public, should bear the burden of proof as to the harmlessness of the activity. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation.
- Finfish aquaculture projects must be fully closed, as they are often near natural water resources. Whether near marine or fresh water, they must not degrade the environment or impact wild fisheries in any measurable way, having zero chemical and biological effluent into aquifers, rivers, bays and estuaries.
  - Fully closed systems should be required as “best practicable treatment” called for in the Clean Water Act. Systems are available that do not require regular pumping of ground water or sea water and do not discharge into aquifers, rivers, bays or estuaries.
- Industrial-scale RAS are typically extremely energy intensive and would make meeting current government approved climate targets difficult. Legislators should consider requiring new developments including aquaculture projects to demonstrate carbon neutrality in operations and construction.
  - RAS can use wind and solar energy and rely on generators only for back-up during power outages. Simply resorting to carbon trade schemes is insufficient.
  - Generators should not be used regularly for peak shaving to reduce costs. Adding large CO<sub>2</sub> emitters during a climate crisis will place an unfair curtailment burden on existing businesses and residents to meet climate targets.
- Projects should make use of brownfield sites (if they can be utilized without further negative impact on the environment) or previously cleared or industrialized lands (with stable soils, and not prime agricultural lands, wetlands or forests).
- Smaller-scale closed finfish systems that use polycultures are preferred. These systems incorporate several species with different trophic and spatial niches that

increase species health and minimize wastes. Monocultures typically require chemical intervention<sup>2</sup> while violating compassionate animal welfare.<sup>3 4 5</sup>

- Communities are wise to consider the restoration of wild stocks by ensuring fish passage, habitat protection and preventing overfishing as an alternative to aquaculture. By restoring fisheries and rebuilding a sustainable working waterfront the benefits will be long lasting for many small holders and businesses through a circular sustainable-yield economy<sup>6 7</sup> that exports neither profits nor a region's ecosystem services.
- A community's clean fresh water, seawater, air and soil are public resources to be shared by natural ecosystems and human activity. One large fish factory can use disproportionate amounts of a region's fresh water, energy, carbon budgets, or assimilative capacity at the expense of smaller businesses and nature.

## THE SIERRA CLUB POLICY<sup>8</sup>

The following states the Sierra Club National Policy on **Industrial Finfish Aquaculture**.

### Farming of fish and other aquatic organisms

1. Cultivation of aquatic organisms in a manner that has a high potential to impact natural ecosystems, such as net-pen fish farming in coastal waters, should be discouraged.
2. Aquaculture systems should include components that recycle wastes internal to the system.
3. Multi-trophic aquaculture systems that integrate fish and plant ecosystems to process waste and optimize use of resources should be encouraged. (Sustainable Marine Fisheries Policy)<sup>9</sup>

## 1. Introduction

This white paper is intended to inform decision-makers, citizens and the many stakeholders who rely on a sustainable working waterfront and marine ecosystem as to the risks and benefits of industrial-scale finfish RAS and discuss the opportunity costs in terms of wild fish recovery.

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<sup>2</sup> Reverter, M., Sarter, S., Caruso, D. *et al.* Aquaculture at the crossroads of global warming and antimicrobial resistance. *Nat Commun* **11**, 1870 (2020). <https://doi.org/10.1038/s41467-020-15735-6>

<sup>3</sup> Sneddon LU. Pain perception in fish: indicators and endpoints. *ILAR J.* 2009;50(4):338-42. doi: 10.1093/ilar.50.4.338. PMID: 19949250.

<sup>4</sup> <https://www.ciwf.com/shop-with-compassion/fish/fish-certification-labels/>

<sup>5</sup> <https://awionline.org/content/fish-farming>

<sup>6</sup> <https://archive.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail>

<sup>7</sup> [https://webgate.ec.europa.eu/fpfis/cms/farnet2/sites/default/files/publication/en\\_farnetguide17.pdf](https://webgate.ec.europa.eu/fpfis/cms/farnet2/sites/default/files/publication/en_farnetguide17.pdf)

<sup>8</sup> <https://www.sierraclub.org/policy/agriculture/food>:

<sup>9</sup><https://www.sierraclub.org/policy/policy-sustainable-marine-fisheries>

With some of the most historically productive fishing or lobstering grounds now being promoted as locations for industrial fish farms, members of the fishing community<sup>10</sup> are questioning whether these operations will deliver on their promises of low impact or, instead, add to the problems fisheries already face, further complicating recovery efforts with novel diseases and pollutants.

The fishing communities also know that the large capture of forage fish as feed for aquaculture, agriculture and pet food is in part contributing to a declining wild catch. Some 14 species at the base of the food chain are used in fish pellets. Scientists link cod's disappearance to alewife demise.<sup>11</sup> Further, poorer countries catch and eat forage fish directly which is more efficient than feeding these forage species to higher trophic species such as salmon in captivity. Research suggests that finfish aquaculture is creating the very problem they claim to solve.<sup>12</sup>

The real alternative to finfish aquaculture is the recovery of marine systems through ensuring fish passage (with dam removals or functioning ladders) and enforcing sustainable catch regulations. The fecundity of properly managed wild fisheries is astonishing and wherever given the chance, the comeback has been impressive.<sup>13</sup> It is not too late to restore wild fisheries and the working waterfront. This generation decides whether our children will be able to catch and eat a wild fish, abundant just a generation ago.

Small-scale aquaculture and sustainable wild fisheries have a long history around the world of providing mollusks, seaweed, crustaceans and fish.<sup>14</sup> These modest operations utilizing ponds, rivers, oceans, estuaries, and even land-based facilities, for the most part, have coexisted with native fisheries,<sup>15</sup> at times beneficial or having little negative impact on surrounding ecosystems.<sup>16 17</sup>

## 2. Background

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<sup>10</sup>[https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/d7341b\\_c47f99aa826c48969e323216bd92563c.pdf](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/d7341b_c47f99aa826c48969e323216bd92563c.pdf)

<sup>11</sup> Edward P. Ames, John Lichter, Gadids and Alewives: Structure within complexity in the Gulf of Maine, Fisheries Research, Volume 141, 2013, Pages 70-78, ISSN 0165-7836, <https://doi.org/10.1016/j.fishres.2012.09.011>.

<sup>12</sup> <https://www.sciencedaily.com/releases/2018/06/180614213822.htm>

<sup>13</sup> <https://www.nature.org/en-us/about-us/where-we-work/united-states/maine/stories-in-maine/the-comeback-alewives-return-to-maine-rivers/>

<sup>14</sup> <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/polyculture>

<sup>15</sup> Ridler, Neil & Wowchuk, M. & Robinson, Bryn & Barrington, K. & Chopin, Thierry & Robinson, Shawn & Page, F. & Reid, G.K. & Szemerda, Michael & Sewuster, J. & Boyne-Travis, S.. (2007). Integrated Multi-Trophic Aquaculture (IMTA): a potential strategic choice for farmers. Aquaculture Economics & Management. 11. 99-110. 10.1080/13657300701202767.

<sup>16</sup> Morton A, Routledge R, Hrushowy S, Kibenge M, Kibenge F (2017) The effect of exposure to farmed salmon on piscine orthoreovirus infection and fitness in wild Pacific salmon in British Columbia, Canada. PLOS ONE 12(12): e0188793. <https://doi.org/10.1371/journal.pone.0188793>

<sup>17</sup> <https://www.facetsjournal.com/doi/10.1139/facets-2018-0008#pill-view-options>



Over the last 30 years, net pen aquaculture systems have made their way into shallow sensitive marine ecosystems, often with anticipated detrimental impacts.<sup>18</sup> These systems replicate many of the problems of Concentrated Animal Feeding Operations (CAFOs), allowing pollution, pathogens and parasites to flush through containment nets or over containment structures into surrounding waters.

Though they benefited from sunlight and the increased biodiversity of the sea, escapes, sea lice infestations, diseases and mass die-offs have occurred.<sup>19 20 21</sup> Most net pens were sited in sensitive shallow estuaries, rivers and bays or in critical off-shore habitats.

Local fishermen and women who have lived through the impacts of net-pen aquaculture have voiced opposition to industrial aquaculture. Pollution, spread of sea-lice and reduced lobster catch<sup>22 23</sup> have led some regions to ban salmon farming, as in Argentina (June 30, 2021)<sup>24</sup> and the state of Washington<sup>25</sup>.

As opposition to **near-shore net-pen** aquaculture<sup>26</sup> intensifies, **off-shore net pens** are being proposed as a way to dilute pollutants into a larger volume of sea. These systems are exposed to harsh off-shore weather conditions, and escapes, diseases and the efficacy of “dilution as a



<sup>18</sup>University of British Columbia. "Salmon virus originally from the Atlantic, spread to wild Pacific salmon from farms: Study finds Piscine orthoreovirus (PRV) is now almost ubiquitous in salmon farms in British Columbia, Canada.." ScienceDaily. [www.sciencedaily.com/releases/2021/05/210526150216.htm](http://www.sciencedaily.com/releases/2021/05/210526150216.htm) (accessed August 9, 2021).

<sup>19</sup> <https://www.newyorker.com/tech/annals-of-technology/washington-states-great-salmon-spill-and-the-environmental-perils-of-fish-farming>

<sup>20</sup> <https://www.theguardian.com/news/2020/sep/15/net-loss-the-high-price-of-salmon-farming>

<sup>21</sup> <https://animaloutlook.org/investigations/aquaculture/>

<sup>22</sup> <http://www.friendsportmoutonbay.ca/docs/sea-cage-aquaculture-impacts-market-and-berried-lobster.pdf>

<sup>23</sup> Inka Milewski, Ruth E. Smith, Heike K. Lotze, Interactions between finfish aquaculture and American lobster in Atlantic Canada, Ocean & Coastal Management, Volume 210, 2021, 105664, ISSN 0964-5691, <https://doi.org/10.1016/j.ocecoaman.2021.105664>.

<sup>24</sup> <https://www.patagoniaworks.com/press/2021/6/30/historic-announcement-argentina-becomes-first-country-to-reject-salmon-farming>

<sup>25</sup> <https://foe.org/news/washington-state-governor-approves-industrial-ocean-fish-farm-ban/>

<sup>26</sup> [https://vimeo.com/555901886?fbclid=IwAR0ZWJghxRVK-kdf3Ld-IyE3pnCuLjO7\\_HJsT6BI dhmySZc\\_8d4\\_jO9jBV\\_s](https://vimeo.com/555901886?fbclid=IwAR0ZWJghxRVK-kdf3Ld-IyE3pnCuLjO7_HJsT6BI dhmySZc_8d4_jO9jBV_s)

solution” remain as unsolved issues.<sup>27</sup>

In an attempt to solve the issues with near-shore and off-shore net pens, RAS or Recirculating Aquaculture Systems have been developed. Some of these systems are fully contained and once charged with water, have zero discharge into the marine environment.

<sup>28</sup> As they do not require a regular draw of fresh or seawater, biosecurity risks of infecting wild species are better controlled. Long-standing methods such as polycultures utilize several complementary species and are more self-sustaining having fewer negative impact on the surrounding land and sea.

However, many industrial ‘fully open’ or ‘partially open’ RAS systems are now being proposed and permitted that are called “recirculating” yet require large daily quantities of water and discharge millions of gallons of effluent per day into the same waters that wild fish, shellfish, seaweeds and lobsters rely on.

The sizable infrastructures needed for open RAS facilities lead to broad environmental concerns. The systems include containment structures, diesel generators, pumps and pipes for fresh and saltwater, filters, control systems, fuel, chemical and sludge storage and feed systems. Large trucks deliver needed “inputs” and haul away “outputs.” Backup generators need to be large enough to power the operations continuously during extended power outages. Their carbon footprints are so large that meeting state or municipal climate targets become difficult.<sup>29</sup>

Floating sea-based RAS can pump billions of gallons a day of partially filtered effluent into sensitive bays. They require the continuous running of large generators at sea, emitting noise which travels long distances and effect marine life.<sup>30</sup> Combusting diesel fuels generate sizable quantities of air pollutants and carbon emissions. Other risks include toxic algae blooms, spills of fuels and toxic substances and fish escapes during hurricanes and storms, more frequent due to climate change.

Both land-based and floating “open” RAS pump clean water in and typically output significant quantities of dissolved nitrogen, phosphorous, odors, feed, and medication residues, at times requiring exemptions from pollution laws.<sup>31 32 33 34</sup>

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<sup>27</sup> <https://clf.jhsph.edu/sites/default/files/2019-09/ecosystem-and-public-health-risks-from-nearshore-and-offshore-finish-aquaculture.pdf>

<sup>28</sup> <https://www.sustainableblue.com>

<sup>29</sup> [https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52\\_325649afaad2439c8316a864d2f24979.pdf?index=true](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52_325649afaad2439c8316a864d2f24979.pdf?index=true)

<sup>30</sup> Peng, C., Zhao, X., & Liu, G. (2015). Noise in the Sea and Its Impacts on Marine Organisms. *International journal of environmental research and public health*, 12(10), 12304–12323. <https://doi.org/10.3390/ijerph121012304>

<sup>31</sup> [https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52\\_6ffbd30418014db19236f5b01dae6e9d.pdf](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52_6ffbd30418014db19236f5b01dae6e9d.pdf)

<sup>32</sup> [https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52\\_a33201b6f2dc4d899f726b124fb6da42.pdf](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52_a33201b6f2dc4d899f726b124fb6da42.pdf)

<sup>33</sup> <https://npr.brightspotcdn.com/4a/49/f643354c42faa06c4c443922bd01/maine-pollutant-discharge-elimination-system-permit.pdf>

<sup>34</sup> <https://www.maine.gov/dep/ftp/projects/nordic/procedural-orders/2020-05-28%20Nordic%20Seventeenth%20Procedural%20Order.pdf>

These systems are complex but in terms of pollutants, they have inputs and outputs similar to CAFOs,<sup>35</sup> such as poultry, pig or beef operations, except the dissolved wastes go into marine waters, out of sight, while the concentrated sludge is trucked offsite to sacrifice lands<sup>36</sup> or experimentally used as biofuels or fertilizers.<sup>37</sup>

Open land-based and floating RAS systems have been used as hatcheries for growing young fish. However, for growing fish to several pounds for market, they have had serious problems.<sup>38 39</sup> Several start-up operations have experienced mass die-offs, such as the Norwegian-owned Atlantic Sapphire. On July 9, 2021 their Denmark facility lost 17 percent of the harvest – over 360,000 fish, a loss of \$3 million after expected insurance proceeds. Earlier in 2021, two mass-die offs occurred at their 160-acre Florida facility totaling 800,000 fish.<sup>40</sup> Insurers and financiers have elaborated on these risks.<sup>41 42</sup> Multiple law suits and stiff local opposition have challenged Nordic Aquafarms in Belfast.<sup>43 44 45</sup> Then in September 2021, a fire and release of corrosive chemicals occurred at the Danish RAS facility with police and armed forces warning residents with burning, itching, rash or acute shortness of breath to seek medical attention and ordering any caught fish be destroyed.<sup>46</sup> The waters turned red with toxic Iron Sulfide.

At Atlantic Sapphire's Florida facility, three workers were hospitalized in April 2021 after being overcome by fumes from an unknown gas, according to Seafood Source.<sup>47</sup> Several months later in Maine, an industry backed bill, LD-1473, was introduced to exempt the entire aquaculture industry from the Uniform Building and Energy Codes. The bill failed in committee, but forecasts the risks to workers, animal welfare and the ecosystem when an industry unduly influences public processes.

Such problems are not rare. For example, a RAS startup, VeroBlue in Webster City, Iowa went bankrupt in 2018 leaving over 70 companies unpaid, totaling \$100 Million.<sup>48</sup>

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<sup>35</sup> <https://www.sierraclub.org/michigan/why-are-cafos-bad>

<sup>36</sup> <https://www.ucsusa.org/sites/default/files/2019-10/cafos-uncovered-executive-summary.pdf>

<sup>37</sup> <https://www.sciencedirect.com/science/article/pii/S2211339819300334>

<sup>38</sup> [https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52\\_51f4e5795dab47298dd485a357325471.pdf?index=true](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52_51f4e5795dab47298dd485a357325471.pdf?index=true)

<sup>39</sup> <https://www.sciencedirect.com/science/article/pii/S001671852100124X>

<sup>40</sup> <https://www.miaminewtimes.com/news/activists-accuse-atlantic-sapphire-salmon-farm-of-animal-cruelty-12210072>

<sup>41</sup> <https://salmonbusiness.com/banks-skeptical-about-financing-land-based-fish-farms-must-have-a-better-overview-of-the-overall-risks/>

<sup>42</sup> <https://salmonbusiness.com/aquaculture-insurer-on-ras-less-than-2-premium-but-over-5-of-the-losses/>

<sup>43</sup> <https://www.csmonitor.com/Environment/2019/0313/Aquaculture-wars-The-perils-and-promise-of-Big-Fish>

<sup>44</sup> <https://www.upstreamwatch.org/current-appeals>

<sup>45</sup> [https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52\\_d07a559d15754ff19a2207986334c37f.pdf](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52_d07a559d15754ff19a2207986334c37f.pdf)

<sup>46</sup> <https://nord.news/2021/09/16/large-fire-at-salmon-factory-has-created-corrosive-chemical-emissions-2/>

<sup>47</sup> <https://www.seafoodsource.com/news/aquaculture/three-atlantic-sapphire-workers-overcome-by-fumes-hospitalized>

<sup>48</sup> <https://www.messengernews.net/news/local-news/2018/11/awash-in-100m-debt-veroblue-files-for-chapter-11-sues-top-management/>

Creditors included Webster City itself and Hamilton County. Promised tax relief and jobs never materialized.

Maine Proposals:

Company	Location	QTY/yr. Mil lbs.* MT	Effluent Mgd**	Nitrogen Lbs/day	CO2 MT/yr.***	Tech.
Nordic Aquafarms <sup>49</sup>	Belfast	66 33,000	7.7	1,484	594,000	RAS
Whole Oceans <sup>50</sup>	Bucksport	44 20,000	18.6	7,460	360,000	RAS
American Aquafarms <sup>51</sup>	Frenchman Bay	66 33,000	4,000	2,338	594,000	FLOAT RAS
Kingfish Maine <sup>52</sup>	Jonesport	16 8,000	28.7	1,580	144,000	RAS
Aquabanq****	Millenocket	22 10,000	N/A	N/A	180,000	RAS
<b>Totals</b>		214 104,000	4,055	13,082	1,870,000	

\*Mil lbs. = Million pounds of fish produced per year, MT = metric tons produced per year.

\*\*Mgd = million gallons of effluent per day to be discharged directly into coastal waters

\*\*\* MT/yr. = metric ton (MT) CO2e generated per year calculated using life-cycle assessment methods and scientific studies that includes construction and operational carbon emissions. Carbon emissions for RAS varies between 16.7 and 23 MT CO2e/MT fish produced.<sup>53</sup> CO2e is estimated using a conservative 18 MT CO2e/MT fish for each of the 5 projects.

\*\*\*\* Aquabanq decided to shift to zero effluent<sup>54</sup>

The cumulative impacts of five proposed facilities in Maine would release over 4 billion gallons of effluent per day into waters that Maine’s lobster industry rely on to be clean, and would add 1,870,000 metric tons of carbon to the atmosphere, equivalent to adding 406,500 cars to Maine’s roads. These carbon emissions represent 15.7 percent of Maine’s 2030 GHG target (11.91 (MMTCO2e). **The opportunity costs of investing \$1.3 billion dollars to grow 104,000 metric tons of fish in confinement must be evaluated in terms of a similar investment into dam removal and the restoration of abused fisheries.**

Due to the unlikely feasibility of solving the above-mentioned challenges of “open” systems, “fully closed” RAS have become the preferred technology as they have zero

<sup>49</sup>

[https://www.maine.gov/dep/ftp/projects/nordic/applications/MEPDES%20Permit%20Application\\_Final\\_Oct%202019,%202018.pdf](https://www.maine.gov/dep/ftp/projects/nordic/applications/MEPDES%20Permit%20Application_Final_Oct%202019,%202018.pdf)

<sup>50</sup> <https://www.epa.gov/sites/default/files/2018-10/documents/draftme0037478permit.pdf>

<sup>51</sup> <https://www.maine.gov/dep/ftp/projects/american-aquafarms/applications/mepdes/FB01%20Long%20Porcupine%20General%20Application%20for%20Was%20Discharge%20Permit%20with%20Attachments.pdf>

<sup>52</sup> <https://www3.epa.gov/region1/npdes/permits/2021/finalme0037559permit.pdf>

<sup>53</sup> [https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52\\_325649afaad2439c8316a864d2f24979.pdf?index=true](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52_325649afaad2439c8316a864d2f24979.pdf?index=true)

<sup>54</sup> <https://www.intrafish.com/shrimp/norwegian-land-based-salmon-operators-have-poisoned-the-well-executive-says-rivals-mistakes-forced-strategic-shift/2-1-1057096>

effluent and recycle wastes internal to their system.<sup>55</sup> A Wyoming based firm who were proposing to grow open RAS salmon at an old mill site in Millinocket, Maine announced on 8/25/2021 that they decided to shift from salmon to zero effluent shrimp stating “Norwegian land-based salmon operators have poisoned the well” stating that their rivals mistakes forced their strategic shift.<sup>56</sup> The town of Gouldsboro, Maine is now considering a moratorium on large-scale aquaculture projects.<sup>57</sup> Government regulators should also make this shift and enforce the Clean Water Act requirements for “best practicable treatment” and require these zero discharge systems be used.

### 3. KEY FINDINGS

The following key findings detail opportunities and risks regarding finfish.

#### **KEY FINDING #1: CUT THE EFFLUENT PIPE -- RIVERS, ESTUARIES, BAYS**

The sites chosen for industrial finfish aquaculture are typically the most productive fresh and salt water systems, serving many ecosystem functions. Because wild fish use these same waters throughout their lifecycle, recovery efforts are severely threatened by chemicals, diseases and viruses. ‘Open and partially open’ land-based aquaculture operations flush biological pollutants into fresh and salt waters via effluent pipes. Although much of the solids are filtered out, the dissolved pollutants include nitrogen and phosphorus. Because large coastal areas already suffer shellfish closures linked to excessive nitrogen, these discharges will increase eutrophication and red tides.

Note: The Penobscot Estuary is among the most productive marine ecosystems on the east coast. The proposed Bucksport facility at the river’s mouth has recovering populations of Atlantic Salmon and alewives.



<sup>55</sup> Jani T. Pulkkinen, Anna-Kaisa Ronkanen, Antti Pasanen, Sepideh Kiani, Tapio Kiuru, Juha Koskela, Petra Lindholm-Lehto, Antti-Jussi Lindroos, Muhammad Muniruzzaman, Lauri Solismaa, Björn Klöve, Jouni Vielma, Start-up of a “zero-discharge” recirculating aquaculture system using woodchip denitrification, constructed wetland, and sand infiltration, *Aquacultural Engineering*, Volume 93, 2021, 102161, ISSN 0144-8609, <https://doi.org/10.1016/j.aquaeng.2021.102161>.

<sup>56</sup> <https://www.intrafish.com/shrimp/norwegian-land-based-salmon-operators-have-poisoned-the-well-executive-says-rivals-mistakes-forced-strategic-shift/2-1-1057096>

<sup>57</sup> <https://www.mdislander.com/maine-news/waterfront/large-scale-aquaculture-moratorium-explored-in-gouldsboro>

As an example of industrial scale, a proposed facility in Belfast, Maine, would release a 7.7 million gallon/day waste water plume, containing 11-times more nitrogen than the Belfast City Sewer,<sup>58</sup> to yield 33,000 metric tons/year of fish.<sup>59</sup> This plume will move in and out with tides and winds, all within shallow waters important for eelgrass and salmon and cod recovery. Sea life including lice will be attracted to the odors of the plume while any viruses and diseases discharged could threaten endangered salmon recovery.<sup>60</sup>

The water bodies receiving the effluents have currents that flow in complex paths, at various depths, around islands, and are affected by winds, river outflows, tides and seasonal salinity changes from rivers. To predict the impact and dispersal of an effluent plume requires a multiyear study to understand the site-specific behavior.<sup>61</sup> The thermal pollution of open RAS is a concern as discharges of millions of gallons of water per day will warm receiving waters. Studies reveal that warmer brackish water effect the heart rate, appetite, digestion, growth rate and disease in marine organisms including increases in the risk of algae blooms<sup>62</sup> and can kill or drive away cold-water fish.<sup>63</sup> More research is needed to know how this would affect salmon recovery, local lobster catches or mussel and kelp farms.

Many government agencies require adherence to the Clean Water Act and have requirements that the best available technology be used.<sup>64</sup> ‘Closed’ RAS, similar to Sustainable Blue,<sup>65</sup> Aquamaof<sup>66</sup> and Superior Fresh<sup>67</sup> should be explored as “best available” technology. Combined with successful restoration efforts,<sup>68</sup> locally-based regenerative aquaculture systems<sup>69</sup> could meet Maine’s economic needs and ecological imperatives including sequestering carbon.<sup>70</sup>

## **KEY FINDING #2: Restore a Sustainable Working Waterfront**

Studies show that the benefits of restoring wild fisheries outweigh the costs.<sup>71</sup> According

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<sup>58</sup> <https://www.maine.gov/dep/ftp/projects/nordic/public-comments/Merkel,%20Jim%203.pdf>

<sup>59</sup> <https://www.epa.gov/sites/default/files/2018-10/documents/draftme0037478permit.pdf>

<sup>60</sup> Núñez-Acuña, G., Gallardo-Escárate, C., Fields, D. M., Shema, S., Skiftesvik, A. B., Ormazábal, I., & Browman, H. I. (2018). The Atlantic salmon (*Salmo salar*) antimicrobial peptide cathelicidin-2 is a molecular host-associated cue for the salmon louse (*Lepeophtheirus salmonis*). *Scientific reports*, 8(1), 13738. <https://doi.org/10.1038/s41598-018-31885-6>

<sup>61</sup> [https://8774567e-61ab-4355-a629-](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52_646c0a57836240afbb8b1c2bcb3bfc3c.pdf?index=true)

[8a49a81506a2.filesusr.com/ugd/207e52\\_646c0a57836240afbb8b1c2bcb3bfc3c.pdf?index=true](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52_646c0a57836240afbb8b1c2bcb3bfc3c.pdf?index=true)

<sup>62</sup> [https://8774567e-61ab-4355-a629-](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52_54e257b464c54d55af8231b22a324840.pdf)

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<sup>63</sup> <https://www.jstor.org/stable/44547838>

<sup>64</sup> [tps://8774567e-61ab-4355-a629-](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52_41a395272c3349fc943a4db99c7100f6.pdf)

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<sup>65</sup> <https://www.sustainableblue.com>

<sup>66</sup> <https://salmonbusiness.com/aquamaof-reveal-600-ton-atlantic-salmon-rd-facility-in-poland/>

<sup>67</sup> <https://www.fishfarmingexpert.com/article/superior-fresh-outlines-big-salmon-leap-forward/>

<sup>68</sup> <https://estuaries.org/bluecarbon/>

<sup>69</sup> <http://www.seagreensfarms.com>

<sup>70</sup> [https://www.youtube.com/watch?v=Vzn5XO\\_GYL0&t=75s](https://www.youtube.com/watch?v=Vzn5XO_GYL0&t=75s)

<sup>71</sup> Sumaila UR, Cheung W, Dyck A, Gueye K, Huang L, Lam V, et al. (2012) Benefits of Rebuilding Global Marine Fisheries Outweigh Costs. *PLoS ONE* 7(7): e40542.

<https://doi.org/10.1371/journal.pone.0040542>

to NOAA over 2 million dams and other barriers block fish from migrating upstream in the US. “Atlantic salmon used to be found in every river north of the Hudson River. Due to dams and other threats, less than half of 1 percent of the historic population remains. The last remnant populations of Atlantic Salmon in U.S. waters exist in just a few rivers and streams in central and eastern Maine. They are an endangered species.”<sup>72</sup>

The Penobscot Nation had explicitly claimed the Penobscot River (now with two RAS aquaculture proposals) as theirs before signing a 1796 treaty that secured vital sustenance fishing rights.<sup>73</sup> “Restoration of the river's migratory fish stocks is necessary to comply with sustenance fishery rights guaranteed by the 1980 Maine Indian Land Claims Settlement Act and treaties between the Penobscot Nation, Massachusetts, and Maine. Penobscot tribal members have used the watershed and its abundant natural resources for physical and spiritual sustenance for 10,000-12,000 years.”<sup>74</sup>

Where properly functioning fish ladders have been built or dams removed, massive alewife runs have returned, even on small rivers. Recovery of the historical abundance of diverse fish species is linked to recovery of forage pelagic fish; these are primary feeders near the base of the food chain that feed on plankton and are food for larger fish, seabirds and marine mammals.<sup>75</sup>

By restoring damaged fisheries, a sustainably managed wild catch of diverse species can return a thriving economy and ecology to communities, once again employing many smallholders. This working waterfront has historically included many value-added and support businesses that serve the local and regional economy. Communities are advised to:

- support dam removal or ensure fish ladders actually work,
- eliminate overfishing and using forage fish as feed for other animals and fish,
- regulate toxic industries and
- enact sustainable-yield laws that protect wild populations<sup>76</sup> and stop offshore industrial fishing.<sup>77</sup>

### **KEY FINDING #3: FINFISH EFFLUENT WILL AFFECT LOBSTER’S ABILITY TO FIND FOOD**

An 11-year study in Port Mouton Bay, Atlantic Canada, released June 28, 2018, in *Marine Ecology*,<sup>78</sup> measured the impacts to lobster in proximity to net pen salmon aquaculture. Although this study was focused on net pens, the odor plume of an open RAS system will create the same effect as it pertains to lobsters.

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<sup>72</sup> <https://www.fisheries.noaa.gov/insight/barriers-fish-migration>

<sup>73</sup> <https://medium.com/indigenously/penobscot-million-b5e8d02bf290>

<sup>74</sup> <https://atlanticsalmonrestoration.org/partners/penobscot-indian-nation>

<sup>75</sup> Dias, B. S., Frisk, M. G., & Jordaan, A. (2019). Opening the tap: Increased riverine connectivity strengthens marine food web pathways. *PLoS one*, 14(5), e0217008. <https://doi.org/10.1371/journal.pone.0217008>

<sup>76</sup> Sumaila UR, Cheung W, Dyck A, Gueye K, Huang L, Lam V, et al. (2012) Benefits of Rebuilding Global Marine Fisheries Outweigh Costs. *PLoS ONE* 7(7): e40542. <https://doi.org/10.1371/journal.pone.0040542>

<sup>77</sup> <https://doi.org/10.1525/elementa.346>

<sup>78</sup> Inka Milewski, Ruth E. Smith, Heike K. Lotze, Interactions between finfish aquaculture and American lobster in Atlantic Canada, *Ocean & Coastal Management*, Volume 210, 2021, 105664, ISSN 0964-5691, <https://doi.org/10.1016/j.ocecoaman.2021.105664>.

Inka Milewski, a marine biologist who managed the study in its last four years, stated, “What we found was during periods when the fish farm was actively raising fish, market catch across all regions, dropped by 42 per cent.” “The egg-bearing lobster counts also dropped by an average of 52 per cent when the farm was active,” she said. Milewski believes an odor plume from the farm may be affecting lobster’s ability to detect food; thus, and they are “not finding their way into the traps.”

The study reported:

- Lobster “sniff” the odor seascape with their antennules and chemoreceptors found on their legs.
- Odors are used to locate food, find mates, detect predators and avoid environmental stresses.
- Sulphides and ammonium have toxic and behavioral effects on adults and other lobster life stages.
- In laboratory studies, 50% of lobster die within 3.3 days in low oxygen, low sulphides (5.5  $\mu\text{M}$ ) and ammonium (17  $\mu\text{M}$ ) conditions (Draxler et al. 2005)
- Berried lobster (female lobster with fertilized eggs attached) are highly sensitive to odors and temperature.
- Berried lobster show retreat behavior at 50  $\mu\text{M}$  sulphide (Butterworth et al. 2004); at 500  $\mu\text{M}$  and regular oxygen conditions, 50% of lobster died in 22.5 hr.
- Further, the study said the effects of nitrogen pollution include the following:
  - Decrease in water quality.
  - Increase in epiphyte growth on eelgrass.
  - Increase in benthic algae
  - Increase in nuisance or “slime” algae.

Independent-reviewed studies should take place before RAS finfish operations affect the lobster industry, to determine potential impacts.



#### KEY FINDING #4: LARGE CARBON FOOTPRINTS WILL MAKE MEETING CLIMATE GOALS UNLIKELY



Note: The resources needed to construct and operate land-based systems make them among the most carbon-intensive seafood choices.

Several research studies have been done on “open” RAS salmon citing it among the highest carbon footprint seafood a person could eat, generating up to 23 kg CO<sub>2</sub>e/kg.<sup>79</sup> The large footprints result from the extensive materials and energy used in construction, energy for pumping and conditioning water, oxygen, chemicals and feed. Although RAS companies claim their fish saves carbon over airfreight, as mentioned earlier, only 5% of seafood is shipped by air and wild local fish have dramatically lower carbon intensity. Researchers at the University in Halifax, calculate the carbon intensity of wild caught salmon at 1.9kg CO<sub>2</sub>e/kg,<sup>80</sup> twelve times lower than RAS salmon. Haddock is 2.4 kg CO<sub>2</sub>e/kg or 9.6 times less than RAS salmon.

And if one decides to eat wild small pelagic fish such as sardines or any one of 14 species now ground up for farmed fish feed, the carbon intensity would be 115 times lower than RAS salmon (0.2 kg CO<sub>2</sub>e/kg).<sup>81</sup>

Another potential climate impact of aquaculture facilities is the loss of carbon sequestration if land is cleared for construction. Forests and wetlands both sequester and store carbon with equal amounts stored above and below ground level.<sup>82</sup> Brownfield sites should be used providing the sites are stable and won't release buried toxins.

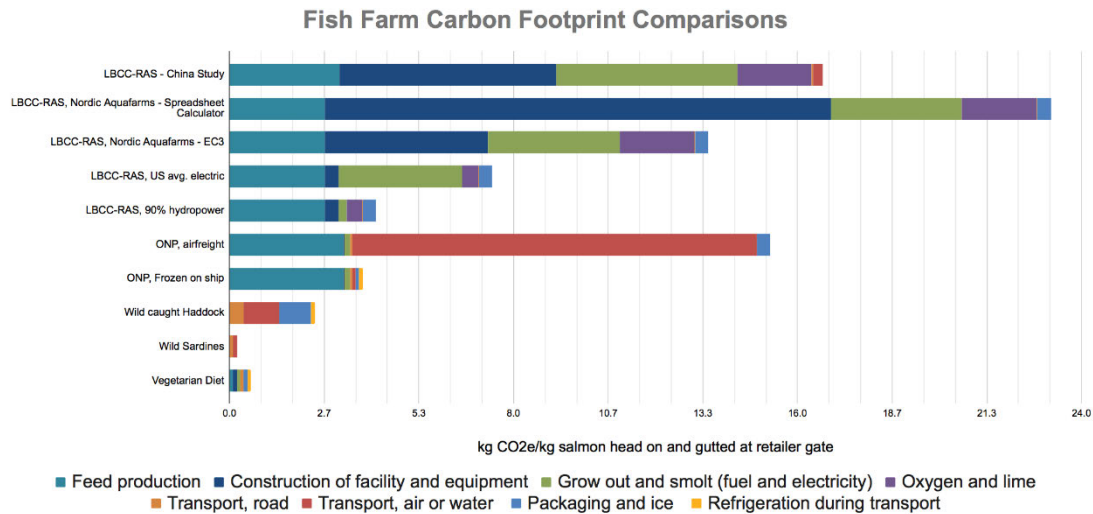
<sup>79</sup>[https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52\\_325649afaad2439c8316a864d2f24979.pdf?index=true](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52_325649afaad2439c8316a864d2f24979.pdf?index=true)

<sup>80</sup> Parker, R.W.R., Blanchard, J.L., Gardner, C. *et al.* Fuel use and greenhouse gas emissions of world fisheries. *Nature Clim Change* 8, 333–337 (2018). <https://doi.org/10.1038/s41558-018-0117-x>

<sup>81</sup> Fuel use and greenhouse gas emissions of world fisheries

Robert W. R. Parker 1,2\*, Julia L. Blanchard 1,3, Caleb Gardner1, Bridget S. Green1, Klaas Hartmann1, Peter H. Tyedmers 4 and Reg A. Watson 1,3

<sup>82</sup> <https://www.frontiersin.org/articles/10.3389/ffgc.2019.00027/full>



1. In the above chart, the first bar is an operational RAS in China.<sup>83</sup>
2. Bars 2 and 3 are based upon detailed LCA assessment from documents submitted by Nordic Aquafarms in Belfast. Bar two used a more detailed calculator that allowed for more construction details: foundations, buildings, tanks, motors, filters, pumps, etc. The Bar 3 calculator allowed for fewer data inputs.<sup>84</sup>
3. Bars 4, 5, 6 and 7<sup>85</sup> are results from a 2016 study.<sup>86</sup>
4. Bars 8, 9 and 10 evaluate the carbon footprint of wild caught seafood, or production of plant proteins.<sup>87</sup>

<sup>83</sup> This Life Cycle Assessment or LCA paper was published in 2019, based upon actual data from growing out 29,000 salmon in northern China from 100 g smolts to 4 KG fish.<sup>83</sup> The results of this study were that to grow one tonne of live-weight salmon required 7,509 KWh of electricity and generated 16.7 tonnes of Co2e, 106 kg of SO2 e, 2.4 kg of P e and 108kg of N e (cradle to farm gate). The study cited electricity and feed as the larger components of the overall impact. This more recent study from an actual operation reported roughly double the tonnes of CO2e/tonne of fish compared to the 2016 FreshWater Institute Study (Bars 4, 5, 6 and 7 counting from the top) (7.4 vs. 16.7).<sup>83</sup> The power per tonne of fish produced was 5,460 kWh in the 2016 study while the more recent China study was 7,509 kWh. Many factors can account for the differences such as power grid composition, fish food sources and makeup, different inventories and assumptions, however, the data are close enough to offer some confidence in their similar methodologies and findings.

<sup>84</sup> [https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52\\_325649afaad2439c8316a864d2f24979.pdf?index=true](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52_325649afaad2439c8316a864d2f24979.pdf?index=true)

<sup>85</sup> Yajie Liua, Trond W. Rostena, Kristian Henriksena, Erik Skontorp Hognesa, Steve Summerfeltb, Brian Vincib, Comparative economic performance and carbon footprint of two farming models for producing Atlantic salmon (*Salmo salar*): Land-based closed containment system in freshwater and open net pen in seawater, in *Aquacultural Engineering* 71, (2016) 1-12. <https://doi.org/10.1016/j.aquaeng.2016.01.001>

<sup>86</sup> This study compared producing Atlantic salmon in open pens in seawater to a hypothetical land-based closed containment recirculating aquaculture system (LBCC-RAS) based upon the Conservation Fund's Freshwater Institute grow out trials of Atlantic salmon.<sup>86</sup> This is the study that is often cited to argue that salmon grown in a LBCC-RAS system has a lower carbon footprint than shipping open net pen (ONP) salmon by airfreight from Norway to Seattle, Washington: 7.4kg CO2e/kg (RAS) vs. 15.2 kg CO2e/kg (airfreight from Norway to Seattle). Electricity to produce 1 tonne of salmon in RAS is cited as 5,460 kWh. However, shipping frozen net-pen salmon by container ship from Norway to the US was the lowest footprint option in this study at 3.75kg CO2e/kg.

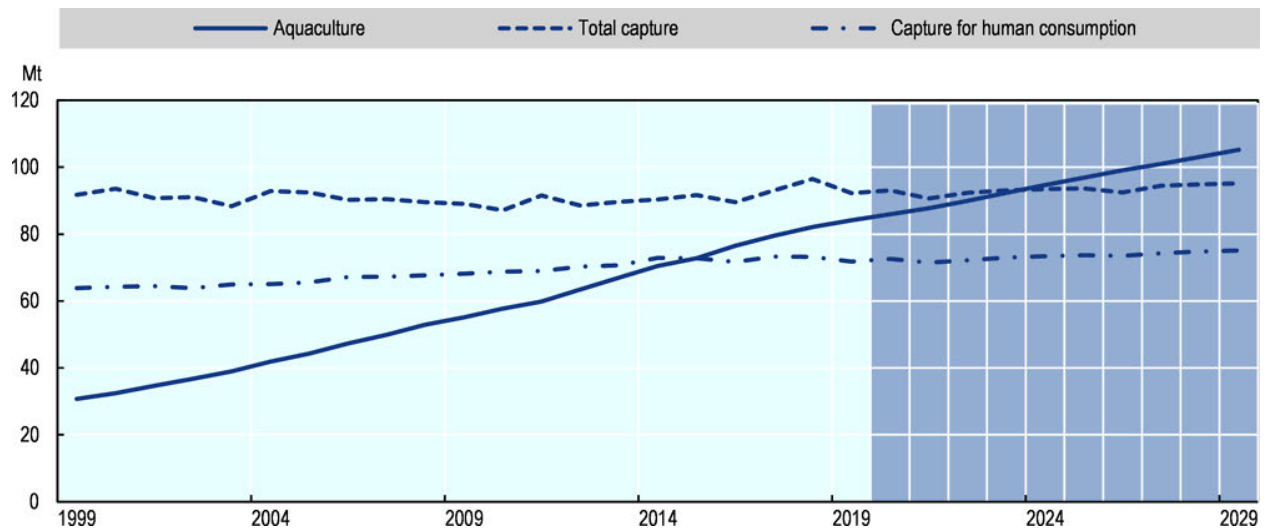
<sup>87</sup> For example, wild caught Demersal fish (eg. Haddock) species have a life-cycle CO2e intensity of 2.4 kg CO2e/kg. Small Pelagic fish (eg. Sardines) have a lifecycle CO2e of 0.2 kg CO2e/kg.<sup>87</sup> Vegetarian diets including legumes have CO2e in the range of 0.6 kg CO2e.<sup>87</sup>

## KEY FINDING #5: MARKETING CLAIMS REQUIRE A DEEPER LOOK

The aquaculture industry commonly cites statistics that suggest industrial aquaculture will lower imports, take pressure off wild fisheries, save carbon, create jobs and cut taxes. These claims require a deeper look.

1. Claim: 90 percent of seafood is imported.

Analysis: A 2019 article in the Proceedings of the National Academy of Sciences of the United States of America or PNAS states<sup>88</sup> that this number doesn't account properly for seafood that is exported for processing where labor is less expensive and then reimported. According to the latest statistics 35-38% of seafood consumed in the U.S. is produced domestically, meaning 62-65% is imported.<sup>89</sup> The United States is the world's 4<sup>th</sup> largest exporter of seafood.<sup>90</sup> The misleading 90% number is used to suggest the USA needs to produce more fish domestically with aquaculture. Sustainable alternatives include processing fish locally or consuming local wild catch; these would reduce the carbon footprint of exporting seafood only to reimport it, just to pay lower wages. This would also create more jobs, tax revenue, support historic working waterfronts and indigenous coastal fishing communities, and further reduce seafood imports. The SLOWFISH movement advocates less frequent and smaller harvests of locally caught fish, within sustainable yields, ensuring an enduring sector of the economy and food system.



Note: The graph above from the Food and Agriculture Organization (FAO) is used to justify expansion of aquaculture. Source: [OECD-FAO Agricultural Outlook 2020-2029](#)<sup>91</sup>

2. Claim: Population growth and human demand for fish will outpace what the sea can supply; suggesting aquaculture must make up for demand.

<sup>88</sup>Jessica A. Gephart<sup>a,1</sup>,

<https://www.pnas.org/content/116/19/9142/tab-article-info>

<sup>89</sup><https://www.pnas.org/content/pnas/suppl/2019/05/02/1905650116.DCSupplemental/pnas.1905650116.sapp.pdf>

<sup>90</sup> [https://sites.nationalacademies.org/cs/groups/pgasite/documents/webpage/pga\\_198073.pdf](https://sites.nationalacademies.org/cs/groups/pgasite/documents/webpage/pga_198073.pdf)

<sup>91</sup> <https://www.oecd-ilibrary.org/sites/4dd9b3d0-en/index.html?itemId=/content/component/4dd9b3d0-en>

Analysis: Seafood demand is partially created through marketing – advertising products that businesses hope to profit from. Seafood prices fluctuate widely for complicated reasons. A linear growth line is a projection, not science, possibly drawn as a marketing tool. There are several nuances to this widely used projection. First, nearly 120 nations are at or below replacement fertility with the human population of these nations projected to peak and then slowly decline over the next few decades.

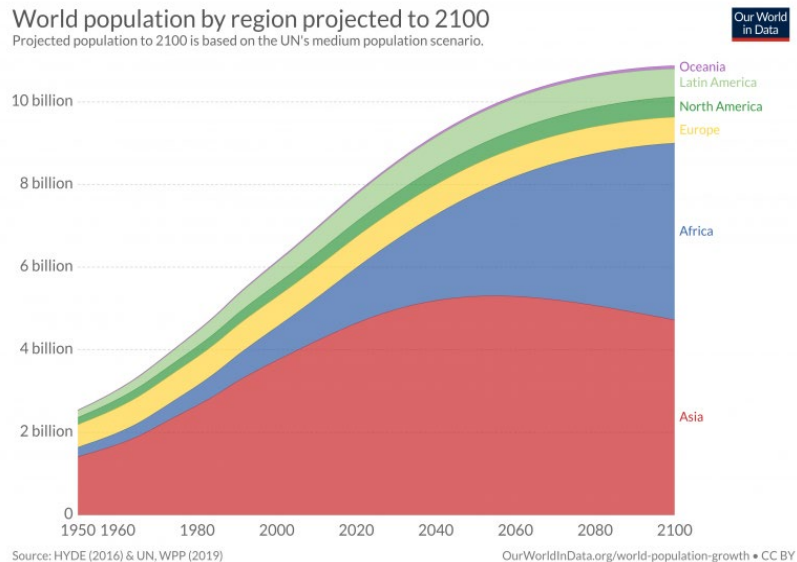
This means demand for expensive RAS fish could decline.

Second, the large catches of pelagic forage fish used to feed higher trophic farmed fish such as salmon, are typically captured in Asian, African or South American waters, depriving small-scale indigenous fishing communities of their traditional source of protein.<sup>92</sup> This demand also disrupts generations of self-reliant economies.

Nearly all population growth projected for the planet is in Africa.<sup>93</sup> This population will be far more secure by being able to go to sea in small boats catching a sustainable yield of their forage fish for human consumption. It is misleading to suggest aquaculture will “feed the hungry.”

3. Claim: Carbon Emissions are reduced by locating RAS systems near consumers.

Analysis: A frequently cited study by the Freshwater Institute compares transporting net-pen salmon by plane from Norway to Seattle and compares that total carbon footprint to a hypothetical land-based RAS, presumably close to markets.<sup>94</sup> The claim is that eating RAS fish produced regionally spares the carbon emitted when flying fish from distant lands. The problem with this claim is that only 5% of annual world seafood production is transported by plane.<sup>95</sup> These airfreighted products tend to be luxury foods, never intended to feed burgeoning populations. The rest is shipped by sea or ground at far lower carbon footprints. “Depending on the prevailing conditions, air transport causes around 170 to 200 times more emissions than the transport of the same quantity of goods by



<sup>92</sup> <https://thefishsite.com/articles/african-fishmeal-factories-under-fire>

<sup>93</sup> <https://ourworldindata.org/region-population-2100>

<sup>94</sup> Yajie Liua, Trond W. Rostena, Kristian Henriksena, Erik Skontorp Hognesa, Steve Summerfelth, Brian Vincib, Comparative economic performance and carbon footprint of two farming models for producing Atlantic salmon (*Salmo salar*): Land-based closed containment system in freshwater and open net pen in seawater, in *Aquacultural Engineering* 71, (2016) 1-12. <https://doi.org/10.1016/j.aquaeng.2016.01.001>

<sup>95</sup> <https://www.eurofishmagazine.com/sections/trade-and-markets/item/173-freshness-and-quality-versus-environmental-and-climate-impact>

ship.”<sup>96</sup> With the United States being the world’s fourth largest exporter of seafood; consumers have the option of eating un-caged fish caught locally. Just as cage-free eggs and fair-trade enter today’s consumer choices, the slow fish and community supported fisheries movement advocates for smaller, less frequent portions of low trophic level fish harvested at sustainable levels by small-scale fishermen and women.<sup>97</sup>

#### 4. Claim: Create jobs and cut taxes

Analysis: Many rural communities in Maine are in need of good paying jobs and ironically, at the same time, many employers struggle to find qualified employees. Because industrial aquaculture is highly mechanized and the jobs require unique qualifications, for the short term, few employees will be from the local area. More employment could be attained through support for many smaller sustainable businesses. Boom-bust economics are correlated to too-big-to-fail projects.<sup>98</sup>

Industrial developments can struggle to net tax benefits to residents as their facilities create additional strain on public infrastructures such as roadways, water and sewer systems and electrical grids. For example, a municipality may agree to pay costs for dechlorinating water, running sewer pipes, or upgrading treatment facilities. Rate-payers might not know they will shoulder the costs of new powerlines or secure debts.

Large businesses can access state-level funds that might otherwise be directed toward municipalities, again reducing any net benefit to residents. Towns may assume financial risks or be asked to relieve taxes during a financial emergency, a drop in commodity prices or in the case of aquaculture, a mass mortality of finfish. Diverse smaller businesses can yield similar tax benefits and employment while creating fewer demands on, and risks to, the surrounding environments and infrastructures.

### **KEY FINDING #6: ENERGY USE AND POLLUTION**

The welfare of fish in RAS is dependent upon power grids to continually circulate, filter and replace water. Facilities must plan for a week or more of power interruption from ice storms or grid failures. Generators capable of running the entire operation are necessary. To demonstrate the scale of the power needed, consider the Belfast facility with a proposed demand of 28 MW, power sufficient for a 38,000-home subdivision.<sup>99</sup> Eight 2-megawatt back-up diesel generators each with a 65-foot smoke stack, plan to be operated daily in a residential area to shave peak demand. Noise and air pollution concerns neighbors as permits are sought to store and burn 900,000 gallons of fuel annually. By comparison, the 2019 peak demand for the entire mid coast of Maine was 145 MW (megawatts). This power demand requires a \$63 million upgrade to a power corridor, with costs passed on to ratepayers.

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<sup>96</sup><https://www.eurofishmagazine.com/sections/trade-and-markets/item/173-freshness-and-quality-versus-environmental-and-climate-impact>

<sup>97</sup> Liao Y-Y, Chang C-C. Impact of the Slow Fish Movement Curriculum on Students’ Awareness of Marine Environment Conservation and Marine Resource Sustainability. *Sustainability*. 2021; 13(5):2880. <https://doi.org/10.3390/su13052880>

<sup>98</sup> <https://michaelshuman.com/7-ways-to-grow-your-economy-now/>

<sup>99</sup> [https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/2a8a91\\_2c1b43c743994bcf8cd08d71c95bef94.pdf](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/2a8a91_2c1b43c743994bcf8cd08d71c95bef94.pdf)

As another example, a sea-based RAS system proposed next to Maine’s iconic Acadia National Park in Frenchman’s Bay would include 10 diesel generators burning four million gallons of fuel annually.<sup>100</sup> On land or sea, the electricity required to grow Maine’s proposed 100 MT of aquaculture fish a year is estimated at 75 MW.

It is important to note that many technologies are available to dramatically lower carbon footprints. Some operators of fully closed RAS finfish operations are employing wind and solar energy and using recycled materials in construction.

### **KEY FINDING #7: BIOSECURITY, DISEASES AND VIRUSES**

Fish disease is a serious problem for the aquaculture industry and some estimates suggest that facilities at Maine latitudes can lose up to 34% of their stock to disease over the whole life cycle.<sup>101</sup> The “extreme monoculture” environment of RAS (stressors, sanitation, density) often requires medications that can lead to resistant diseases as these wild creatures suffer in confinement.<sup>102</sup>



Note: Dead salmon dump on North Uist in September 2018. At least nine million fish have been killed by diseases, botched treatments, poor handling and other problems at salmon farms around Scotland since 2016, according to official returns.

**1.) Fish farms can introduce diseases or viruses into wild fish stocks causing economic impacts.** A scientific study found that piscine orthoreovirus or PRV was detected in: 95% of farmed Atlantic salmon, 37–45% of wild salmon from regions highly exposed to salmon farms and 5% of wild salmon from the regions furthest from salmon farms.<sup>103</sup> The problem is that once a virus begins spreading, vaccinations that might

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<sup>100</sup> <https://www.maine.gov/dep/ftp/projects/american-aquafarms/applications/mepdes/FB01%20Long%20Porcupine%20General%20Application%20for%20Waste%20Discharge%20Permit%20with%20Attachments.pdf>

<sup>101</sup> Leung, TLF and AE Bates (2013) *Journal of Applied Ecology*, 50:215–222

<sup>102</sup> Brown C. Fish intelligence, sentience and ethics. *Anim Cogn*. 2015 Jan;18(1):1-17. doi: 10.1007/s10071-014-0761-0. Epub 2014 Jun 19. PMID: 24942105.

<sup>103</sup> Morton A, Routledge R, Hrushowy S, Kibenge M, Kibenge F (2017) The effect of exposure to farmed salmon on piscine orthoreovirus infection and fitness in wild Pacific salmon in British Columbia, Canada. *PLOS ONE* 12(12): e0188793. <https://doi.org/10.1371/journal.pone.0188793>

protect caged fish, will not help wild fish. Biosecurity threats can be catastrophic when introducing viruses and diseases cultivated and mutated in aquaculture into bays and estuaries via outflow pipes.

**2.) Poor practices by the industry can exacerbate these risks by shipping infected fish stock (as eggs, smolts, or food).** According to Dr. Stephen Ellis, about 10% of caged salmon is sent to market early because it is infected with salmon anemia (ISA) virus. The aquaculture industry has developed markets for the smaller, diseased fish, unbeknownst to the consumer.<sup>104</sup> Sold fish and destroyed fish can spread viruses and diseases.

As Mark Hume reported in the *Globe and Mail*, updated May 11, 2018, “The action, filed with the Federal Court by Ecojustice on behalf of Alexandra Morton, alleges the Minister of Fisheries and Oceans (DFO) acted ‘unlawfully’ by issuing a license to Marine Harvest Canada Inc. (rebranded as MOWI, the owner of Ducktrap) to allow the farm to transfer fish carrying piscine reovirus (PRV).” The virus is deadly and causes heart and skeletal muscle inflammation in fish. “Morton said she first detected PRV last year when she tested samples of farmed salmon bought at Vancouver supermarkets. The Cohen Commission of Inquiry, which examined the collapse of sockeye stocks in the Fraser, warned that fish farms could be passing diseases to wild salmon. The Piscine reovirus began in Norway, home to massive aquaculture facilities.

**3.) RAS can breed diseases resistant to anti-microbials.** Viruses and diseases can be managed and reduced; however, risks are always present. Monocultures such as RAS tanks are the precise breeding grounds and bio-amplifiers for resistant forms of diseases. The use of antibiotics and medications has resulted in increased antimicrobial resistance. Additionally, recent trials have shown that the infectious pancreatic necrosis (IPN) virus has changed and that family lines of salmon genetically selected for resistance to the disease are no longer as protected as they once were.<sup>105</sup>

**4.) Antimicrobials and disinfectants used to manage disease in aquaculture systems impact water quality.** Antifoulants, fungicides, pesticides and other medications flush out the RAS discharge pipe beyond the footprint of the operation. Although some land-based operations claim they will not use antibiotics, recent permits applications include pages of medications and chemicals that include chlorine,<sup>106</sup> potassium monopersulfate,<sup>107</sup> and formaldehyde.<sup>108</sup> Open RAS that experiences mass die-offs need to use bleach or other chemicals to disinfect tanks, pumps and pipes and then dump millions of gallons of chemically laden water into the marine environment.

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<sup>104</sup>[https://alexandramorton.typepad.com/alexandra\\_morton/2013/02/the-canadian-food-inspection-agency-cfia-has-declared-240000-isa-virus-contaminated-feedlot-salmon-are-fit-for-canadian-co.html](https://alexandramorton.typepad.com/alexandra_morton/2013/02/the-canadian-food-inspection-agency-cfia-has-declared-240000-isa-virus-contaminated-feedlot-salmon-are-fit-for-canadian-co.html)

<sup>105</sup><https://www.fishfarmingexpert.com/article/changes-in-ipn-virus-make-salmon-more-susceptible/>

<sup>106</sup> da Costa JB, Rodgher S, Daniel LA, Espíndola EL. Toxicity on aquatic organisms exposed to secondary effluent disinfected with chlorine, peracetic acid, ozone and UV radiation. *Ecotoxicology*. 2014 Nov;23(9):1803-13. doi: 10.1007/s10646-014-1346-z. Epub 2014 Sep 12. PMID: 25213288.

<sup>107</sup> <https://www.alfa.com/en/msds/?language=EN&subformat=AGHS&sku=89892>

<sup>108</sup> <http://www.npi.gov.au/system/files/resources/9c275e33-dcb4-6694-4995-24bd63aa09d6/files/factsheet-formaldehyde.pdf>

**5. Some systems employ UV light, ozone and bio-filters that do reduce pathogens and solids;** however, UV treatment only works if viruses are not shielded by particles in the water. Because turbidity of water varies with runoff events, viruses can pass through.<sup>109</sup> Even with the addition of some ozone treatment this methodology will not address all virus and virions discharged. The combined levels of UV and ozone needed to fully sterilize, not merely partially disinfect a production tank full of fish cannot be achieved due to the sensitivity of the livestock.

In fully closed land-based RAS facilities, the production water can be fully sterilized before introducing the fish. Then by implementing good bio-security measures, there is a better chance of reducing viruses and diseases.

#### **KEY FINDING #8: SLUDGE**

Finfish RAS generates large quantities of concentrated sludge. If dehydrated, considerable energy is needed and salts are further concentrated. In wintertime, with frozen soil and snow on the ground, trucking sludge out of state to warmer climates to spread on sacrifice zones would be problematic, as spring runoff would send the nitrogen-rich mix into streams, increasing nitrogen runoff. Work is ongoing in experimenting with generating biogas or fertilizers from aquaculture sludge.

Polyculture systems have been developed that recycle nutrients with “waste equals food” loops, where the manure grows algae or plants that are then feedstock components, possibly lowering the carbon intensity of feeds.<sup>110</sup>

#### **KEY FINDING #9: FRESH WATER**

Some land-based RAS systems require high daily rates of fresh, clean water from wells, aquifers or surface water. As an example, the Belfast facility in Maine would require more than 1.8 million gallons of fresh water/day,<sup>111</sup> similar to four Nestle bottled water operations in Maine. As climate change advances, so have extended droughts, putting wells used by municipalities, residents and farmers at risk.<sup>112</sup> <sup>113</sup>Large water withdrawals such as those planned by some RAS operations, can draw wells down and lead to salt water intrusion.<sup>114</sup> Closed RAS systems eliminate the massive daily draw of fresh water requiring minimal makeup water due to losses from evaporation.

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<sup>109</sup>[https://www.maine.gov/dep/ftp/projects/nordic/pre-filed-testimony/intervenor-Upstream%20Watch%20Northport%20Village%20Corporation/BRYDEN\\_NVCUPSTREAM8.pdf](https://www.maine.gov/dep/ftp/projects/nordic/pre-filed-testimony/intervenor-Upstream%20Watch%20Northport%20Village%20Corporation/BRYDEN_NVCUPSTREAM8.pdf)

<sup>110</sup> <https://www.frontiersin.org/articles/10.3389/fmars.2021.666662/full>

<sup>111</sup> [https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52\\_12dd7a59189643b38ba78941c603cc82.pdf?index=true](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52_12dd7a59189643b38ba78941c603cc82.pdf?index=true)

<sup>112</sup> <https://statesatrisk.org/maine/drought>

<sup>113</sup> [https://www.maine.gov/dacf/ard/water\\_management/docs/2020-maine-drought-and-agriculture-report.pdf](https://www.maine.gov/dacf/ard/water_management/docs/2020-maine-drought-and-agriculture-report.pdf)

<sup>114</sup> [https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52\\_360f424dc85546e09aa69ff978d15715.pdf](https://8774567e-61ab-4355-a629-8a49a81506a2.filesusr.com/ugd/207e52_360f424dc85546e09aa69ff978d15715.pdf)



## **KEY FINDING #10: FISH FEED, ADDITIVES, CONTAMINANTS**

Currently fish feed is comprised of various mixes of soy, corn, canola, slaughterhouse poultry or pork wastes, bloodmeal, Krill, shrimp and crab, and wild-catch forage fish.<sup>115</sup> The small forage fish ground into fish meal often comprise 20-30 % of the diet. Use of insects and algae are being tested. The five proposed Maine facilities would need over 600,000 pounds per day of feed (220 million pounds a year).

Feeding forage fish to caged fish has become a global issue, as these pelagic species are at the base of the food chain. They feed not only people in lower-income societies, but also many other species in marine environments.<sup>116</sup> Impacts of industrial-scale harvest includes the bycatch of threatened species, depriving traditional fishermen and women of their livelihoods, and communities of important food sources.

Finfish producers are promoting higher percentages of corn and soy, most of which is genetically engineered and grown with herbicides, pesticides and chemical fertilizers, depending upon local regulations. These residues can make their way to the sea, unless fully closed RAS systems are used. Each nation regulates the use of antibiotics, growth hormones, GMO feedstocks and synthetic dyes that can be used.

Fishmeal, depending on the source and local regulations can contain persistent and bioaccumulative toxic substances (PBTs),<sup>117 118</sup> including monomethyl mercury in protein, and organohalogen pollutants. Exposure to these chlorinated compounds is known to cause reproductive, neurotoxic, immunotoxic, endocrine, behavioral, and carcinogenic effects in wildlife and humans.

Additives are used to enhance feed intake (amino acids, peptides and betaine), to impart a pink color (natural and/or synthetic astaxanthin), for digestibility of feeds (Bactocell®), and to preserve the feed (Ethoxyquin).<sup>119</sup> Antibiotics and medications including synthetic chemicals can be integrated into the feed pellets.

A study published in *Aquaculture Engineering* found that dissolved phosphorus levels vary with fish diet. “Total phosphorous (most of which was dissolved) was 4 times greater in the culture water of RAS that received a Fishmeal-free diet.”<sup>120</sup>

## **KEY FINDING #11: PUBLIC COMMONS**

Humanity has entered the “6<sup>th</sup> great extinction” an epoch being coined as the “Anthropocene” evidenced by accelerated climate change, pollution, biodiversity losses and collapse of fisheries. Industrial food systems along with fossil fuel use are primary

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<sup>115</sup> <https://www.fisheries.noaa.gov/insight/feeds-aquaculture>

<sup>116</sup> <https://www.sciencedaily.com/releases/2018/06/180614213822.htm>

<sup>117</sup> <https://pubmed.ncbi.nlm.nih.gov/17133828/>

<sup>118</sup> <https://www.epa.gov/report-environment/consumable-fish-and-shellfish>

<sup>119</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4745505/>

<sup>120</sup> *Aquacultural Engineering* Volume 74, September 2016, Pages 38-51, Effects of feeding a fishmeal-free versus a fishmeal-based diet on post-smolt Atlantic salmon *Salmo salar* performance, water quality, and waste production in recirculation aquaculture systems. JohnDavidson<sup>a</sup>Frederic T.Barrows<sup>b</sup>P. BrettKenney<sup>c</sup>ChristopherGood<sup>d</sup>KarenSchroyer<sup>a</sup>Steven T.Summerfelt<sup>a</sup>

contributors. Bold restoration efforts are needed, along with sustainable, local, organic, fair-trade food systems.

A long history of exploitation and poorly regulated extractive fishery practices has collapsed species after species. Large-scale sea-based and land-based aquaculture creates new and profound impacts. Unfortunately, we do not have the luxury to claim these impacts as “unintended consequences” as enough information is now known, both about the real impacts as well as how to support the recovery of wild stocks.

Globally, environmentalists, wild fish advocates, consumers, chefs, independent scientists, wildlife enthusiasts have called attention to the environmental impacts of industrial aquaculture on wild species, water quality, coastal economies, tourism, ecologies and cultures.

Tourism in a region depends upon clean harbors and beaches. If beachgoers begin to experience unhealthy effluent as they swim at beaches near outflow pipes, they might look for cleaner waters for their vacations or homes.

Placing feedlots or pipelines in navigable waters can interfere with vessel traffic, recreational and commercial fishing, tourist activities, renewable energy infrastructure, migration of marine mammals and other marine fish and animals. Floating or submerged structures full of fish attract wildlife and natural predators, which can become entangled. Installing pipelines can stir up industrial in sediments such as mercury, halocarbons, lead, chromium arsenic.



### **KEY FINDING #12: AGENCY OVERSIGHT LACKING**

Unfortunately, communities are not always aware of the scope of the impacts as this is an emerging industry seen by some as “innovative” and “sustainable.” Worldwide, the aquaculture sector has been proactive in lobbying for leniency in regulation and application of existing laws. Citizens have been forced to raise large budgets for legal and technical expertise to obtain objective information. From these experiences it is clear that effective and comprehensive state or federal regulatory and monitoring system are not in place to prevent environmental damage early enough to stop it and avoid unanticipated harm.

Multiple federal agencies regulate different aspects of the US aquaculture industry: Food and Drug Administration, National Oceanic and Atmospheric Administration, US Army Corps of Engineers, US Dept of Agriculture, US Environmental Protection Agency, and US Fish and Wildlife Service. Within NOAA, the National Marine Fisheries Service has attempted to clarify regulations, including considering “harvesting” under the Magnuson-Stevens Fishery Conservation and Management Act as applying to aquaculture as well as wild caught fish. Courts ruled that aquaculture does not fit the definition of ‘fishing’ so proponents of aquaculture continue to try to expand the industry through policy changes within regulatory agencies and favorable legislative policies.

Various agencies have been willing to suspend or change environmental and health protections. In May 2020, a presidential executive order to “Promote American Seafood Competitiveness and Economic Growth” touted expansion of industrial aquaculture into federally managed waters.

Much of the information that policy makers and the public receive is from the industry itself, or researchers at universities and NGOs who receive funding from this \$245 billion industry. Often the same government agencies charged with protecting the marine ecosystem, find themselves in an advocacy role for the aquaculture industry.

When the impacts of the aquaculture industry become apparent, small fines can be considered part of the cost of doing business. In this way, a diverse, multi-stakeholder working waterfront can become dominated by the influence of several corporate interests. Independent and science-based evaluations can be built and policies developed that would ensure zero-effluent and safeguard local ecosystems. Any large-scale project must use the best practicable technology which at this point is zero discharge and carbon neutral. The permitting of small-scale, sustainable polycultures could be researched, streamlined and encouraged.

#### **4. SUMMARY**

Restoring wild fish habitat and water quality needs to be our global goal. Adding pollutants such as dissolved nitrogen and carbon emissions when levels are currently greater than assimilative capacity is not prudent. Reducing the use of small pelagic fish for aquaculture feed protects the marine food chain and allows people in developing nations to meet their protein needs with local, native seafood. Encouraging consumers to choose wild-caught fish harvested in well-regulated fisheries can help restore small-scale, family and tribal fisheries throughout the country and world. Keeping waste and chemicals and debris from ocean and coastal regions can help restore healthy oceans and sea life.

Completely ‘closed’ land-based systems, including polycultures have become operational and solve many of the problems mentioned in the Key Findings. These systems integrate multi-trophic species that recycle nutrients internal to their systems. The benefits include control of disease, pests and weeds without chemical inputs. Further investments in these systems can contribute to a sustainable food system.

Low-trophic-level fish reared in ponds or enclosures with closed recirculating systems currently offer protein around the world. These are generally not the high-value species but fulfill the promise of providing affordable, abundant seafood for our hungry planet.

If state and federal regulators insist that zero-effluent and minimal carbon footprint projects are required, permitting can be streamlined, when quantifiably sustainable designs are demonstrated. The advantages of smaller systems include reduced biosecurity risks when catastrophic die offs or disease or virus outbreaks occur. The smaller systems also reduce risks to communities, ecosystems, investors, and economies.

Humanity is at a crossroads between a brave new world of factory fish and a traditional working waterfront with recovered fish stocks. Just as the Maine Organic Farmers and Gardeners Association (MOFGA) has shown that a food system doesn't have to degrade ecosystems, the same can be said about the seafood sector, where thousands of fishermen and women earn an independent living from the sea. The restoration of a working waterfront with a sustainably managed wild-caught fishery should be a strong priority.

As vital as sustainable food systems are, a reality remains -- the tourism sector yields many times more revenue to Maine's economy than agriculture and seafood combined. The iconic brand that attracts millions of visitors a year is a relatively clean and beautiful environment. Building open and polluting, carbon intensive aquaculture is in stark contrast to the brand that attracts tourists.

We find that 'open' land-based and floating RAS finfish aquaculture projects pose numerous environmental and societal risks, including:

- The spread of virus, disease and pollutants that threaten recovery of nearby wild and endangered fish populations,
- Weakening food sovereignty of the Penobscot Nation,
- Impacts on wild forage fish populations near and distant, and
- Extractive use of the most sensitive marine ecosystems.

The good news is that there are many options for creating sustainable food systems that include sustainably harvested and/or grown seafood, including fin fish that have little or no negative impacts on marine environments.

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