TO: Maine Department of Environmental Protection
Bureau of Water Quality
17 State House Station
Augusta, ME 04333-0017

ATTN: Laura Crossley, Licensing Coordinator

RE: Supplemental Public Comment in Opposition — Kingfish Maine, Inc., Renewal of Combination MEPDES Permit ME0037559 / Maine Waste Discharge License W009238-6F-A-N, Jonesport, Maine

September 10, 2026

Dear Members of the Department:

Further to the Eastern Maine Conservation Initiative's comment of July 8, 2026, submitted in opposition to the renewal of the above-referenced permit, we respectfully submit two additional memoranda prepared by Remote Ecologist. We ask that they be entered into the record for this proceeding.

The first, *Evaluating Kingfish Maine's Projected Wastewater Discharge into Chandler Bay*, examines the feed assumptions underlying the application's discharge projections. Kingfish proposes to introduce roughly 22,000 pounds of commercial feed per day yet identifies that feed only as a "commercially produced diet." Because feed formulation directly governs how much of that input becomes fish biomass rather than solid and dissolved waste — and because Kingfish-affiliated research shows that diet choice alone can alter waste output by roughly half, producing fine particles that fall below the facility's own filtration thresholds — the application does not give the Department enough information to verify that its projected solids, nitrogen, and phosphorus loads reflect realistic operating conditions.

The second, *Why NOAA's June 2022 Review Remains Relevant to Kingfish Maine's 2026 Permit Renewal Application*, addresses the continuing force of NOAA's habitat review. Because the facility, its intake, and its discharge are unchanged from what NOAA evaluated in 2022, the concerns that review documented remain live: Essential Fish Habitat for sixteen federally managed species, a nitrogen discharge many times ambient concentration in waters supporting vulnerable eelgrass, and potential entrainment of eggs, larvae, and bivalve larvae on a scale NOAA called "not trivial." The site-specific studies NOAA recommended were never performed, because the facility was never built. Those recommendations apply with equal force to the application now before the Department.

Both memoranda reinforce the conclusion of our earlier comment: the application does not support the discharge it proposes and should be denied as written. We appreciate the Department's consideration and ask that you include these materials in the record.

Respectfully submitted,

Anastasia Fischer
Executive Director, Eastern Maine Conservation Initiative

Enclosures:

(1) *Evaluating Kingfish Maine's Projected Wastewater Discharge into Chandler Bay* (Remote Ecologist, August 29, 2026)
(2) *Why NOAA's June 2022 Review Remains Relevant to Kingfish Maine's 2026 Permit Renewal Application* (Remote Ecologist, August 29, 2026)

Evaluating Kingfish Maine's Projected Wastewater Discharge into Chandler Bay

Missing Feed and Treatment Information Limits Independent Review

August 29, 2026

Prepared by Remote Ecologist
320 Boston Post Rd., Ste. 180-100
Darien, CT 06820
T: 203-807-4232

Project Team: Jason Krumholz, Ph.D. and Darby L. Pochtar, Ph.D.

Kingfish Maine proposes to introduce approximately 22,000 pounds, or 11 tons, of commercial feed into the facility every day, with daily feed use reaching as high as 26,000 pounds, or 13 tons. This feed would support annual production of approximately 6,000–8,000 tons of yellowtail kingfish (*Seriola lalandi*). Despite the scale of this daily feed input, the Permit Renewal Application ME0037559 describes the feed only as a "commercially produced diet in multiple sizes to support various growth stages." It does not identify the specific feed formulation, nutrient composition, expected feed conversion ratio, or other diet-specific assumptions used to determine how much of that feed will ultimately become fish biomass versus solid and dissolved waste. While Kingfish Maine provides very specific estimates for what it expects to discharge after treatment. At a proposed wastewater flow of approximately 108,600 m³, or 28.7 million gallons, per day, the facility projects daily discharges of approximately 1,629 pounds of TSS, 1,639 pounds of total nitrogen, and 393 pounds of total phosphorus, the mathematical basis for these assumptions is wholly opaque, despite substantial uncertainty in the scientific literature (detailed below).

This information is critical to independent verification of whether Kingfish Maine's wastewater-treatment system can perform as projected, and whether Kingfish Maine's calculations with respect to effluent composition and concentration are accurate because differences in commercial feed can substantially alter the quantity and characteristics of the waste entering the treatment system (1–3). Without knowing the feed and associated waste-production assumptions, it is difficult to determine whether the projected total suspended solids (TSS), nitrogen, phosphorus, and other pollutant loads discharged into Chandler Bay accurately reflect expected operating conditions. *Independent verification of Kingfish Maine's claims should be essential to approval of their permits.*

Yellowtail Kingfish Present a Particular Waste-Management Challenge in Recirculating Aquaculture Systems

Yellowtail kingfish raised in recirculating aquaculture systems (RAS) are known to produce feces with poor integrity, unstable consistency, and fine particles commonly described in the peer-reviewed literature

as “diarrhea-like.” These characteristics make the fecal material more difficult to remove from the wastewater and can contribute to elevated TSS in the RAS and its effluent (2, 4).

Importantly, this problem is strongly influenced by diet. In a Kingfish-affiliated study (2), researchers specifically developed a Commercial Dummy (CD) diet to mimic the fecal waste characteristics and production expected from a commercially available yellowtail kingfish diet used by the Kingfish Company (the parent company of Kingfish Maine). Fish fed this commercial-type diet produced diarrhea-like feces and the highest amount of non-removed fecal waste among the three treatments tested, while fish receiving a diet containing natural feed ingredients produced more cohesive fecal pellets and almost 50% less unremoved waste. This finding is consistent with other Kingfish-affiliated research led by Peter Horstmann, highlighting that the composition of commercial-style feeds can directly change both the amount and physical form of waste produced. Changes in protein source and starch content have been shown to affect feed conversion, nutrient digestibility, fecal waste production, particle size, and removal efficiency, with some formulations producing more waste, smaller particles, and substantially greater amounts of fecal material that remain unremoved from the water (3, 4). Taken together, these studies demonstrate that the specific formulation of a commercial diet directly influences the waste load and waste characteristics that the RAS treatment system must manage before discharge (2–4). However, it is unclear if Kingfish Maine is taking the steps recommended by the scientific literature to reduce its waste output as these steps (e.g. natural feed) likely add additional complexity and cost to the rearing process.

Commercial Diets Can Produce Very Different Waste Loads

The fact that a feed is commercially produced does not mean that it will produce a predictable amount of fish growth or waste. For example, in a study where yellowtail kingfish were fed three different commercial diets, the amount of feed required to produce the same amount of fish growth varied substantially: approximately 1.22 pounds of feed were required to produce one pound of fish growth with the most efficient diet, compared with 2.17 pounds with the least efficient diet (1). In practical terms, the less efficient diet required nearly 80% more feed to produce the same amount of fish growth. The three different diets also produced substantially different quantities of settleable fecal solids, nitrogen, and phosphorus, with one commercial diet generating approximately half the waste produced by another (1).

This variability is directly relevant to Kingfish Maine, which proposes to use approximately 22,000 pounds of feed per day but identifies that feed only as a “commercially produced diet in multiple sizes to support various growth stages.” Without identifying the specific formulation or the feed-conversion and digestibility assumptions used in its calculations, it is not possible to determine how much of that daily feed is expected to become fish biomass versus solid and dissolved waste. As a result, the permit does not provide enough information to independently determine whether its projected TSS, nitrogen, and phosphorus loads realistically reflect the waste expected from the commercial diet Kingfish Maine plans to use (1–4).

Feed Composition Directly Affects the Mechanical Filtration Kingfish Maine Plans to Use

These differences in fecal waste are especially important because mechanical filtration is the first major step Kingfish Maine plans to use to remove solids from its wastewater. The Permit Renewal Application ME0037559 states that drum or disc filters will remove solids down to approximately 40–60 µm within the culture system, followed by additional mechanical filtration down to approximately 100 µm during wastewater treatment. The smaller the micron size, the finer the filtration; therefore, the 40–60 µm filters represent the facility's finest stated mechanical filtration.

How effectively these filters remove waste depends not only on their micron rating, but also on the size and physical stability of the feces produced by the fish. Larger, cohesive fecal material is generally easier to remove, while fine, unstable feces can remain suspended and become more difficult to capture (2, 3). This is particularly relevant to the Commercial Dummy diet discussed above, which produced diarrhea-like feces and included measurable fecal material smaller than 40 µm and between 40 and 100 µm, directly overlapping or falling below the filtration sizes proposed for Kingfish Maine (2). These measurements may also underestimate the finest fraction because the particle-size analysis was based on fecal material that had already been recovered through settling, rather than all material remaining suspended in the water (2).

Feed composition can also determine how much effort is required to maintain effective filtration. In yellowtail kingfish RAS using a 40-µm drum filter, a higher-starch diet required approximately 100 backwashes per day compared with 46 for a lower-starch diet to maintain similar fecal-removal efficiency, reflecting greater waste production and filter clogging (3). In practical terms, the same filter had to clean itself more than twice as often simply because the feed changed. Greater cleaning and backwashing requirements increase the operational demands needed to maintain treatment performance, making consistent maintenance, monitoring, and equipment operation increasingly important (5).

The significance for Kingfish Maine is therefore straightforward: simply specifying 40-, 60-, and 100-µm filters does not establish how effectively those filters will remove the waste produced by the commercial diet that will actually be used. Feed composition affects both the amount and physical characteristics of the waste reaching those filters, as well as the effort required to maintain their performance (2, 3). Without identifying the proposed commercial feed and the waste characteristics used in its calculations, the Permit Renewal Application ME0037559 does not provide enough information to determine whether the assumed solids-removal performance reflects realistic operating conditions. *Transparency and reproducibility of the calculations provided should be an essential part of a successful permit.*

Conclusion

The Permit Renewal Application ME0037559 provides detailed estimates of daily feed input, wastewater flow, and final pollutant concentrations, but does not provide enough information to independently evaluate the assumptions connecting those values. This is particularly important for yellowtail kingfish because feed formulation can affect feed conversion, nutrient digestibility, fecal waste production, particle size, and solids-removal performance (1–4).

To determine whether the projected discharge accurately reflects expected operating conditions, the Permit Renewal Application ME0037559 should be required to identify:

- The specific commercial feed or feed formulations expected to be used, including nutritional composition
- The feed conversion and digestibility assumptions used to estimate how much feed becomes fish biomass versus waste
- The expected production of solid and dissolved waste, including nitrogen and phosphorus.
- The expected fecal particle-size distribution and solids-removal efficiency under the proposed commercial diet
- The numerical TSS, BOD, nitrogen, and phosphorus removal efficiencies used to calculate the final effluent
- Whether those removal efficiencies account for realistic operating conditions, including filter loading, clogging, backwashing, cleaning, and maintenance

These are not minor operational details. They are essential to understanding how approximately 22,000 pounds of feed entering the facility each day translate daily loads Kingfish Maine predicts will ultimately be discharged to Chandler Bay. DEP should not rely on discharge projections that cannot be independently evaluated. For this reason, Permit Renewal Application ME0037559 should be denied as currently written, with Kingfish Maine required to provide the missing information before DEP considers renewal.

References

1. Moran, D., S.J. Pether, and P.S. Lee. 2009. Growth, feed conversion and faecal discharge of yellowtail kingfish (*Seriola lalandi*) fed three commercial diets. *N. Z. J. Mar. Freshw. Res.* 43:917–927, doi: 10.1080/00288330909510050.

2. Horstmann, P., R.M. Maas, X.V. De Boer, T.W.O. Staessen, F. Kokou, and J.W. Schrama. 2023. Faecal waste characteristics of yellowtail kingfish (*Seriola lalandi*) fed with pelleted and natural feed. *Anim. Feed Sci. Technol.* 299:115625, doi: 10.1016/j.anifeedsci.2023.115625.

3. Horstmann, P., N. Alliney, E.H. Eding, J. Kals, S. Prakash, T.W.O. Staessen, F. Kokou, J.W. Schrama, and R.M. Maas. 2024. Practical implications of lowering dietary starch content on waste management in recirculating aquaculture systems operated with drum filtration or sedimentation in yellowtail kingfish (*Seriola lalandi*). *Aquaculture* 584:740587, doi: 10.1016/j.aquaculture.2024.740587.

4. Horstmann, P., R.M. Maas, X.V. De Boer, T.M.B. De Jong, T.W.O. Staessen, F. Kokou, and J.W. Schrama. 2023. Effect of dietary protein source and ingredient grinding size on fish performance, faecal waste production and characteristics of yellowtail kingfish (*Seriola lalandi*) fed restrictively and to apparent satiation. *Aquaculture* 562:738875, doi: 10.1016/j.aquaculture.2022.738875.

5. Slette, H.T., C. Salomonsen, K. Størkersen, G.M. Tveit, A. Misund, and E. Lona. 2025. Biosafety in Norwegian Aquaculture—Risks and Measures in RAS Facilities and Well-Boats. *Rev. Aquac.* 17:e12979, doi: 10.1111/raq.12979.

Why NOAA's June 2022 Review Remains Relevant to Kingfish Maine's 2026 Permit Renewal Application ME0037559

August 29, 2026

Prepared by Remote Ecologist
320 Boston Post Rd., Ste. 180-100
Darien, CT 06820
T: 203-807-4232

Project Team: Jason Krumholz, Ph.D. and Darby L. Pochtar, Ph.D.

In the June 2022 letter to Frank J. DelGuidice, the Chief of the Permits and Enforcement Branch of the U.S. Army Corps of Engineers New England District, NOAA's Assistant Regional Administrator for Habitat and Ecosystem Services, Louis A. Chiarella, reviewed the proposed Kingfish Maine facility and identified significant concerns about potential impacts to Chandler Bay's fish habitat, water quality, eelgrass, shellfish resources, seafloor habitat, and marine life. The concerns raised by NOAA remain directly applicable to the 2026 permit renewal because the proposed facility, its operating scale [up to 8,000 metric tons of fish per year], and its intake [approximately 28.53 million gallons of seawater per day] and discharge [up to 28.7 million gallons of wastewater per day] volumes remain the same as those reviewed in 2022. The purpose of this summary is to highlight why NOAA's 2022 review remains directly relevant to the 2026 Permit Renewal Application ME0037559 and why its identified risks, data gaps, and recommendations should be considered before the permit is renewed.

Key Findings from NOAA's 2022 Review:

1. **Chandler Bay is not an empty receiving water; it is already supporting a dense concentration of important and sensitive habitat.** The project area contains overlapping Essential Fish Habitat for 16 federally managed species across numerous life stages, including Atlantic cod, plaice, halibut, herring, sea scallop, wolffish, ocean pout, mackerel, pollock, red hake, silver hake, spiny dogfish, white hake, windowpane flounder, winter flounder, and yellowtail flounder (Figure 1). NOAA also documented eelgrass beds, wetlands, mudflats, rocky-bottom habitat, spawning areas, and shallow nursery habitat, with portions designated as a Habitat Area of Particular Concern for juvenile Atlantic cod. Figure 1 makes the significance of this especially clear by showing the extent to which Essential Fish Habitat overlaps with seagrass habitat and Atlantic salmon Gulf of Maine DPS critical habitat throughout Chandler Bay (Figure 1). The proposed intake and discharge would therefore operate within a system already supporting multiple sensitive habitats and life stages, rather than in an area with limited ecological value. See NOAA letter, pp. 2–3.
2. **The proposed wastewater discharge would add a substantial nitrogen source to waters already supporting vulnerable eelgrass habitat.** NOAA reported an assumed background nitrogen concentration of 0.26 mg/L, compared with an eelgrass-protective threshold of 0.32 mg/L, while the proposed discharge was projected to contain approximately 6.6 mg/L of nitrogen, about 25 times the ambient concentration. Limited nutrient data collected since this time have generally confirmed this estimate. NOAA also noted that Maine DEP had determined the proposed discharge would lower water quality as it relates to eelgrass habitat and identified

potential consequences of nutrient enrichment including reduced water clarity and dissolved oxygen, macroalgal blooms, fish kills, eelgrass mortality, and increased susceptibility to disease. This concern is particularly important because available mapping shows that the seagrass documented during the 2010 Maine DMR survey was already reduced compared with its mapped historical extent (Figure 1). Updated surveys are underway in 2026, but those results are not yet available, meaning the present extent and condition of a habitat NOAA specifically identified as vulnerable is still unknown. See NOAA letter, p. 5.

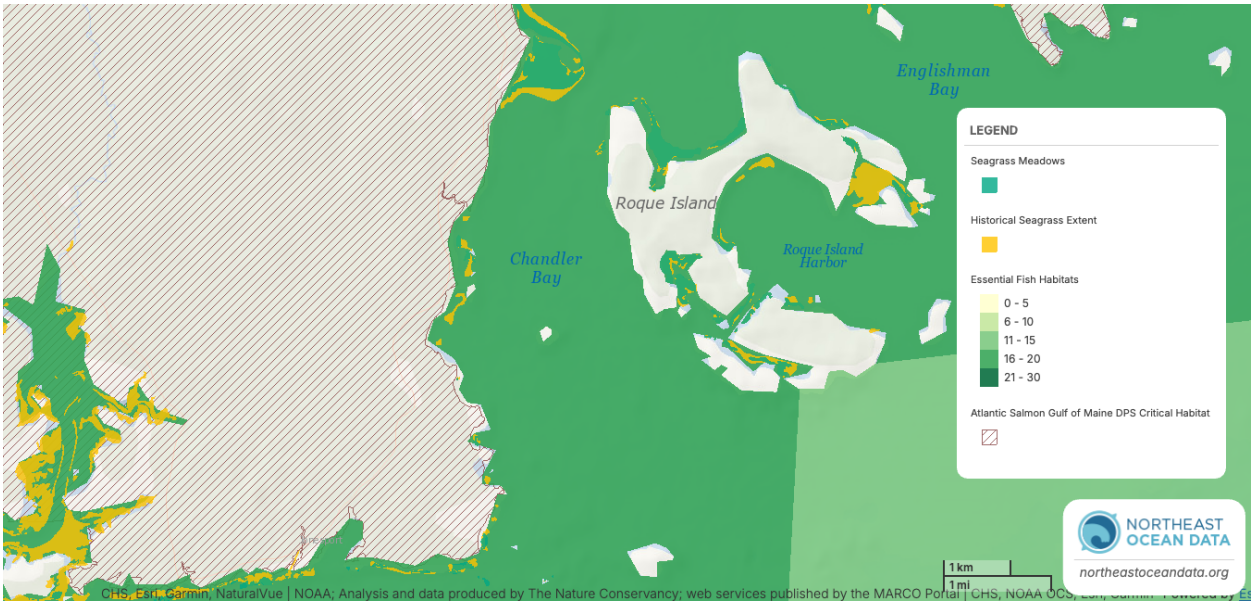

Figure 1. Essential Fish Habitat, seagrass habitat, and Atlantic salmon critical habitat in Chandler Bay and surrounding waters. Current seagrass mapping is based on the 2010 Maine DMR survey and shows a reduced distribution compared with historical mapped extent, illustrating the concentration and sensitivity of ecological resources within Chandler Bay. Link to map online: https://www.northeastoceandata.org/ZazzD2Mx.

3. **The proposed intake could remove large numbers of fish and shellfish before they ever reach later life stages.** NOAA found that the proposed one-inch wedge-wire intake screens may reduce impingement of larger organisms, but they would not prevent various species of eggs and larvae from being drawn into the facility. Kingfish has asserted that the majority of those organisms would pass through unharmed, but this seems unlikely given the extent of screening, and filtration necessary to protect Kingfish's infrastructure, combined with physical and thermal disruption of high velocity passage through these mechanisms. Using available entrainment data scaled to the proposed intake volume, NOAA estimated potential annual entrainment of approximately 20 million fish eggs, 8.87 million fish larvae, and 50 billion bivalve larvae and emphasized that these potential impacts were "not trivial." Yet no Chandler Bay-specific ichthyoplankton study had been completed to determine which species and life stages occur near the intake or how many organisms could actually be affected. That uncertainty is especially important in a bay that supports extensive clam, mussel, oyster, and scallop habitat and lies entirely within a designated lobster management area, highlighting the concentration of ecologically and commercially important shellfish resources in the same waters from which Kingfish Maine proposes to withdraw approximately 28.53 million gallons each day (Figure 2). NOAA's

recommendation for a site-specific entrainment assessment is therefore particularly important for determining how the proposed intake could affect the early life stages of species in these habitats. See NOAA letter, pp. 4–6.

4. **Changes in water quality could affect shellfish and the broader estuarine food web, not eelgrass alone.** Suspension-feeding bivalves continuously process large volumes of surrounding water and are closely connected to nutrient and phytoplankton dynamics. Adult clams and oysters have been shown to filter approximately 42–67% of the surrounding water volume per day, while increased nutrient loading can alter phytoplankton concentrations and affect the growth of juvenile shellfish and eelgrass[1]. These interactions are again particularly relevant in Chandler Bay, due to the combination of ecological and socioeconomic uses discussed above; *many livelihoods are at stake here, and this alone justifies more careful review*. NOAA separately warned that nutrient enrichment from the proposed discharge could reduce water clarity and dissolved oxygen, increase macroalgal growth, and contribute to broader ecological degradation. Taken together, these findings highlight the potential consequences of the proposed discharge extend beyond eelgrass to the shellfish resources and food-web processes supported by receiving waters. See NOAA letter, p. 5.

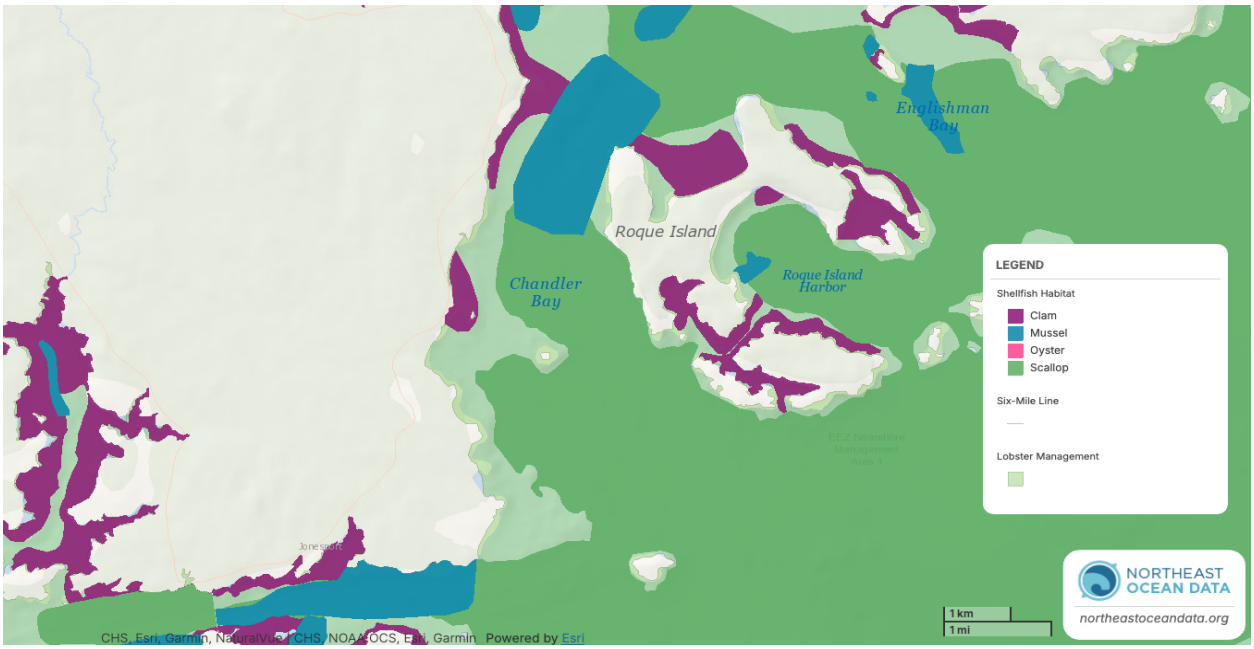

Figure 2. Shellfish habitat and lobster management area in Chandler Bay and surrounding waters. Link to map online: https://www.northeastoceandata.org/aWw0lzm0.

5. **NOAA identified important information gaps and recommended additional assessment and protections before the project proceeded.** In response to the risks identified above, NOAA specifically recommended a Chandler Bay-specific entrainment assessment to determine which fish and shellfish species and life stages could be affected by the proposed intake. NOAA also recommended habitat monitoring and mitigation, measures to address turbidity, sedimentation, scour and erosion, and seasonal restrictions to protect winter flounder

[1] Charles C. Wall, Bradley J. Peterson, and Christopher J. Gobler, "The Growth of Estuarine Resources (*Zostera Marina, Mercenaria Mercenaria, Crassostrea Virginica, Argopecten Irradians, Cyprinodon Variegatus*) in Response to Nutrient Loading and Enhanced Suspension Feeding by Adult Shellfish," *Estuaries and Coasts* 34, no. 6 (2011): 1262–77.

spawning and egg development. None of these protective measures were undertaken to date. Because the facility has still not been constructed or begun operating, NOAA's recommended studies and protections remain directly relevant to the same project now before DEP for renewal. See NOAA letter, pp. 4–7.

Conclusion

NOAA's 2022 review is not simply part of the historical record for an earlier version of the project. It evaluates the same proposed facility, intake, discharge, and receiving waters now before DEP and identifies clear ecological and socioeconomic risks and information gaps that remain relevant because the facility has never been constructed or operated. **For these reasons, NOAA's findings and recommendations from June 2022 should be fully considered as part of DEP's review of the 2026 Permit Renewal Application ME0037559 before the same project is authorized to proceed.**