Exhibit D

Petitioners' Supplemental Comments

In re: Permit No. FL0A00001
Sender: mstevenson@centerforfoodsafety.org

Submitted via email to R4NPDES.Kampachi@epa.gov

February 4, 2020

Kip Taylor
U.S. Environmental Protection Agency, Region 4
NPDES Permitting Section, Water Division
Attn: Kip Taylor
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R4NPDES.Kampachi@epa.gov

Re: Comments on NPDES Permit Application: Kampachi Farms, LLC (Permit No. FL 0A00001)

Dear Mr. Taylor:

The Center for Biological Diversity, Friends of the Earth, Ocean Preservation Society, Ocean Conservation Research, Food & Water Watch, Suncoast Waterkeeper, National Family Farm Coalition, Farmworker Association of Florida, Sierra Club, Environmental Confederation of Southwest Florida, Northwest Atlantic Marine Alliance, Healthy Gulf, Center for Food Safety, and Community Alliance for Global Justice (Conservation Organizations) provide these comments on the Environmental Protection Agency's (EPA) draft National Pollutant Discharge Elimination System (NPDES) permit under the Clean Water Act (CWA), 33 U.S.C. 1251 *et seq.*, to Kampachi Farms, LLC (Permit No. FL0A00001).

This letter incorporates and supplements the comment letter Conservation Organizations submitted to the EPA on Sept. 29, 2019.[1] Conservation Organizations remain concerned that this project would set a dangerous precedent for what is considered an appropriate project in our nation's waters. The EPA must address impacts to human health and the environment and endangered and threatened species, concerns regarding red tide, and threats from increasingly intense storms in the region.

I. Fish Farms Cause Documented Damage to Human Health and the Environment

The aquaculture industry has many well-documented impacts to human health and the environment that the EPA must consider prior to authorizing an experimental finfish pen in the Gulf of Mexico. These impacts include death and injury to industry workers, navigation hazards to other water-users, antibiotic-resistant marine animals – with impacts to humans, as well as increased human exposure to toxins.

Employees of aquaculture facilities have suffered drowning, electrocution, crushing-related injury, hydrogen sulfide poisoning, and fatal head injuries, as well as non-fatal injuries, including slips, trips, and falls, injuries from machines, strains and sprains, and injury from chemicals and

[1] Sept. 29, 2019 Joint Comments.

fires.[2] In December 2019, an employee at a fish farm in Vancouver died, and two other were injured in a serious boating accident.[3]

Aquaculture also poses a risk to the general public who may use the water or other resources in the project area. For example, in January 2019, a man fishing six miles off of Huntington Beach drowned when a 25-foot boat he was on capsized because a broken underwater line from an aquaculture facility wrapped around the boat's propeller.[4] Investigators reported that "the accident was caused by an approximately 400-foot section of broken coil line that had been tied to an adjacent line" which "created an unseen hazard that would have been very difficult to avoid."[5] It is possible fishermen may seek out areas near aquaculture facilities because crabs, lobsters, prawns and shrimp, and other fish tend to aquaculture pens and the accumulated discharge near finfish aquaculture operations.[6]

Aquaculture also poses environmental human health risks. Confining large amounts of finfish in aquaculture facilities is likely to increase bacteria and viruses, both of which are a threat to the public health and the environment.[7] In the United States, approximately 80% of all antibiotics sold are used in animal agriculture, and viruses cause detrimental, highly contagious diseases in finfish that result in significant illness and mortality.[8] There is a high cost associated with vaccinations necessary to treat viruses.[9] The use of antimicrobial agents has resulted in the emergence of antimicrobial-resistant bacteria in fish and other aquatic animals,[10] as well as humans.[11]

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[2] Myers, M.L. 2010. Review of Occupational Hazards Associated With Aquaculture. Journal of Agromedicine Vol. 15, 2010. Iss. 4; Holen, S.M. et al. 2018. Occupational safety in aquaculture – Part 1: Injuries in Norway. Marine Policy. Vol. 96.

[3] Little, S. Worker killed, 2 others hurt at fish farm near Tofino, B.C., WorkSafeBC investigating, Global News, Dec. 23, 2019, https://globalnews.ca/news/6332869/worker-killed-fish-farm-tofino-worksafebc/.

[4] Sclafani, J. Family of man, 71, who drowned when fishing boat capsized off H.B. seeks $10 million in wrongful-death claim, Daily Pilot, Dec. 11, 2019, https://www.latimes.com/socal/daily-pilot/news/story/2019-12-11/underwater-mussel-farm-reason-fishing-boat-capsized.

[5] *Id.*

[6] Bright, D.A. and S. Dionne. 2002. Use of Emamectin Benzoate in the Canadian Finfish Aquaculture Industry: A Review of Environmental Fate and Effects. Prepared for Environment Canada.

[7] Jillian Fry, PhD MPH, David Love, PhD MSPH, & Gabriel Innes, VMD, Johns Hopkins University, Center for a Livable Future, "Ecosystem and Public Health Risks from Nearshore and Offshore Finfish Aquaculture" at 8-9 (2017).

[8] Michael Martin, *Antibiotics Overuse in Animal Agriculture: A Call to Action for Health Care Providers.* American Journal of Public Health. vol. 105,12 (2015): 2409-10. doi:10.2105/AJPH.2015.302870; Fry 2017 at 8.

[9] Fry 2017 at 9.

[10] Heuer, O. et al. 2009. Human Health Consequences of Use of Antimicrobial Agents in Aquaculture. CID 2009:49 Food Safety; Aoki, T. Present and future problems concerning the development of resistance in aquaculture, Chemotherapy in aquaculture – from theory to reality. Paris: Organisation Inter (World Organisation for Animal Health), 1991; Schmidt, A.S. et al. 2000. Occurrence of antimicrobial resistance in fish-pathogenic and environmental bacteria associated with four Danish rainbow trout farms, Appl Environ Microbiol, 2000, Vol. 66; Mirand, C.D. and R. Zemelman. 2002. Antimicrobial mutiresisance in bacteria isolated from freshwater Chilean salmon farms, Sci Total Environ. Vol. 293; Michel, C. et al. 2003. Chloramphenicol and florfenicol susceptibility of fish-pathogenic bacteria isolated in France: comparison of minimum inhibitory concentration, using recommended provisory standards for fish bacteria. J. Appl. Microbiol. Vol. 95; Le, T.S. et al. 2005.Antibiotic resistance in

Stocking thousands of fish in small pens in confined waters also makes fish feedlots ideal breeding grounds for parasites such as sea lice, and drastically increases the number of lice in surrounding waters,[12] which can infect other wild fish, and can demand chemical treatment. Fish farms in flow-through nets and cages allow fish waste and added chemicals used in industrial fish farming operations to freely pass into marine waters. Farmed fish have much higher body burden of antibiotics, pesticides, and persistent organic pollutants, than wild fish.[13] These contaminants may pass along to other marine animals and the humans who consume them.

II. The Kampachi Fish Farm May Impact Endangered and Threatened Species

Aquaculture facilities interact with wildlife because the structures themselves and/or the concentration of fish and their attendant pollutants are an attractant to other animals. They can spread diseases, cause entanglement, and impact native stocks through escaped fish.[14] The use of feed and medicines can also harm habitat for other marine species.[15] The most vulnerable species and habitat in the Gulf could be impacted by the Kampachi fish farm. The EPA must consult with the U.S. Fish and Wildlife Service and National Marine Fisheries Service prior to issuing a permit and produce biological opinions that quantify take and establish mitigation measures.

The Endangered Species Act, by way of its "language, history, and structure . . . indicates beyond doubt that Congress intended endangered species to be afforded the highest of priorities"

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bacteria from shrimp farming in mangrove areas, Sci Total Environ. Vol. 349; Akinbowale, O.L. et al. 2006. Antimicrobial resistance in bacteria isolated from aquaculture sources in Australia, J Appl Microbiol. Vol. 100.

[11] Caballo, F.C. 2006. Heavy use of prophylactic antibiotics in aquaculture: a growing problem for human and animal health and for the environment. Environmental Microbiology. Vol. 8, Iss. 7; Alderman, D.J. and T.S. Hastings. 2003. Antibiotic use in aquaculture: development of antibiotic resistance-potential for consumer health risks. International use in aquaculture: development of antibiotic resistance-potential for consumer health risks. International Journal of Food Science & Technology. Vo. 33, Iss. 2.

[12] Fast, M.D., N.W. Ross, A. Mustafa, D.E. Sims, S.C. Johnson, G.A. Conboy, D.J. Speare, G. Johnson and J.F. Burka. 2002. Susceptibility of Rainbow Trout *Oncorhynchus mykiss*, Atlantic Salmon *Salmo salar*, and Coho Salmon *Oncorhynchus kisutch* to Experimental Infection With Sea Lice *Lepeophtheirus salmonis*. *Diseases of Aquatic Organisms* 52(1): p. 57-68; Johnson, S.C. and L.J. Albright. 1992. Comparative Susceptibility and Histopathology of the Response of Naïve Atlantic, Chinook, and Coho Salmon to Experimental Infection with Lepeophtheirus Salmonis (Copepoda: Caligidae). *Diseases of Aquatic Organisms* 14: p. 179-193; Kabata, Z. 1988. Copepoda and Branchiura. *In* Margolis, L. and Z. Kabata, editors, Guide to the Parasites of Fishes of Canada, Part II – Crustacea. Canadian Special Publications of Fisheries and Aquatic Sciences. p. 3-123; MacKinnon, B.M. 1997. Sea Lice: a Review. *World Aquaculture* 28: p. 5-10; Bakke, T.A. and P.D. Harris. 1998. Diseases and Parasites in Wild Atlantic Salmon (*Salmo salar*) Populations. *Canadian Journal of Fisheries and Aquatic Sciences* 55(Supplementary 1): p. 247-266; Krkosek, M., M.A. Lewis and J.P. Volpe. 2005. Transmission Dynamics of Parasitic Sea Lice from Farm to Wild Salmon. *Proceedings of the Royal Society*, Biological Sciences, Vol. 272, Pp. 689-696; Krkosek, M., A.B. Morton, and J.P. Volpe. 2005. Nonlethal Assessment of Juvenile Pink and Chum Salmon for Parasitic Sea Lice Infections and Fish Health. *Transactions of the American Fisheries Society*: Vol. 134, No. 3, pp. 711 716.

[13] Cole, D. et al. 2009. Aquaculture: Environmental, toxicological, and health issues. International Journal of Hygiene and Environmental Health. Vol. 212. Iss. 4.

[14] Beveridge, M.C.M. 2001. Aquaculture and wildlife interactions. Environmental impact assessment of Mediterranean aquaculture farms; Kemper, C.M. et al. Aquaculture and Marine Mammals: Co-existence or conflict? Ch. 11; Young, M.O. 2015. Marine animal entanglements in mussel aquaculture gear. Master's thesis.

[15] Kraufvelin, P. et al. 2001. Changes in zoobenthic community structure after pollution abatement from fish farms in the Archipelago Sea (N. Baltic Sea). Marine Environmental Research 51(3):229-45.

for protection under the law.[16] The purpose of the Endangered Species Act is in part "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved [and] to provide a program for conservation of such endangered and threatened species."[17] The secretaries of Interior and Commerce administer the Endangered Species Act through FWS and NMFS respectively. FWS has jurisdiction over terrestrial species, non-marine aquatic species, and certain marine species while on land. NMFS has jurisdiction over marine species and most anadromous fish.

To fulfill the substantive purpose of the Endangered Species Act, federal agencies are required to "insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the adverse modification of [the critical] habitat of such species."[18] An action will cause "jeopardy" if it "reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species."[19]

The first step in the Section 7 process is for the agency authorizing the project to determine if the proposed action "may affect" an endangered or threatened species.[20] If the agency determines the action will not affect a listed species, and FWS/NMFS concurs, no further action is required. If, on the other hand, the action agency has determined that the proposed action "may affect" a listed species or critical habitat, it may initiate "informal consultation" with FWS/NMFS.[21] If during this process it is revealed that the action is "likely to adversely affect" a listed species or critical habitat, formal consultation is required.[22]

The formal consultation process requires a written statement, known as a "biological opinion," setting forth the Secretary's opinion detailing how the agency action affects the species or its critical habitat.[23] After FWS/NMFS analyzes the direct, indirect and cumulative effects of the proposed action it makes a finding as to whether the action "is likely to jeopardize the continued existence of the species."[24] If it is determined that the action will jeopardize a species or adversely modify the species' critical habitat, the biological opinion must list any "reasonable and prudent alternatives" to the proposed action that would not result in jeopardy to the species.[25]

If FWS/NMFS concludes that the action or the RPAs will not cause jeopardy, but may result in the take of a listed species, FWS/NMFS must issue an incidental take statement (ITS) that specifies "the impact, i.e., the amount or extent, of . . . incidental taking" that may occur.[26]

To "take" an endangered or threatened species means "to harass, harm, pursue, hunt, shoot,

[16] *Tennessee Valley Authority v. Hill*, 437 U.S. 153, 174 (1978).
[17] 16 U.S.C. § 1531(b).
[18] *Id.* § 1536(a)(2).
[19] 50 C.F.R. § 402.02.
[20] *Id*. § 402.02.
[21] *Id.* § 402.13.
[22] *Id*. § 402.12(j).
[23] 16 U.S.C. § 1536(b)(3)(A); 50 C.F.R. § 402.02.
[24] 16 U.S.C. § 1536(b).
[25] *Id*. § 1536(b)(3)(A).
[26] 50 C.F.R. § 402.14(h)(3).

wound, kill, trap, capture, or collect" it, or "to attempt to engage in any such conduct."[27] "Harm" includes significant habitat modification or degradation that results in death or injury to listed species "by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering."[28] "Harass" is defined as intentional or negligent actions that create a likelihood of injury to listed species "to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering."[29] Congress intended the term "take" to be defined in the "broadest possible manner to include every conceivable way" a person could harm or kill fish or wildlife.[30]

An ITS must include "reasonable and prudent measures . . . necessary . . . to minimize such impact,[31] and must specify the permissible level of taking, "thus . . . serv[ing] as a check on the agency's original decision that the incidental take of listed species resulting from the proposed action will not [jeopardize the continued existence of the species]."[32] In addition, when the listed species to be taken are marine mammals, the take must first be authorized pursuant to the Marine Mammal Protection Act (MMPA) and the ITS must include any additional measures necessary to comply with the MMPA take authorization.[33]

Compliance with the biological opinion and its incidental take statement protects federal agencies, and others acting under the biological opinion, from enforcement action under Section 9's prohibition against take;[34] however, take not in compliance with a biological opinion or absent a valid take statement or take permit is in violation of Section 9 of the Endangered Species Act.

Even after the procedural requirements of a consultation are complete, the ultimate duty to ensure that an activity is not likely to cause jeopardy to a listed species lies with the action agency. An action agency's reliance on an inadequate, incomplete, or flawed biological opinion cannot satisfy its duty to avoid the likelihood of jeopardy to listed species.[35]

Federal agencies have additional responsibilities under Section 7(a)(1) of the Endangered Species Act, including a requirement that they "utilize their authorities in furtherance of the purposes of [the Act]" and to "carry[ ] out programs for the conservation of" listed species.[36] The Endangered Species Act defines "conservation" to mean the use of "all methods and procedures" that are necessary to recover a listed species to the point where protections under the act are no longer necessary.[37] Thus, section 7(a)(1) requires each federal agency to ensure that its actions

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[27] 16 U.S.C. § 1532(19).
[28] 50 C.F.R. § 17.3.
[29] *Id.*
[30] *See* S. Rep. No. 93-307, at 7 (1973), *as reprinted in* 1973 U.S.C.C.A.N. 2989, 2995.
[31] 16 U.S.C. § 1536(b)(4).
[32] *Id.*; *Center for Biological Diversity v. Salazar*, 695 F.3d 893, 911 (9th Cir. 2012).
[33] 50 C.F.R. § 402.14(h)(3).
[34] 16 U.S.C. §§ 1536(o)(2); 1538(a); 50 C.F.R. § 17.31(a).
[35] *See, e.g.*, *Florida Key Deer v. Paulison*, 522 F.3d 1133, 1145 (11th Cir. 2008) (action agency must independently ensure that its actions are not likely to cause jeopardy); *Pyramid Lake Tribe of Indians v. U.S. Dep't of Navy*, 898 F.2d 1410, 1415 (9th Cir. 1990) (same).
[36] 16 U.S.C. § 1536(a)(1).
[37] *Id.* at 1532(3).

are consistent with the recovery of listed species.[38]

A. Marine Mammals

Primary threats to six species of whales found in the Gulf of Mexico, and the manatee, from aquaculture facilities include vessel strikes, entanglement, and increased ocean noise. Inadvertent vessel strikes can injure or kill marine mammals. They can become entangled in fishing gear. Once entangled, they may drag and swim with attached gear for long distances, ultimately resulting in fatigue, compromised feeding ability, or severe injury, which may lead to reduced reproductive success and death.[39] Underwater noise threatens whale populations, interrupting their normal behavior and driving them away from areas important to their survival. Increasing evidence suggests that exposure to intense underwater sound in some settings may cause some whales to strand and ultimately die.[40] It is unclear how Kampachi fish farm may impact ESA-listed marine mammals. FWS and NMFS biologists with expertise in marine mammals and knowledge of this region must review the project and determine the potential direct and indirect impacts of the project, including through entanglement, exposure to toxins, increased vessel traffic near the facility, and impacts to red tide.

Blue Whale

Blue whales are found in the Gulf of Mexico. The migrate seasonally but there is some evidence that suggests individuals can remain in certain locations year-round. The primary threats to blue whales are entanglement, vessel strikes, and ocean noise. Inadvertent vessel strikes can injure or kill blue whales. Vessel strikes have killed blue whales throughout their range, but the risk is much higher in some coastal areas with heavy ship traffic.[41] Blue whales can become entangled in many different gear types, including traps, pots, or gillnets. Once entangled, whales may drag and swim with attached gear for long distances, ultimately resulting in fatigue, compromised feeding ability, or severe injury, which may lead to reduced reproductive success and death.[42] Blue whales were one of the five most frequently entangled large whale species reported in 2017 by NOAA.[43] NMFS must evaluate the hazard the proposed project may pose regarding entanglement and other impacts to blue whales.

Gulf of Mexico Bryde's Whale

The Gulf of Mexico Bryde's whale, a subspecies of Bryde's whale, spend its entire life in the Gulf of Mexico.[44] NOAA Fisheries marine mammal surveys have estimated the abundance of Gulf of Mexico Bryde's whales to be 33 individuals.[45] This estimate of remaining individuals

[38] *See* 50 C.F.R. § 402.15(a) (explaining that it is each agency's continuing obligation to "determine whether and in what manner to proceed with the action in light of its section 7 obligations" to protect and recover listed species).
[39] https://www.fisheries.noaa.gov/species/blue-whale.
[40] https://www.fisheries.noaa.gov/species/sei-whale.
[41] https://www.fisheries.noaa.gov/species/blue-whale.
[42] *Id.*
[43] NOAA Fisheries Whale Entanglement Report.
[44] https://www.fisheries.noaa.gov/species/gulf-mexico-brydes-whale.
[45] *Id.*

makes the Gulf of Mexico Bryde's whales one of the most endangered whales in the world.[46] Recovery of the species is dependent upon the protection of each remaining whale.[47] The addition of this proposed aquaculture facility in the Gulf of Mexico is a major threat to the survival of this small population.[48]

Gulf of Mexico Bryde's whales are exposed to a variety of stressors and threats, including entanglement, vessel strikes, ocean noise, and oil and gas production.[49] Accidental vessel strikes can injure or kill Gulf of Mexico Bryde's whales. In 2009, a female Gulf of Mexico Bryde's whale was found dead in Tampa Bay.[50] A necropsy was performed, and its death was determined to be the result of being struck by a vessel.[51]

A variety of manmade sources in the Gulf of Mexico produce a significant amount of underwater noise and the addition of this proposed project will increase the amount of ocean noise in the area and result in adverse physical and behavioral effects to the Gulf of Mexico Bryde's whales.[52] It is likely that the Gulf of Mexico Bryde's whales rely on their hearing to perform critical life functions such as communication, navigation, mate finding, food location, and predator avoidance.[53] NMFS must evaluate the hazard the proposed project may pose to the Gulf of Mexico Bryde's whales.

Fin Whale

Fin whales are found in the Gulf of Mexico. The main threats to fin whales are vessel strikes, entanglement, and ocean noise. Inadvertent vessel strikes can injure or kill fin whales. This proposed project will increase the number of vessels in the area and result in increased ocean noise. Underwater noise threatens fin whale populations, interrupting their normal behavior and driving them away from areas important to their survival and evidence suggests intense underwater sound may cause some whales to strand and ultimately die.[54]

The main threat from this proposed project is that fin whales can become entangled in the aquaculture equipment. Once entangled, whales may drag and swim with attached gear for long distances, ultimately resulting in fatigue, compromised feeding ability, or severe injury, which may lead to reduced reproductive success and death.[55] NMFS must evaluate the hazard the proposed project may pose to fin whales.

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[46] *Id.*
[47] *Id.*
[48] *Id.*
[49] *Id.*
[50] *Id.*
[51] *Id.*
[52] *Id.*
[53] *Id.*
[54] https://www.fisheries.noaa.gov/species/fin-whale.
[55] *Id* .

Humpback Whale

Humpback whales are found in the Gulf of Mexico. They travel incredible distances every year and have one of the longest migrations of any mammal on the planet.[56] Humpback whales are generally found close to shore and are commonly active at the surface, for example breaching (jumping out of the water) or slapping the surface with their pectoral fins and tails, thus making them more susceptible to getting caught in shallow fisheries like this proposed fishery.[57]

Entanglement in fishing gear is a primary threat to humpback whales. Humpback whales can become entangled by many different gear types including moorings, traps, pots, or gillnets.[58] Once entangled, if they can move with the gear, the whale may drag and swim with attached gear for long distances.[59] This ultimately results in fatigue, compromised feeding ability, or severe injury, which may lead to reduced reproductive success and death.[60] Humpback whales are the most frequently reported entangled large whale species and represent 68.1 percent of all confirmed entanglements since 2007.[61] Evidence of rope scarring suggests that most humpback whales experience entanglement over the course of their lives.[62] NMFS must evaluate the hazard the proposed project may pose to Humpback whales.

Sei Whale

Sei whales occur in subtropical, temperate, and subpolar waters around the world, including in the Gulf of Mexico. One of the main threats to sei whales is getting caught in fishing gear. They can become entangled gear including traps, pots, and gillnets.[63] Once entangled, whales may swim for long distances with gear attached, resulting in fatigue, compromised feeding ability, severe injury, or death.[64] NMFS must evaluate the hazard the proposed project may pose to the sei whale.

Sperm Whale

Sperm whales can be found in the Gulf of Mexico. Their distribution is dependent on their food source and suitable conditions for breeding.[65] Sperm whale migrations are not well understood and do not seem to follow a pattern. [66] However, sperm whales located in tropical and temperate areas, like the Gulf of Mexico, do not appear to migrate.[67]

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[56] https://www.fisheries.noaa.gov/species/humpback-whale.
[57] *Id.*
[58] *Id.*
[59] *Id.*
[60] *Id.*
[61] NOAA Fisheries Whale Entanglement Report.
[62] https://www.fisheries.noaa.gov/species/humpback-whale.
[63] https://www.fisheries.noaa.gov/species/sei-whale.
[64] *Id.*
[65] https://www.fisheries.noaa.gov/species/sperm-whale.
[66] *Id.*
[67] *Id.*

A major threat to sperm whales is entanglement in fishing gear. Sperm whales can become entangled in many different types of fishing gear, including trap lines, pots, and gillnets.[68] Once entangled, they may swim for long distances dragging attached gear, potentially resulting in fatigue, compromised feeding ability, severe injury.[69] These conditions can lead to reduced reproductive success and death.[70] Sperm whales have also been documented to remove fish from longline gear, a behavior known as "depredation."[71] They do this by using their long jaw to create tension on the line, which snaps fish off the hooks and sometimes results in injury or entanglement.[72] NMFS must evaluate the hazard the proposed project may pose to sperm whales.

Manatee

FWS has designated the Florida manatee a threatened species under the ESA. Red tide can cause direct mortality of manatees, but can also cause sublethal impacts.[73] The brevetoxin binds to manatees' brains, leading to edema and hemorrhaging,[74] and ultimately leads to their death.[75] Red tide produces a toxin that is neurotoxic to manatees, causing seizure-like symptoms. The toxin is released when the fragile dinoflagellate ruptures. Manatees may inhale red tide in an aerosol form when they surface to breathe, or ingest the toxin via seagrass or tunicates that have absorbed the toxin. During seizures, manatees often become disoriented, cannot surface to breathe, and consequently drown. The long-term consequences to manatee survival of exposure to, and subsequent recovery from, red tide, are unknown. Therefore, FWS must analyze both the potential for direct impacts and indirect impacts including impacts to habitat,[76] and regarding red tide.

B. Fish

Fish farms can also harm native fish. Aquaculture can concentrate fish waste, and require the use of antibiotics and other chemicals, impacting fish outside the pen at various life stages.[77] NMFS must carefully study how this fish farm may impact listed fish species.

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[68] *Id.*
[69] *Id.*
[70] *Id.*
[71] *Id.*
[72] *Id.*
[73] Walsh, C. 2015. Sublethal red tide exposure in free-ranging manatees (Trichechus manatus) affects the immune system through reduced lymphocyte proliferation responses, inflammation, and oxidative stress. Aquatic Toxicology 161 (2015) 73-84.
[74] Bossart, G. et al. 1998. Brevetoxicosis in Manatees (*Trichechus manatus latirostris*) from the 1996 Epizootic: Gross, Histologic, and Immunohistochemical Features. Toxicologic Pathology.
[75] Landsberg, J.E. et at. 2009. *Karenia brevis* red tides, brevetoxins in the food web, and impacts on natural resources: Decadal advancements. Harmful Algae. Vol. 8, Iss. 4; Trainer, V. and D. Baden. 1999. High affinity binding of red tide neurotoxins to marine mammal brain. Aquatic Toxicology Vol. 46, Iss. 2. July 1999.
[76] Water, H. 2017. Bringing Back Tampa Bay's Seagrass. Smithsonian Ocean. https://ocean.si.edu/ocean-life/plants-algae/bringing-back-tampa-bays-seagrass.
[77] Olafsen, J.A. 2001. Interactions between fish larvae and bacteria in marine aquaculture. Aquaculture. Vol. 200, Iss. 1-2; Naylor, R.L. et al. 2000. Effect of aquaculture on world fish supplies. Nature. 405.

Giant Manta Ray

In 2018, NMFS listed the giant manta ray (*Manta birostris*) as threatened under the ESA.[78] Classified as a migratory species, the giant manta ray is a seasonal visitor along Florida's coastlines, including the Gulf of Mexico.[79] NMFS listed the most significant threat to the giant manta ray as overutilization for commercial purposes.[80] Due to commercial fishing, giant manta rays are both targeted and caught as bycatch throughout their range.[81] Other threats to the species include foul-hooking, vessel strikes, entanglement, climate change, and pollution, which may be exacerbated by this proposed action.[82] NMFS must analyze the unique threats the fish farm poses.

Nassau Grouper

The Nassau grouper (*Epinephelus striatus*) has been listed as threatened under the ESA since 2016.[83] Its distribution currently includes Florida and has been documented in the Gulf of Mexico.[84] Currently, all harvest of Nassau grouper is prohibited in the United States.[85] The ESA Recovery Outline indicates fishing as the major threat to Nassau grouper.[86] Specifically, Nassau grouper are particularly vulnerable to over-exploitation because they are long lived and take many years to reach sexual maturity, making them prone to the threats of fishing before reproducing.[87] NMFS must analyze how the fish farm may impact this species.

Oceanic Whitetip Shark

In 2018, NMFS designated the oceanic whitetip shark (*Carcharhinus longimanus*) as threatened under the ESA.[88] The oceanic whitetip shark is highly migratory and considered a top predator.[89] Overutilization from commercial fisheries is a major threat to the oceanic whitetip shark, which includes demand from the international shark fin trade, bycatch-related mortality, and illegal,

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[78] Endangered and Threatened Wildlife and Plants; Final Rule To List the Giant Manta Ray as Threatened Under the Endangered Species Act, 83 Fed. Reg. 2916 (Jan. 22, 2018).

[79] NOAA Giant Manta Ray ESA Recovery Outline (Dec. 4, 2019), https://www.fisheries.noaa.gov/resource/document/giant-manta-ray-recovery-outline.

[80] Miller, M.H. and C. Klimovich. 2017. Endangered Species Act Status Review Report: Giant Manta Ray (Manta birostris) and Reef Manta Ray (Manta alfredi). Report to National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD. September 2017. 128 pp.

[81] *Id.* at 3.

[82] NOAA Giant Manta Ray ESA Recovery Outline (Dec. 4, 2019), https://www.fisheries.noaa.gov/resource/document/giant-manta-ray-recovery-outline.

[83] Endangered and Threatened Wildlife and Plants: Final Listing Determination on the Proposal To List the Nassau Grouper as Threatened Under the Endangered Species Act, 81 Fed. Reg. 42,268 (Jun. 29, 2016).

[84] *Id.* at 42271.

[85] NOAA Nassau Grouper Species Directory, https://www.fisheries.noaa.gov/species/nassau-grouper#overview.

[86] NOAA Nassau Grouper ESA Recovery Outline.

[87] *Id.* at 4.

[88] Endangered and Threatened Wildlife and Plants: Listing the Oceanic Whitetip Shark as Threatened Under the Endangered Species Act, 83 Fed. Reg. 4153 (Jan. 30, 2018).

[89] Young, C.N., Carlson, J., Hutt, C., Kobayashi, D., McCandless, C.T., Wraith, J. 2016. Status review report: oceanic whitetip shark (Carcharhinius longimanus). Final Report to the National Marine Fisheries Service, Office of Protected Resources. November 2016. 169 pp.

unreported, and unregulated fishing.[90] Because of their preferred distribution in warm, tropical waters, and their tendency to remain at the surface, oceanic whitetip sharks have high encounter and mortality rates in fisheries throughout their range.[91] NMFS must analyze the impacts of the project on this species.

Smalltooth Sawfish

The smalltooth sawfish (*Pristis pectinata*) has been listed as endangered under the ESA since 2003.[92] In September 2009, NOAA designated 840,472 acres of critical habitat for the smalltooth sawfish, including two areas along the southwestern coast of Florida.[93] Sawfishes are among the world's largest marine fishes.[94] Currently, sawfish can only be found with any regularity in South Florida between the Caloosahatchee River and the Keys. It has increasingly been observed in the St. Lucie area.95 It is believed that the population is at a level less than 5% of its size at the time of European settlement.[96] The 2009 Recovery Plan for Smalltooth Sawfish indicated that "the primary reason for the decline in smalltooth sawfish abundance has been bycatch in various commercial fisheries, including gillnets, otter trawls, trammel nets, and seines."[97] Sawfish are extremely vulnerable to overfishing due to the potential entanglement of their rostrum by a wide range of fishing gear, similarly to that used in this proposed project. [98] NMFS must analyze how the fish farm may impact this species.

C. Sea turtle

FWS and NMFS have designated the leatherback, Kemp's ridley, and hawksbill sea turtles as endangered under the ESA, and the Northwest Atlantic Ocean Distinct Population Segments of loggerhead and green sea turtles as threatened under the Endangered Species Act. The southeastern United States has the world's largest number of loggerhead nests, with 90% of nesting in Florida.[99]

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[90] *Id.* at 49.

[91] NOAA Oceanic Whitetip Shark Species Directory, https://www.fisheries.noaa.gov/species/oceanic-whitetip-shark#conservation-management.

[92] Endangered and Threatened Species; Final Endangered Status for a Distinct Population Segment of Smalltooth Sawfish (Pristis pectinata) in the United States, 68 Fed. Reg. 15674 (Apr. 1, 2003).

[93] Endangered and Threatened Species; Critical Habitat for the Endangered Distinct Population Segment of Smalltooth Sawfish, 74 Fed. Reg 45353 (Sept. 2, 2009).

[94] Smalltooth Sawfish (Pristis pectinata) 5-Year Review: Summary and Evaluation of United States Distinct Population Segment of Smalltooth Sawfish (2018), https://repository.library.noaa.gov/view/noaa/19253.

[95] Killer, E. Shark survey scientist finds two sawfish in eight days. TC Palm. Apr. 18, 2019.

[96] Smalltooth Sawfish Recovery Plan, National Marine Fisheries Service (Jan. 2009) at v.

[97] National Marine Fisheries Service. 2009. Recovery Plan for Smalltooth Sawfish (Pristis pectinata). Prepared by the Smalltooth Sawfish Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland.

[98] Smalltooth Sawfish (Pristis pectinata) 5-Year Review: Summary and Evaluation of United States Distinct Population Segment of Smalltooth Sawfish (2018), https://repository.library.noaa.gov/view/noaa/19253.

[99] Casale, P. and A.D. Tucker. 2017. Caretta caretta, Loggerhead Turtle. The IUCN Red List of Threatened Species; Ceriani, S.A. and A.B. Melyan. 2017. Caretta caretta (North West Atlantic subpopulation) loggerhead turtle. The IUCN Red List of Threatened Species; FWC. 2018. Loggerhead Nesting in Florida. (FWC 2018b).

Florida is the only state in the continental U.S. where leatherback regularly nest.[100] On July 10, 2104, FWS and NMFS designated critical habitat for the Northwest Atlantic Ocean Distinct Population Segment of the loggerhead sea turtle (*Caretta caretta*).[101] The second largest aggregation of green sea turtle nesting is in Florida.[102]

Red tide with concentrations of *karenia brevis* (at least 100,000 cells/l) is the concentration at which the Florida Fish and Wildlife Conservation Commission (FWC) believes sea turtle mortality due to brevetoxicosis typically begins to occur. It is believed that red tide exposure may pose significant implications for immune function in sea turtles and death.[103] For example, from Nov. 2017-Dec. 10, 2018 FWC documented 1,260 stranded sea turtles with 577 (250 loggerheads, 263 Kemp's ridleys, and 64 green sea turtles) to red tide, making it the largest number of stranded sea turtles attributed to red tide.[104] It is unclear how these imperiled species of sea turtles will be impacted by the fish farm, but both NMFS and FWS must analyze the fish farm's direct and indirect impacts.

D. Birds

It is unclear how the Kampachi fish farm may impact the ESA-listed piping plover and rufa red knot. Large concentrations of fish can be an attractant to birds.[105] And while the plover and red knot are not open-water, fish-eating birds, qualified biologists with the FWS familiar with this region of the Gulf and these birds should review the project to assess its potential impacts.

Piping Plover

The piping plover (*Charadrius melodus*) named for its melodic mating call, is a small, pale-colored North American shorebird.[106] FWS compares the appearance of plover chicks to "tiny wind-up toys or cotton balls with legs."[107] FWS designated the piping plover as threatened under the ESA throughout its entire range, except those areas where listed as endangered.[108] On July 10, 2001, FWS designated critical habitat for wintering plovers, which includes the Gulf Coast of southern Florida.[109] According to the 2009 5-Year Status Review, plovers in eastern Canada and

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[100] FWC. 2018. Leatherback Nesting In Florida. (FWC 2018d).
[101] 79 Fed. Reg. 39756, *Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Northwest Atlantic Ocean Distinct Population Segment of the Loggerhead Sea Turtle*, (July 10, 2014); 79 Fed. Reg. 39356, *Endangered and Threatened Species: Critical Habitat for the Northwest Atlantic Ocean Loggerhead Sea Turtle Distinct Population Segment (DPS) and Determination Regarding Critical Habitat for the North Pacific Ocean Loggerhead DPS*, (July 10, 2014).
[102] FWC. 2018. Green Turtle Nesting in Florida. (FWC 2018c).
[103] Walsh, C. 2009. Effects of brevetoxin exposure on the immune system of loggerhead sea turtles. Aquatic Toxicology 97 (2010) 293-303.
[104] Foley, A. Email. Sea Turtle Stranding and Red Tide. Dec. 10, 2018.
[105] Gorenzel, W.P. et al. 1994. Bird Damage at Aquaculture Facilities; Price, I.M. and J.G. Nickum. 1995. Aquaculture and Birds: The Context for Controversy. Colonial Waterbirds 18.
[106] Endangered and Threatened Wildlife and Plants; Final Determination of Critical Habitat for Wintering Piping Plovers, 66 Fed. Reg. 36038 (July 10, 2001).
[107] USFWS Piping Plover Factsheet. https://www.fws.gov/northeast/pipingplover/pdf/plover.pdf.
[108] Determination of Endangered and Threatened Status for Piping Plover, 50 Fed. Reg. 50726 (Dec. 11, 1985).
[109] Endangered and Threatened Wildlife and Plants; Final Determination of Critical Habitat for Wintering Piping Plovers, 66 Fed. Reg. 36038 (July 10, 2001).

94% of Great Lakes birds wintered from North Carolina to southwest Florida.[110] Development and human disturbance are the biggest challenges the plovers face, which often curtails their breeding success.[111]

Rufa Red Knot

FWS has designated the rufa red knot (*Calidris canutus rufa*) as threatened under the ESA.[112] They are one of the longest-distance migrants in the animal kingdom, as some red knots fly more than 9,300 miles from south to north every spring and repeat the trip in reverse every autumn.[113] Substantial threats, including human disturbance, exist throughout the red knot's breeding, migration, and wintering range and these threats are likely to continue or intensify into the future.[114] Because of their behavior and range, the red knot may face exposure to the activities covered under the proposed action.

E. Coral

EPA and NMFS must survey for the presence of listed coral species, including but not limited to Elkhorn (Acropora palmata), Staghorn (Acropora cervicornis), Pillar (Dendrogyra cylindrus), Rough cactus coral (Mycetophyllia ferox), Lobed star (Orbicella annularis), Mountainous star (Orbicella faveolata), and Boulder star (Montastrea annularis).

III. EPA Must Explore the Potential Influence of Fish Farm Discharges on Red Tide

Red tide has been called "one of the most common chemical stressors impacting South Florida coastal and marine ecosystems,"[115] and studies suggests that nutrients including phosphorous and nitrogen -- and those that will likely be discharged from the fish farm[116] -- can energize or reawaken red tide.[117] Red tide is caused by the dinoflagellate *Karenia brevis* which produces

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[110] USFWS 5-Year Status Review at 28. https://www.fws.gov/northeast/endangered/PDF/Piping_Plover_five_year_review_and_summary.pdf.
[111] USFWS Piping Plover Factsheet. https://www.fws.gov/northeast/pipingplover/pdf/plover.pdf.
[112] Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Rufa Red Knot, 79 Fed. Reg. 73706 (Dec. 11, 2014).
[113] USFWS Rufa Red Knot Factsheet. https://fws.gov/northeast/red-knot/pdf/Redknot_BWfactsheet092013.pdf.
[114] Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Rufa Red Knot, 79 Fed. Reg. 73706 at 73707 (Dec. 11, 2014).
[115] Pierce, R.H. 2008. Harmful algal toxins of the Florida red tide (Karenia brevis): natural chemical stressors in South Florida coastal ecosystems. Ecotoxicology. 2008 Oct. 17(7): 623-631. Doi:10.1007/s10646-008-0241-x.
[116] Olsen, L. et al. 2008. Perspectives of nutrient emission from fish aquaculture in coastal waters. The Fishery and Aquaculture Industry Research Fund.
[117] Olascoaga, M.J. 2010. Isolation on the West Florida Shelf with implications for red tides and pollutant dispersal in the Gulf of Mexico. Nonlinear Process Geophys. 2010 Jan. 1; 17(6): 685-696. Doi:10.5194/npg-17-685-2010; Olascoaga, M.J. et al. 2008. Tracing the Early Development of Harmful Algal Blooms on the West Florida Shelf with the Aid of Lagrangian Coherent Structure. J. Geophys. Res. 2008; 113(c12): c12014-doi: 10.1029/2007JC004533; Poulson-Ellestad, K. et al. 2014. Metabolics and proteomics reveal impacts of chemically mediated competition on marine plankton. PNAS. June 17, 2014. Vol. 11. No. 24. 9009-9014; Morey, J. et al. 2011. Transcriptomic response of the red tide dinoflagellate, Karenia brevis, to nitrogen and phosphorus depletion and addition. Genomics 2011, 12.346; Garrett, M. 2011. Harmful algal bloom species and phosphate-processing effluent: Field and laboratory studies. Marine Pollution Bulletin 62 (2011) 596-601; Heil, C.A. et al. 2014. Blooms

brevetoxins which kill fish,[118] make filter-feeding fish extremely toxic to other animals, and cause respiratory and intestinal distress in humans.[119] Red tide has also been linked to land mammal and bird mortality,[120] and can bioaccumulate.[121] Exposed fish and seagrasses can accumulate high concentrations of brevetoxins and act as toxin vectors to dolphins and manatees.[122] People generally do not become aware of its presence until it reaches above 100,000 cells/l, which is when it leads to fish kills,[123] shellfish toxicity, and respiratory distress.[124]

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of Karenia brevis (Davis) G. Hansen & O. Moestrup on the West Florida Shelf: Nutrient sources and potential management strategies based on a multi-year regional study. Harmful Algae 38 (2014) 127-43; Killberg-Thoreson, L. et al. 2014. Nutrients released from decaying fish support microbial growth in the eastern Gulf of Mexico. Harmful Algae 38 (2014) 40-49; Mulholland, M.R. et al. 2014. Contribution of diazotrpohy to nitrogen inputs supporting Karenia brevis blooms in the Gulf of Mexico. Harmful Algae 38 (2014) 20-29; Redalje, D.G. et al. 2008. The growth dynamics of Karenia brevis within discrete blooms on the West Florida Shelf. Continental Shelf Research 28 (2008) 24-44; Munoz, C. 2018. Scientists: Lake Okeechobee runoff may enhance red tide. Daily Commercial. Oct. 11, 2018; Burkholder, J.M. and P.M. Gilbert. 2011. Grazing by Karenia brevis on Synechococcus enhances its growth rate and may help to sustain blooms. Aquatic Microbial Ecology 55:17-30. https://apprecautionaryprinciple.wordpress.com/2011/06/16/red-tide-blooms-influenced-by-rea-nitrogren-run-off-into-gulf-of-mexico-waters/.

[118] Rolton, A. et al. 2014. Effects of the red tide dinoflagellate, Karenia brevis, on early development of the eastern oyster Crassostrea virginica and northern quahog Mercenaria mercenaria. Aquatic Toxicology 155 (2014) 199-206; Rolton, A. et al. 2015. Susceptibility of gametes and embryos of the eastern oyster, Crassostrea virginica, to Karenia brevis and its toxins. Toxicon 99 (2015) 6-15; Rolton, A. et al. 2016. Effects of field and laboratory exposure to the toxic dinoflagellate Karenia brevis on the reproduction of the eastern oyster, Crassostrea virginia, and subsequent development of offspring. Harmful Algae 57 (20016) 13-26; Walsh, J.J. et al. 2009. Isotopic evidence for dead fish maintenance of Florida red tides, with implications for coastal fisheries over both source regions of the west Florida shelf and within downstream waters of the South Atlantic Bight. Progress in Oceanography 80 (2009) 51-73.

[119] Backer, L. et al. 2005. Occupational Exposure to Aerosolized Brevetoxins during Florida Red Tide Events: Effects on a Healthy Worker Population. Environmental Health Perspectives. Vol. 113. Iss. 5. May 2005; Bienfang, P.K. et al. 2011. Prominent Human Health Impacts from Several Marine Microbes: History, Ecology, and Public Health Implications. International Journal of Microbiology Vol. 2011. Art. ID 152815; CDC. 2008. Illness Associated with Red Tide – Nassau County, Florida, 2007; Fleming, L. 2005. Initial Evaluation of the Effects of Aerosolized Florida Red Tide Toxins (Brevetoxins) in Persons with Asthma. Environmental Health Perspectives. Vol. 113. Iss. 5. May 2005; Naar, J. 2002. Brevetoxin Depuration in Shellfish via Production of Non-toxic Metabolites: Consequences for Seafood Safety and the Environmental Fate of Biotoxins. Harmful Algae 2002 (2002). 2004; 10: 488-490; Steensma, D. 2007. Exacerbation of Asthma by Florida "Red Tide" During an Ocean Sailing Trip. Mayo Clin Proc. Sept. 2007; 82(9): 1128-1130.

[120] Castle, K. et al. 2013. Coyote (Canis latrans) and domestic dog (Canis familiaris) mortality and morbidity due to a Karenia brevis red tide in the Gulf of Mexico. Journal of Wildlife Diseases, 49(4), 2013, pp. 955-64; Kreuder, C. 2012 Clinicopathologic features of suspected brevetoxicosis in double-crested cormorants (phalacrocorax auritus) along the Florida Gulf coast. Journal of Zoo and Wildlife Medicine, 33(1):8-15.

[121] Echevarria, M. 2012. Effects of Karenia brevis on clearance rates and bioaccumulation on brevetoxins in benthic suspension feeding invertebrates. Aquatic Toxicology 106-107 (2012) 85-94.

[122] Flewwelling, L. et al. 2005. Red tides and marine mammal mortalities.: Unexpected brevetoxin vectors may account for deaths long after or remote from an algal bloom. Nature. 2005. June 9; 435(7043).

[123] Gravinese, P. et al. 2018. The effects of red tide (Karenia brevis) on reflex impairment and mortality of sublegal Florida stone crabs, Menippe mercenaria. Marine Environmental Research 137 (2018) 145-148.

[124] Bienfang 2011; Pierce, R. 2011. Compositional changes in neurotoxins and their oxidative derivatives from the dinoflagellate, Karenia brevis, in seawater and marine aerosol. Journal of Plankton Research. Vol. 30. No. 2.

There has been an increase in red tide in southwest Florida since 1954, in abundance and frequency.[125] Other red tide impacts include paralytic shellfish poisoning,[126] neurotoxic shellfish poisoning, ciguatera fish poisoning, fish kills, loss of submerged vegetation, shellfish mortalities, and marine mammal mortalities.[127] Brevetoxins are large, lipid soluble molecules that bioaccumulate in fatty tissue and are not easily shed or excreted.[128] As a result, sublethal concentrations can have lethal consequences.[129] Because *k.brevis* is a particularly delicate dinoflagellate, turbulence can break apart the cells and aerosolize the brevetoxins which are then inhaled and can cause respiratory distress.[130]

Eerera et al. (2011) determined that by rapidly changing salinity to simulate the shift from oceanic to coastal conditions, brevetoxin was triggered, showing that brevetoxin production can increase dramatically in response to osmotic stress regardless of the initial source of the red tide.[131] Sources contributing to red tide include nutrients in runoff, iron-rich atmospheric dust, dead marine life, and nutrient rich groundwater.[132]

At concentrations of >100,000 cells/l, the 12 brevetoxins produced by red tide can and have killed marine animals, including fish, sea turtles, manatee, sea birds, and dolphins.[133] Brevetoxins from red tide have long been known to cause manatee mortality.[134] One study found markedly less shrimp and fish activity during red tide.[135] Meanwhile, almost nothing is known about the longterm chronic exposure.[136]

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[125] Brand, L and A. Compton. 2007. Long-term increase in Karenia brevis abundance along the Southwest Florida Coast. Harmful Algae. 2007. 6(2): 232-252. doi:10.1016/j/hal.2006.08.005.
[126] Watkins, S. 2008. Neurotoxic Shellfish Poisoning. Mar. Drugs 2008, 6, 431-455; DOI: 10.3390/md20080021.
[127] Anderson, D. et al. 2008. Harmful algal blooms and eutrophication: Examining linkages from selected coastal regions of the United States. Harmful Algae. 2008. Dec. 1; 8(1): 39-53. Doi:10.1016/j.hal.2008.08.017.
[128] Bienfang 2011.
[129] *Id*.
[130] *Id*.; Fleming, L. 2007. Aerosolized Red-Tide Toxins (Brevetoxins) and Asthma. Chest. 2007. Jan; 131(1): 187-194. Doi:10.1378/chest.06-1830; Kirkpatrick, B. et al. 2010. Inland Transport of Aerosolized Florida Red Tide Toxins. Harmful Algae. 2010. Feb. 1; 9(2): 186-189. Doi:10.1016/j.hal.2009.09.003; Kirkpatrick, B. et al. 2011. Aerosolized Red Tide Toxins (Brevetoxins) and Asthma: Continued health effects after 1 hour beach exposure. Harmful Algae 2011. Jan. 1: 10(2): 138-143. Doi:10.1016/j.hal.2010.08.005.
[131] Errera R. and L. Campbell. 2011. Osmotic stress triggers toxin production by the dinoflagellate Karenia brevis. PNAS. June 28,2011. Vol. 108. No. 26.
[132] Bienfang 2011; Walsh, J.J. et al. 2006. Red tides in the Gulf of Mexico: Where, when, and why? J. Geophys Res. 2006. Nov. 7; 111(C11003): 1-46. Doi:10.1029/2004JC002813.
[133] Bienfang 2011; Twiner, M. et al. 2012. Comparative Analysis of Three Brevetoxin-Associated Bottlenose Dolphin (*Tursiops truncatus*) Mortality Events in the Florida Panhandle Region (USA). PLoS ONE 7(8):e42974. Doi:10.1371/journal.pone.0042974; Twiner, M. et al. 2011. Concurrent Exposure of Bottlenose Dolphins (*Tursiops truncatus*) to Multiple Algal Toxins in Sarasota Bay, Florida, USA. PLoS ONE 6(3): e17394. Doi:10.1371/journal.pone.0017394.
[134] Kirkpatrick, B. et al. 2002. Florida Red Tides, Manatee Brevetoxicosis, and Lung Models Harmful Algae 2002 (2002). 2004; 10:491-493.
[135] Indeck, K.L. 2015. A severe red tide (Tampa Bay, 2005) cause an anomalous decrease in biological sound. R. Soc. Open sci. 2:150337.
[136] Erdner, D. et al. 2008. Centers for Oceans and Human Health: a unified approach to the challenge of harmful algal blooms. From Centers for Oceans and Human Health Investigators Meeting. Woods hole, MA. USA. 24-27. Apr. 2007.

Red tide has also impacted coastal economies. Red tide increases the use of emergency medical services, local fisheries close, and local shops are affected.[137] One study found that red tide can cause $0.5-4 million in emergency room costs for treating respiratory illness associated with red tide.[138] Another calculated $300,000 impacts in lifeguard absenteeism in Sarasota County alone.[139] Anderson (2000) calculated red tide is responsible for more than $20 million tourism-related loses every year.[140]

Florida recently suffered a sustained red tide bloom that started in October 2017 and by November 2018, red tide and fish kills had reached the Florida panhandle in Okaloosa, Walton, Bay and Franklin counties and wrapped around the southern tip of Florida and up the Atlantic coast.[141] By October 2018, red tide closed beaches in Pinellas, Manatee, Sarasota, Lee, Collier, Escambia, Okaloosa, Brevard and Indian River counties.[142] Concentrations of more than 1 million *K.brevis* cells per liter were observed in Pinellas, Hillsborough, Manatee, and Sarasota counties by November 2018.[143] Governor Scott declared a state of emergency, and by August 2018, thousands of tons marine life killed by the bloom had been removed, costing tax-payers millions of dollars.[144]

Modelers have estimated that "every ton of fish produced results in an additional 69 kg of nitrogen and 10 kg of phosphorus released into the environment."[145] Given that the fish farm will contribute additional nutrients in a region believed to be where red tide originates, EPA must thoroughly analyze whether the fish farm will influence to red tide.

IV. Increasing Intensity of Storms Threaten the Security of the Fish Farm

Climate change is increasing the intensity of storms in the region, and significant concerns remain regarding Kampachi's ability to secure its fish farm under the force of a major, or series or major, storms. Climate change has contributed to an increase in North Atlantic hurricane activity since the 1970s.[146] The frequency of high-severity Atlantic hurricanes is increasing.[147]

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[137] Backer, L. 2009. Impacts of Florida red tides on coastal communities. Harmful Algae 8 (2009) 618-622.
[138] Hoagland, P. et al. 2009. The Costs of Respiratory Illnesses Arising from Florida Gulf Coast Karenia brevis Blooms. Environmental Health Perspective. Vol. 117. Iss. 8; Fleming, L. et al. 2011. Review of Florida Red Tide and Human Health Effects. Harmful Algae. 2011. Jan. 1: 10(2): 224-233. Doi:10.1016/j.hal.2010.08.006; Anderson, D. 2008. Harmful algal blooms and eutrophication: Examining linkages from selected coastal regions of the United States. Harmful Algae. 2008. Dec. 1: 8(1): 39-53. Doi: 10.101016/j.hal.2008.08.017.
[139] Fleming 2011; Nierenberg, K. et al. 2010. Florida Red Tide Perception: Residents versus Tourists. Harmful Algae. 2010 Sept. 1; 9(6): 600-606. Doi:10.1016/j.hal.2010.04.010.
[140] Anderson, D. and P. Hoagland. 2000. Estimated Annual Economic Impacts from Harmful Algal Blooms (HABs) in the United States. WHOI-2000-11. Sea Grant. Woods Hole.
[141] Keiek, B. Red tide update for Northwest Florida. Mynbc15.com (Nov. 1, 2018); Jones, C. 2018. Could toxic red tide move farther north to St. Johns County? The St. Augustine Record. Oct. 8, 2018.
[142] Murphy. 2018. Red tide is spreading in Florida. Hurricane Michael didn't stop it. CNN. Oct. 18, 2018.
[143] Ballogg, R. 2018. Red tide remains strong on Anna Maria Island. Bradenton Herald. Nov. 1, 2018.
[144] Murphy, P. 2018. Red tide just spread to Florida's Atlantic coast, choking some the most popular beaches. CNN. Oct. 5, 2018.
[145] Fry 2017.
[146] Elsner, James B. et al., The increasing intensity of the strongest tropical cyclones, 455 Nature 92 (2008); Saunders, Mark A. & Adam S. Lea, Large contribution of sea surface warming to recent increase in Atlantic hurricane activity, 451 Nature 557 (2008); U.S. Global Change Research Program, Climate Science Special Report:

Anomalously warm ocean waters due to climate change have contributed to the formation and strength of destructive storms like Hurricane Irma which devastated large parts of Florida with high-intensity winds, extreme rainfall, and high storm surge.[148] As the ocean and atmosphere warm, climate change is increasing the amount and intensity of rainfall of Atlantic hurricanes such as Hurricane Harvey with its record rainfall and massive flooding.[149] A recent study found that climate change is also contributing to rapid Atlantic hurricane intensification, in which hurricanes grow from a weaker storm to a Category 4 or 5 in a short period, causing a disproportionate amount of human and financial losses.[150]

The increasing intensity of Atlantic hurricanes is also resulting in more frequent and severe hurricane-generated surge events and wave heights.[151] Large storm surge events of Hurricane Katrina magnitude have doubled in response to warming during the 20th century,[152] and are projected to increase in frequency twofold to sevenfold for each 1°C in temperature rise.[153] The increasing frequency of extreme precipitation events is also compounding coastal flooding risk when storm surge and heavy rainfall occur together.[154] As climate change continues unabated, Atlantic hurricane rainfall and intensity are projected to continue to increase, making hurricanes more and more destructive.[155]

Kampachi must demonstrate its technology is capable of protecting the environment from its fish farm in the event of a major storm.

Fourth National Climate Assessment, Vol. I (2017), https://science2017.globalchange.gov/ at 257; U.S. Global Change Research Program, Impacts, Risks, and Adaptation in the United States, Fourth National Climate Assessment, Volume II (2018), https://nca2018.globalchange.gov/ at 74.

[147] Elsner, James B. et al., The increasing intensity of the strongest tropical cyclones, 455 Nature 92 (2008); Bender, M.A. et al, Modeled impact of anthropogenic warming on the frequency of intense Atlantic hurricanes, 327 Science 454 (2010); Kishtawal, C.M. et al., Tropical cyclone intensification trends during satellite era (1986–2010), 39 Geophysical Research Letters L10810 (2012).

[148] Global Change Research Program, Impacts, Risks, and Adaptation in the United States, Fourth National Climate Assessment, Volume II (2018), https://nca2018.globalchange.gov/ at 766-767.

[149] Emanuel, Kerry, Assessing the present and future probability of Hurricane Harvey's rainfall 2017, 114 PNAS 12681 (2017); Risser, Mark D. and Michael F. Wehner, Attributable human-induced changes in the likelihood and magnitude of the observed extreme precipitation during Hurricane Harvey, 44 Geophysical Research Letters 12,457 (2017); van Oldenborgh, Geert J. et al., Attribution of extreme rainfall from Hurricane Harvey, 12 Environmental Research Letters 124009 (2017).; Trenberth, Kevin E. et al., Hurricane Harvey links to ocean heat content and climate change adaptation, 6 Earth's Future 730 (2018).

[150] Bhatia, Kieran T. et al., Recent increases in tropical cyclone intensification rates, Nature Communications https://doi.org/10.1038/s41467-019-08471-z (2019).

[151] Komar, Paul D. & Jonathan C. Allan, Increasing hurricane-generated wave heights along the U.S. east coast and their climate controls, 24 Journal of Coastal Research 479 (2008); Grinsted, Aslak et al., Homogeneous record of Atlantic hurricane surge threat since 1923, 109 PNAS 19601 (2012).

[152] Grinsted, Aslak et al., Homogeneous record of Atlantic hurricane surge threat since 1923, 109 PNAS 19601 (2012).

[153] Grinsted, Aslak et al., Projected hurricane surge threat from rising temperatures, 110 PNAS 5369 (2013).

[154] Wahl, T. et al., Increasing risk of compound flooding from storm surge and rainfall for major US cities, 5 Nature Climate Change 1093 (2015).

[155] U.S. Global Change Research Program, Impacts, Risks, and Adaptation in the United States, Fourth National Climate Assessment, Volume II (2018), https://nca2018.globalchange.gov/at 74.

V. Conclusion

The EPA must address remaining concerns regarding impacts to human health and the environment, listed species, influence on red tide, and Kampachi's ability to maintain the security of its fish farm in a severe storm.

Please do not hesitate to contact me with any questions or concerns about this comment letter at jlopez@biologicaldiversity.org or 727-490-9190.

Thank you,

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