

**UNITED STATES DISTRICT COURT
DISTRICT OF COLUMBIA**

CENTER FOR BIOLOGICAL DIVERSITY,
et al.,

Plaintiffs,

v.

WILBUR ROSS, *et al.*,

Federal Defendants, and

MAINE LOBSTERMEN'S
ASSOCIATION, INC., and
MASSACHUSETTS LOBSTERMEN'S
ASSOCIATION,

Defendant-Intervenors.

Civil Action Nos. 18-112 (JEB)
18-283 (JEB)

PLAINTIFFS' OPENING BRIEF ON REMEDY

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INTRODUCTION

On April 9, 2020 this Court granted Plaintiffs’ motion for summary judgment on their first claim, holding that the National Marine Fisheries Service’s (NMFS) 2014 biological opinion on the American lobster fishery (2014 BiOp) violates the Endangered Species Act (ESA). The Court held that NMFS’s “failure to include an [incidental take statement] in its 2014 BiOp after finding that the American lobster fishery had the potential to harm the North Atlantic right whale at more than three times the sustainable rate is about as straightforward a violation of the ESA as they come.” Mem. Op. 19, ECF. No. 91. This serious violation of law has deprived endangered right whales of desperately needed protections to which they are legally entitled. NMFS’s legal errors mean that it may no longer lawfully rely on the invalid 2014 BiOp in authorizing and managing the fishery. To comply with the Court’s decision and fulfill its legal obligations under both the ESA and the Marine Mammal Protection Act (MMPA), NMFS must implement substantial changes to the regulations implementing the Atlantic Large Whale Take Reduction Plan (ALWTRP) to ensure that the fishery does not continue to entangle, injure, and kill right whales at unsustainable levels such that a new biological opinion may lawfully issue.

As NMFS has repeatedly assured the Court, the rulemaking to amend the ALWTRP is well underway. Most recently, NMFS stated that it expects to issue a proposed rule and new draft biological opinion by July 2020, with a final biological opinion, final rule, and implementation of the rule at some unspecified points thereafter. *See* Jt. Status Report 5, ECF No. 95.

The question here is what happens between now and the issuance of a new, lawful biological opinion and how quickly NMFS must come into compliance with the Court’s decision (especially considering NMFS’s history of delaying actions to protect right whales). As set forth below, Plaintiffs seek both the ordinary remedies provided by the Administrative Procedure Act

(APA) as well as an interim injunction to prevent irreparable harm pending NMFS's compliance with the Court's decision.

With respect to APA remedies, Plaintiffs respectfully request the Court vacate and remand the 2014 BiOp and stay vacatur until January 31, 2021. In the alternative, should the Court decline to grant the standard remedy of vacatur, Plaintiffs request that it remand the 2014 BiOp and order that NMFS issue a new biological opinion and associated final rule to amend the ALWTRP by January 31, 2021.

In addition, Plaintiffs respectfully request that the Court enjoin NMFS's authorization of the use of static vertical lines in the lobster fishery in an area south of Martha's Vineyard and Nantucket where right whales are especially at risk. Plaintiffs request that this injunction stay in place until the agency issues a biological opinion that includes an incidental take statement (ITS) for right whales and until any necessary mitigation measures are in effect on the water. Plaintiffs' requested interim injunctive relief is necessary to remedy the agency's serious legal errors and the irreparable harm that could befall right whales prior to these measures' implementation.

BACKGROUND

The North Atlantic right whale faces a very real prospect of extinction. Entanglement in commercial trap/pot fishing gear is one of the primary threats to the survival and recovery of the species. Right whales become entangled by swimming into the rope, or vertical line, that runs from a trap set on the seafloor through the water column to a buoy at or near the surface (a "static" line). *See* Pls.' Summ. J. Mem. 4, ECF No. 66-1; *see, e.g.*, AR_8724.¹ Entanglements cause right whales to drown immediately or to die slowly of injuries, infections, or starvation. *Id.*

¹ As explained further below, "ropeless" gear—which involves traps on the seafloor being called to the surface remotely—eliminates the use of vertical lines except during active retrieval of traps and has significant potential to reduce the risk of right whale entanglements.

Entanglements also cause sublethal impacts, including impeding feeding ability and reducing reproduction. *Id.*

The American lobster fishery frequently seriously injures and kills right whales. *See, e.g., id.* at 5; 85 Fed. Reg. 21,079–21,780, 21,096 (Apr. 16, 2020). As this Court has recognized, “[t]he risk of entanglement mortality to right whales is much higher in trap/pot gear, particularly lobster gear, because lobster fishing accounts for over 97% of the vertical lines on the east coast.” Mem. Op. 9 (citing Decl. of Michael Asaro, *Conserv. Law Found. v. Ross*, No. 18-1087 (D.D.C. June 21, 2019), ECF No. 40-4).

The 2014 BiOp concluded that operation of the fishery would not jeopardize the species’ survival or recovery, even though the death or serious injury of *just one* right whale per year is unsustainable. *See, e.g.,* C1_26796; Mem. Op. 10. Despite finding that the fishery could kill or seriously injure more than three right whales every year, the 2014 BiOp failed to include an ITS to authorize and mitigate this anticipated incidental take from operation of the fishery. *See* Pls.’ Summ. J. Mem. 5; *see also* 16 U.S.C. § 1536(b)(4).

On April 9, 2020, this Court held that the 2014 BiOp violates the ESA. As it “summarized quite neatly, [t]he ESA and its regulations require an ITS when the taking of an endangered species is anticipated. Take was anticipated here, and NMFS did not produce an ITS. The 2014 BiOp therefore violates the ESA.” Mem. Op. 15. The Court rejected NMFS’s argument that, because it cannot authorize take of right whales under the MMPA, it reasonably chose to issue the 2014 BiOp without an ITS rather than shutting down the fishery.² The Court

² NMFS has never authorized the take of right whales by the lobster fishery under the MMPA because it has never made the negligible impact determination that statute requires. *See* 16 U.S.C. § 1371(a)(5)(E)(i) (requiring NMFS to find that the “incidental mortality and serious injury from commercial fisheries will have a negligible impact” on an ESA-listed marine mammal species to authorize take by fisheries).

explained that “the ESA and accompanying regulations plainly require an ITS, and they require that the ITS find that any take resulting from the proposed agency action will neither jeopardize the continued existence of the listed species nor run afoul of § 101(a)(5) of the MMPA.” *Id.* at 17. Because NMFS was unable to make the necessary MMPA negligible impact determination, “[t]his should have ended the agency’s inquiry,” particularly in light of Congress’s intent in enacting the ESA “to halt and reverse the trend toward species extinction, whatever the cost.” *Id.* at 18 (citations omitted).

The Court also noted that, while it did not rule on Plaintiffs’ other arguments as to why the 2014 BiOp is unlawful, “NMFS would do well to adhere to all of the [ESA’s] requirements in any future BiOps” and that “just because the Court had no need to discuss other features of the 2014 BiOp does not mean that they complied with the ESA (or, for that matter, the MMPA) and should be repeated in future BiOps.” Mem. Op. 19.

Although the Court did not reach the merits of Plaintiffs’ substantive ESA claims under sections 7(a)(2) and 9, *see* Pls.’ Summ. J. Mem. 41–53, its decision means that NMFS cannot lawfully rely on the 2014 BiOp in authorizing and managing the American lobster fishery to fulfill its substantive duty to avoid jeopardy to the right whale. *See, e.g., Ctr. for Biological Diversity v. U.S. Bureau of Land Mgmt.*, 698 F.3d 1101, 1127–28 (9th Cir. 2012) (“an agency cannot meet its section 7 obligations by relying on a Biological Opinion that is legally flawed”); *City of Tacoma v. Fed. Energy Reg. Comm’n*, 460 F.3d 53, 75–76 (D.C. Cir. 2000) (similar). Likewise, in the absence of an ITS, every entanglement of a right whale is a violation of section 9 of the ESA. *See* 16 U.S.C. § 1532(19) (defining take); *id.* § 1538(a)(1) (take prohibition); *id.* § 1538(g) (prohibition on causing unlawful take to be committed). As the entity that authorizes

and manages the fishery, NMFS is responsible for such unauthorized take. *See Strahan v. Cox*, 127 F.3d 155, 163–64 (1st Cir. 1997).

ARGUMENT

The legal errors in the 2014 BiOp are significant. NMFS’s legal failures leave critically endangered right whales vulnerable to increased risk of entanglement-related death and injury in lobster gear, fail to ensure that ongoing operation of the lobster fishery will not jeopardize the species’ continued existence, and undermine congressional intent that federal agencies “afford first priority to the declared national policy of saving endangered species.” *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 185 (1978). While the Court has declared the 2014 BiOp unlawful, further remedies are necessary to correct the agency’s substantial errors and prevent the likelihood of irreparable harm. Plaintiffs request two forms of relief, described in detail below.

First, Plaintiffs request that the Court vacate and remand the 2014 BiOp as applied to right whales, thereby granting the presumptive remedy for an agency action held contrary to law under the APA, but additionally stay vacatur until January 31, 2021. In the alternative, if the Court declines to vacate the 2014 BiOp, it should remand the 2014 BiOp and order NMFS to issue a new biological opinion and final rule amending the ALWTRP by January 31, 2021.

Second, in addition to granting these ordinary APA remedies, given the significant threat that ongoing lobster fishing poses to right whales, Plaintiffs request that the Court enjoin NMFS from authorizing the use of static vertical lines in the lobster fishery in an important right whale habitat area in Southern New England until an ITS issues and until all the regulatory measures needed for NMFS to issue a lawful ITS are implemented on the water.

Plaintiffs’ requested relief is meaningful yet narrowly tailored to correct the agency’s substantial violations and provide critical protections to right whales over the coming months. Each form of Plaintiffs’ requested relief is warranted and well within this Court’s broad power to

cure federal agency wrongdoing. *See Hecht v. Bowles*, 321 U.S. 321, 328–30 (1944) (“The essence of equity jurisdiction has been the power of the Chancellor to do equity and mould each decree to the necessities of the particular case. Flexibility rather than rigidity has distinguished it.”). The Court should therefore grant Plaintiffs’ requested remedies.

I. Plaintiffs Are Entitled to Ordinary APA Remedies

A. The Court Should Vacate and Remand the 2014 BiOp as Applied to Right Whales and Stay Vacatur Until January 31, 2021

The Court should vacate the 2014 BiOp as applied to right whales and remand it to NMFS to issue a new biological opinion consistent with the Court’s decision. Vacatur and remand is consistent with established principles of administrative law and appropriate to resolve the legal errors found by this Court. However, given the potential disruptive environmental consequences of vacating the 2014 BiOp, Plaintiffs ask the Court to stay vacatur until January 31, 2021 to give the agency time to address and correct its legal deficiencies by issuing a new biological opinion and whatever additional mitigation measures are required to comply with the ESA as a result, while incentivizing it to act within a certain timeframe. Without such incentive, it is likely the agency will continue its longstanding pattern of delay in implementing actions to protect right whales from entanglement in fishing gear.

1. Vacatur is the Presumptive Remedy

Plaintiffs’ challenge to the 2014 BiOp arises under the APA, which provides the exclusive judicial mechanism for challenging NMFS’s “maladministration” of the ESA. *See* 5 U.S.C. § 704; *Bennett v. Spear*, 520 U.S. 154, 171–74 (1997) (ESA citizen-suit review is not available for biological opinions); *id.* at 177–79 (judicial review of biological opinions is

available under the APA).³ Under the plain language of the APA, a reviewing court “*shall . . .* hold unlawful and *set aside* agency action, findings, and conclusions found to be . . . arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.” 5 U.S.C. § 706(2) (emphases added).

Vacatur is the presumptive remedy for agency actions held contrary to law. *See Citizens to Preserve Overton Park, Inc. v. Volpe*, 401 U.S. 402, 413–14 (1971) (“In all cases agency action *must be set aside* if the action was ‘arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law’ or if the action failed to meet statutory, procedural, or constitutional requirements.” (quoting 5 U.S.C. § 706(2)(A)-(D)); *see also FCC v. Nextwave Personal Commc’s*, 537 U.S. 293, 300 (2003) (“The [APA] requires federal courts to set aside federal agency action that is ‘not in accordance with law’ . . . which means, of course, *any* law, and not merely those laws that the agency itself is charged with administering.” (citations omitted)); *In re Polar Bear Endangered Species Act Listing and 4(d) Rule Litig.*, 818 F. Supp. 2d 214, 238 (D.D.C. 2011) (“Both the Supreme Court and the D.C. Circuit Court have held that vacatur is the presumptive remedy” for a violation of the APA).

Consistent with this directive, courts regularly vacate biological opinions that fail to comply with the ESA, as well as agency actions taken in violation of the ESA’s no-jeopardy obligations. *See, e.g., Ctr. for Biological Diversity*, 698 F.3d at 1128 (vacating and remanding biological opinion on gas pipeline and vacating underlying agency action); *Defenders of Wildlife*

³ This Court has previously recognized the jurisdictional distinction between Plaintiffs’ first and fourth claims, arising under the APA, and their second and third claims, arising under the ESA citizen-suit provision. *Ctr. for Biol. Diversity v. Ross*, 349 F. Supp. 3d 38, 41 (D.D.C. 2018). Plaintiffs respectfully note that, while it did not affect the Court’s decision as to why NMFS’s 2014 BiOp is unlawful, the statements in the Court’s decision as to the adequacy of the ESA citizen-suit provision for remedying Plaintiffs’ first claim are inconsistent with *Bennett v. Spear* because that claim arises under the APA. *See* Mem. Op. 2–3, 7–8.

v. U.S. Dep't of the Interior, 931 F.3d 339, 366 (4th Cir. 2019) (vacating and remanding biological opinion on gas pipeline); *Am. Rivers v. Fed. Energy Reg. Comm'n*, 895 F.3d 32, 55 (D.C. Cir. 2018) (vacating and remanding licensing decision for hydroelectric project because, *inter alia*, decision relied on biological opinion that failed to comply with the ESA).

While the D.C. Circuit has recognized an exception to the default remedy of vacatur in cases arising under the APA, *Allied-Signal, Inc. v. U.S. Nuclear Reg. Comm'n*, 988 F.2d 146, 150–51 (D.C. Cir. 1993), such an exception is to be applied rarely and NMFS—not Plaintiffs—carry the burden to show why vacatur is inappropriate. *See, e.g., W. Watersheds Proj. v. Zinke*, No. 1:18-cv-00187-REB, 2020 WL 959242, at *12 (D. Idaho Feb. 27, 2020) (“The burden is on [the agency] to show that compelling equities demand anything less than vacatur”). Under *Allied-Signal*, a court’s decision whether to vacate “depends on ‘the seriousness of the order’s deficiencies (and thus the extent of doubt whether the agency chose correctly) and the disruptive consequences of an interim change that may itself be changed.’” 988 F.2d at 150–51 (citation omitted). NMFS cannot meet that burden here: its violations are serious and unjustifiable and the short stay of vacatur that Plaintiffs seek will mitigate potential disruptive consequences.

2. The Legal Errors in the 2014 BiOp Are Serious Violations of Law

Applying *Allied-Signal*, the Court must consider “the seriousness of the order’s deficiencies.” *Id.* Here, NMFS’s failure to include an ITS constitutes a fundamental flaw in the agency’s decision, with serious implications for NMFS’s ongoing authorization and management of the lobster fishery and its obligation to protect endangered right whales in accordance with the ESA and MMPA. The agency has no option other than to correct this fundamental flaw in a new biological opinion.

NMFS violated section 7 of the ESA in issuing the 2014 BiOp without an ITS. 16 U.S.C. § 1536(b)(4); Mem. Op. 15. The ESA’s consultation requirement is how agencies carry out the

ESA’s substantive mandate to protect endangered species from jeopardy. *See* 50 C.F.R. §§ 402.12–402.17; *Thomas v. Peterson*, 753 F.2d 754, 764 (9th Cir. 1985) (“[T]he strict substantive provisions of the ESA justify *more* stringent enforcement of its procedural requirements, because the procedural requirements are designed to ensure compliance with the substantive provisions”).

Section 7 is the very “heart” of the ESA for federal agencies, *Cal ex. rel. Lockyer v. USDA*, 575 F.3d 999, 1018 (9th Cir. 2009), and NMFS’s violation cuts to the core of the statute. *See Tenn. Valley Auth.*, 437 U.S. at 184–85. The failure to include an ITS deprives the 2014 BiOp of “twin, vital purposes: Gauging conservation and monitoring take to ensure that the agency really does ensure against jeopardy and that any take that occurs is minimized.” *Ctr. for Biological Diversity v. NMFS*, 977 F. Supp. 2d 55, 85 (D.P.R. 2013) (citing 50 C.F.R. § 402.14(i)).

On remand, the agency cannot possibly justify its plain legal error of failing to include an ITS to authorize and mitigate right whale take in the 2014 BiOp. The Court clearly stated that “[h]ere, the ESA and accompanying regulations plainly require an ITS, and they require that the ITS find that any take resulting from the proposed agency action will neither jeopardize the continued existence of the listed species nor run afoul of § 101(a)(5) of the MMPA.” Mem. Op. 17. NMFS “must develop an entirely new [biological opinion] to correct its errors,” rendering remand without vacatur inappropriate. *See Anacostia Riverkeeper, Inc. v. Jackson*, 713 F. Supp. 2d 50, 52 (D.D.C. 2010).

Remand without vacatur would be especially improper here given NMFS’s decades-long history of: (1) authorizing the fishery without the requisite ITS; and (2) delaying issuance of regulations to protect right whales from entanglement in lobster gear despite recognizing that

such actions are necessary. *See Citizens for Responsibility & Ethics in Wash. v. Fed. Election Comm’n*, 316 F. Supp. 3d 349, 415 (D.D.C. 2018) (“Given the length of time [an] invalid regulation has persisted, particularly in the face of internal acknowledgement by OGC of potential shortfalls, inaction by the FEC to address its flaws is inevitably a significant concern with a remand-only remedy”); *infra* pp. 13–14 (discussing NMFS’s history of delaying action to protect right whales from entanglements in fishing gear); Pls.’ Opp. to Defs.’ Mot. to Stay 6–9, ECF No. 71 (same). The Court should therefore vacate and remand the 2014 BiOp.

3. Vacatur Plus a Short Stay Will Provide Incentive for NMFS to Act While Limiting Potential Disruptive Consequences

Under *Allied-Signal*, the Court should also consider the “disruptive consequences of an interim change” in considering vacatur. 988 F.2d at 150–51. Under this test, “[v]acatur would be disruptive if it set[s] back achievement of the environmental protection required” by statute. *Nat. Res. Def. Council v. U.S. EPA*, 489 F.3d 1364, 1374 (D.C. Cir. 2007).

Plaintiffs request vacatur of the 2014 BiOp but also request a brief stay of vacatur until January 31, 2021 to provide NMFS time to finalize its biological opinion and final rule amending the ALWTRP. This stay provides NMFS the necessary incentive to act within a certain timeframe, while limiting the potentially disruptive environmental consequences of vacatur that might result from vacating a biological opinion on NMFS’s ongoing authorization and management of the lobster fishery under the ALWTRP regulations and the federal lobster permitting system. Additionally, while the 2014 BiOp fails to adequately protect right whales, it does contain several conservation recommendations, including that NMFS continue to undertake and support aerial surveys, passive acoustic monitoring, and disentanglement activities. C1_26816–17. While these recommendations are limited, having them in place is better than nothing at all.

Numerous courts in this Circuit have taken a comparable approach in similar circumstances. *See Anacostia Riverkeeper, Inc. v. Wheeler*, 404 F. Supp. 3d 160, 189 (D.D.C. 2019) (vacating unlawful pollution limits ruled not protective enough under the Clean Water Act, but staying vacatur for one year because “better these [limits] than no limits at all”); *Anacostia Riverkeeper v. Jackson*, 713 F. Supp. 2d at 52 (similar); *see also Indep. U.S. Tanker Owners Comm. v. Dole*, 809 F.2d 847, 855 (D.C. Cir. 1987) (“In this case, we vacate the rule because the Secretary’s omissions are quite serious . . . Yet we exercise our power to withhold issuance of our mandate [for six months]”); *Friends of the Earth, Inc. v. U.S. EPA*, 446 F.3d 140, 148 (D.C. Cir. 2006) (vacating EPA’s unlawful approval of a water pollution control limit and recognizing the district court’s authority to stay the order of vacatur until EPA issues a new limit).

Accordingly, Plaintiffs ask the Court to stay vacatur until January 31, 2021. This timeframe is roughly six months from the date NMFS has stated it intends to issue the proposed amendments to the ALWTRP and draft biological opinion analyzing those amendments. *See* It. Status Report 5. Six months is generally consistent with the timeframe NMFS previously represented to the Court that it needed to finalize the rulemaking following the proposed rule. *See* Anderson Decl. ¶ 16, ECF 68-2 (NMFS declaration stating it intended to issue a proposed rule in January or February 2020 and final rule in July 2020). This stay of vacatur will provide NMFS time to enact needed amendments to the ALWTRP to reduce serious injury and mortality of right whales in lobster gear and issue a new biological opinion, while also providing right whales with the continued protections of the existing management regime analyzed in the 2014 BiOp during the stay.

Staying vacatur until January 31, 2021 will also provide the agency with the incentive to act within this timeframe. *See Nat. Res. Def. Council v. U.S. EPA*, 489 F.3d 1250, 1264 (D.C.

Cir. 2007) (Randolph, J., concurring in part) (“The existence of a stay with time limits, rather than an open-ended remand without vacating, will give the agency an incentive to act in a reasonable time, given the other constraints on its resources. When we simply remand the agency has no such incentive.”). This incentive is particularly important here, where the agency has a long-established history of delaying actions to protect right whales and of authorizing the fishery without adequate measures to reduce the risk of entanglements. *See infra* pp. 13–14 (discussing delays); *Citizens for Responsibility & Ethics in Wash.*, 316 F. Supp. 3d at 414–15 (vacating rule but staying vacatur for 45 days to motivate agency to act to amend unlawful regulation).

Given the agency’s history of not meeting its own deadlines, Plaintiffs also request that the Court retain jurisdiction and require NMFS to submit monthly progress reports to the Court regarding the status of the agency’s new biological opinion and final rule. *See, e.g., Nat’l Wildlife Fed’n v. NMFS*, 524 F.3d 917, 937 (9th Cir. 2008) (finding reasonable the district court’s requiring status reports every 90 days during remand on unlawful biological opinion, noting that requiring such reports is “clearly permissible”) (hereinafter, *Nat’l Wildlife Fed’n D*); *Telecomm. Research & Action Ctr. v. FCC*, 750 F.2d 70, 81 (D.C. Cir. 1984) (requiring status reports every 60 days).

B. In the Alternative, the Court Should Remand the 2014 BiOp and Order NMFS to Issue a New Biological Opinion and Final Rule by January 31, 2021

Vacatur of the 2014 BiOp plus a stay of vacatur both gives NMFS time to come into compliance with the ESA and avoids potentially disruptive environmental consequences while also ensuring NMFS acts within a certain timeframe. If, however, the Court declines to vacate the 2014 BiOp, it should remand the 2014 BiOp and order NMFS to issue a new biological opinion and final rule to reduce serious injury and mortality of right whales in lobster gear by January 31, 2021.

Notably, in ordering such relief, the Court will not be commanding *how* NMFS must act, only that it must act by a date certain. This is well within this Court’s power. *See, e.g., In re American Rivers & Idaho Rivers United*, 372 F.3d 413, 420 (D.C. Cir. 2004) (ordering agency action within 45 days); *Cutler v. Hayes*, 818 F.2d 879, 895 n.137 (D.C. Cir. 1987) (listing cases where courts “intervened to compel an agency unreasonably delaying to speed up its activities” and imposed 30 and 60 day deadlines); *Zambrana v. Califano*, 651 F.2d 842, 844 (2nd Cir. 1981) (noting that “[t]he remanding court is vested with equity powers” and that “[i]t may when appropriate set a time limit for action by the administrative tribunal, and this is often done”).

Absent vacatur, a court-ordered deadline for a final, revised biological opinion and final rule is necessary due to the agency’s long and consistent history of delaying actions to protect right whales from entanglements and “the urgency of the listed species’ situation.” *See Nat’l Wildlife Fed’n I*, 524 F.3d at 937 (holding a court has discretionary authority to impose deadlines on remand proceedings and district court properly did so especially considering agency’s history of issuing flawed biological opinions and the highly endangered status of the species at issue).

Over the past two decades, NMFS has made only slow progress in issuing and revising rules and biological opinions and even that progress has often been the result of litigation. *See* Pls.’ Opp. to Defs.’ Mot. to Stay 6–9 (describing NMFS’s history of delay). For example, in 2003, NMFS concluded that then-existing measures were not sufficiently protective of right whales yet did not issue a proposed rule to amend the ALWTRP until June 2005. *See, e.g.,* 70 Fed. Reg. 35,894 (June 21, 2005); C1_ 026657. And it did not finalize that rule until October 2007—nearly two and a half years after the proposed rule, five years after NMFS acknowledged the ALWTRP should be amended, and well beyond the timelines established by the MMPA. *See* 72 Fed. Reg. 57,104 (Oct. 5, 2007); 16 U.S.C. § 1387(f)(7)(C) (requiring NMFS to publish final

rule within 60 days of close of comment period on proposed rule). Moreover, NMFS only issued the final rule because Plaintiff the Humane Society of the United States challenged the agency's unlawful delay and it was under a court order to act. *See Order, Humane Society of the U.S. v. Gutierrez*, No. 07-00333-ESH (D.D.C. July 11, 2007), ECF No. 23 (adopting Stipulated Settlement and Agreement, filed at ECF No. 21).

NMFS has also delayed issuing legally-required biological opinions under the ESA. For example, despite reinitiating consultation on the lobster fishery in July 2003, NMFS did not issue a biological opinion until October 2010—more than seven years later. *See* C1_26657. Here, without a date certain for a new biological opinion and final rule, it is reasonable to assume that urgently-needed regulatory protections for right whales will continue to languish.

The history of this litigation also demonstrates why a court-ordered deadline for final action by NMFS is necessary. In moving to stay this lawsuit in August 2019, the agency stated that it “expects to issue a new set of regulations under the [MMPA] and a new, superseding biological opinion under the [ESA] on the operation of the lobster fishery by July 31, 2020.” Defs.’ Mot. to Stay 2, ECF No. 68. Its supporting declaration stated that the agency intended to issue a proposed rule “by the end of January or February 2020” and, although noting the possibility of additional delays, had an “ultimate goal of a final rule in July 2020.” Anderson Decl. ¶ 16. Less than one month later, NMFS submitted another declaration indicating that issuance of the final rule (and accompanying biological opinion) may be delayed due to review of the rule by the Office of Management and Budget, but the agency still hoped to finalize the rule by July 2020. Second Anderson Decl. ¶¶ 3–5, ECF No. 74-1. Then, at the summary judgment stage of this case, NMFS submitted a third declaration indicating that it now expects to issue a draft biological opinion and proposed rule in July 2020. Third Anderson Decl. ¶ 9, ECF

No. 87-1.

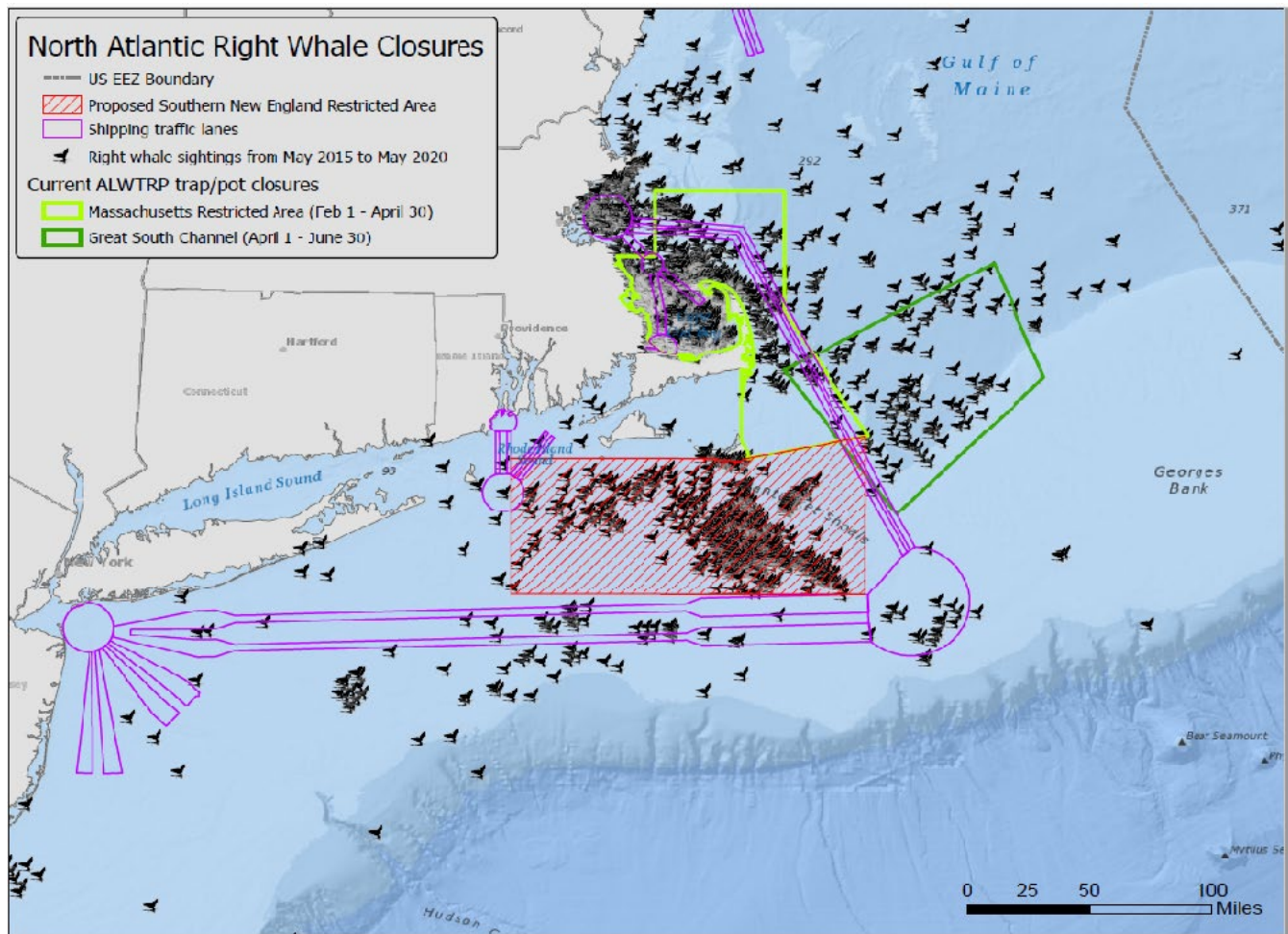
Given the agency's long history of delaying actions to protect right whales from entanglements in lobster gear—and often only acting once forced to do so by a court—there is no basis for confidence in any of NMFS's promises. A court-ordered deadline of a final rule and biological opinion by January 31, 2021 would provide the necessary certainty. While this date is already beyond the statutory deadlines for amending a take reduction plan under the MMPA, *see* 16 U.S.C. § 1387(f)(7), and beyond the 90-day default for completing section 7 consultation under the ESA, *see id.* § 1536(b)(1), this timeline will provide NMFS with ample opportunity to finalize its forthcoming regulation to implement additional measures to protect right whales from entanglement in lobster gear and to issue a new biological opinion that complies with the Court's decision. Again, because of the agency's history of delay, Plaintiffs also request that the Court retain jurisdiction during the pendency of the remand and require NMFS to submit monthly progress reports. *See Nat'l Wildlife Fed'n I*, 524 F.3d at 937; *Telecomm. Research & Action Ctr.*, 750 F.2d at 81.

II. The Court Should Also Order Interim Injunctive Relief

Vacatur of an agency's biological opinion would typically provide the relief necessary to remedy a plaintiff's harms because the underlying agency action analyzed in the biological opinion could not go forward. However, to narrow the relief requested, provide the agency time to correct its legal errors, and limit potential environmentally disruptive consequences of vacatur, Plaintiffs instead ask the Court to stay vacatur; or, alternatively, to remand the 2014 BiOp with a date certain for a new biological opinion and final rule. Thus, additional relief is necessary to prevent irreparable harm to right whales (and to Plaintiffs' protected interests in right whale conservation) in the interim.

So long as NMFS continues to authorize and manage the lobster fishery under the current regulatory regime analyzed in the 2014 BiOp, right whales are at ongoing risk of unlawful entanglements. The Court should therefore issue injunctive relief until NMFS issues a new, final biological opinion that complies with the Court's decision by including an ITS authorizing any take from operation of the lobster fishery and until the measures necessary to do so are effective on the water. This interim injunctive relief will help remedy the irreparable harm that could befall right whales absent such relief. It will also help avoid unauthorized incidental take of right whales in violation of section 9 of the ESA and help ensure that ongoing lobster fishing does not jeopardize the continued existence of this critically endangered species. *See* 16 U.S.C. § 1536(a)(2); *Wild Fish Conservancy v. Salazar*, 628 F.3d 513, 532 (9th Cir. 2010) (holding an agency's biological opinion unlawful and remanding the case to the district court to "grant injunctive relief until the Service complies with its obligations under the ESA.").

Specifically, Plaintiffs seek an interim injunction enjoining NMFS from authorizing the lobster fishery's use of static vertical lines in an area of high, year-round right whale use. This area south of Martha's Vineyard and Nantucket off Massachusetts (hereinafter referred to as "Southern New England") has increasingly become important right whale foraging and socializing habitat in recent years. This area is depicted in the map below as the proposed Southern New England Restricted Area.



Plaintiffs’ requested injunctive relief properly responds to NMFS’s legal errors. The requested injunction is narrowly tailored to protect right whales from entanglement risk in an important habitat area and will lift once NMFS issues a new biological opinion that contains an ITS for take of right whales by the lobster fishery and any measures necessary to authorize such take are effective. The requested relief may also facilitate experimental lobster fishing in the area using various prototypes of “ropeless” gear, which NMFS has acknowledged has great promise for solving the entanglement crisis.⁴

⁴ To be clear, Plaintiffs do not request that the Court order NMFS to conduct or permit ropeless experimental fishing in the proposed Southern New England Restricted Area, only that NMFS’s authorization of the use of static vertical lines in this area be enjoined.

A. Standard of Review for Injunctive Relief

In an ordinary case, a plaintiff seeking a permanent injunction must demonstrate: “(1) that it has suffered an irreparable injury” (or will, absent injunctive relief); “(2) that remedies available at law, such as monetary damages, are inadequate to compensate for that injury; (3) that, considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted; and (4) that the public interest would not be disserved by a permanent injunction.”

Monsanto Co. v. Geertson Seed Farms, 561 U.S. 139, 156–57 (2010) (citation omitted).

However, that test is modified where, as here, a plaintiff seeks interim injunctive relief for an agency’s established violation of the ESA. *See Nat’l Wildlife Fed’n v. NMFS*, 886 F.3d 803, 817 (9th Cir. 2018) (hereinafter, *Nat’l Wildlife Fed’n II*). Regarding irreparable harm, “because the injunction may be lifted after federal defendants issue a new BiOp and comply with [the ESA] . . . the first prong of the injunction test should be modified to match the analogous prong in the preliminary injunction test: plaintiffs must show that they are ‘likely to suffer irreparable harm in the absence of preliminary relief.’” *Id.* (quoting *Winter v Nat. Res. Def. Council*, 555 U.S. 7, 20 (2008) (additional citations omitted)).

Moreover, as the Supreme Court has made plain, because Congress intended that endangered species conservation be given paramount importance, courts cannot use equities to strike a different balance. *Tenn. Valley Auth.*, 437 U.S. at 194; *United States v. Oakland Cannabis Buyers’ Coop.*, 532 U.S. 483, 497 (2001). Thus, “[w]hen considering an injunction under the ESA, [the Court] presume[s] that remedies at law are inadequate, that the balance of interests weighs in favor of protecting endangered species, and that the public interest would not be disserved by an injunction.” *Nat’l Wildlife Fed’n II*, 886 F.3d at 817. In short, injunctive relief should issue upon a demonstration by the plaintiff “that irreparable injury ‘is *likely* in the absence of an injunction.’” *Id.* at 818 (quoting *Winter*, 555 U.S. at 22).

B. Irreparable Harm is Likely Absent an Interim Injunction

Although injunctions have been characterized as extraordinary remedies, courts have consistently recognized that they are appropriate in environmental cases. As the Supreme Court has explained:

Environmental injury, by its nature, can seldom be adequately remedied by money damages and is often permanent or at least of long duration, i.e., irreparable. If such injury is sufficiently likely, therefore, the balance of harms will usually favor the issuance of an injunction to protect the environment.

Amoco Prod. Co. v. Vill. of Gambell, 480 U.S. 531, 545 (1987); *see also Nat'l Wildlife Fed'n v. Burford*, 835 F.2d 305, 323–25 (D.C. Cir. 1987) (“destroying wildlife habitat, air and water quality, natural beauty, and other environmental and aesthetic values and interests” constitutes irreparable harm); *Brady Campaign to End Gun Violence v. Salazar*, 612 F. Supp. 2d 1, 25 (D.D.C. 2009) (“These environmental and aesthetic injuries are irreparable”). That is particularly true for violations of the ESA. Where a case involves harm to endangered species, “establishing irreparable injury should not be an onerous task for plaintiffs.” *Cottonwood Env'tl. Law Ctr. v. U.S. Forest Serv.*, 789 F.3d 1075, 1091 (9th Cir. 2015).

This case is no exception. Entanglement of right whales constitutes irreparable harm and the requested relief is likely to prevent that harm from occurring during the pendency of the requested interim injunction.

1. Entanglement of Right Whales Constitutes Irreparable Harm

There is no question that entanglement of endangered right whales in lobster gear constitutes irreparable harm. NMFS succinctly stated, “[b]ecoming entangled in fishing gear can severely stress and injure a right whale. Being entangled slows down the whale, decreases its overall fitness, and can lead to a long and painful death.” NMFS, *North Atlantic Right Whales and the Dangers of Vessel Strikes and Entanglement*, <https://www.fisheries.noaa.gov/feature->

story/north-atlantic-right-whales-and-dangers-vessel-strikes-and-entanglement (Feb. 19, 2020).

“Biologists also believe that injuries and stress caused by long-term entanglements is one of the reasons that females are calving less often.” *Id.*

According to NMFS, entanglement in commercial fishing gear is responsible for the majority of known right whale deaths in recent years. *See, e.g.*, AR_8724. The sublethal impacts of entanglement—and the impacts that entanglement can have on a whale’s ability to reproduce in particular—“may be equally harmful to the whale population.” *Conserv. Law Found. v. Ross*, 422 F. Supp. 3d 12, 32 (D.D.C. 2019). A 2012 study indicates that 83 percent of right whales had been scarred at least once by fishing gear between 1980 and 2009 and nearly half the population had been entangled more than once. Pls.’ Summ. J. Mem. 22. A 2016 study confirms these findings. AR_2494.

These harms to individual right whales from entanglements are irreparable. *See Nat’l Wildlife Fed’n II*, 886 F.3d at 818–19 (extinction-level threat is not required to demonstrate irreparable harm). This is “because ‘[o]nce a member of an endangered species has been injured, the task of preserving that species becomes all the more difficult.’” *Id.* (quoting *Forest Conserv. Council v. Rosboro Lumber Co.*, 50 F.3d 781, 785 (9th Cir. 1995)); *see also Fund for Animals v. Turner*, No. 91-2201(MB), 1991 WL 206232, at *8 (D.D.C. Sept. 27, 1991) (“the loss even of the relatively few grizzly bears that are likely to be taken . . . is a significant, and undoubtedly irreparable, harm”).

And while harm to an individual member of an endangered species in general is significant and irreparable, harm to a right whale is especially so. Despite being protected as endangered for more than 40 years, right whales have not recovered. To the contrary, the species has been steadily declining since 2010, calving rates have significantly decreased, and at least 30

right whales have died since 2017. NMFS, *North Atlantic Right Whale*, <https://www.fisheries.noaa.gov/species/north-atlantic-right-whale> (last visited May 14, 2020). NMFS recently assigned the right whale “a recovery priority #1,” meaning its “extinction is almost certain in the immediate future” absent intervention. NMFS, *Species in the Spotlight*, <https://www.fisheries.noaa.gov/topic/endangered-species-conservation#species-in-the-spotlight> (last visited May 14, 2020).

This Court recently recognized that an entanglement of right whale constitutes irreparable harm, stating that “[b]oth lethal and sublethal effects of entanglement bring the species ever closer to extinction, from which there is, of course, no return.” *Conserv. Law Found.*, 422 F. Supp. 3d at 34; *see also id.* at 32 (“[w]hen the global population of a species is as low as 400 . . . ‘every mortality is of huge significance to the potential for the species to avoid extinction’” (citing Decl. of Dr. Michael Moore)). NMFS has conceded as much, stating that “protecting every individual is a top priority.” Pls. Opp. to Mot. to Stay, Ex. 1 at 2, ECF No. 71-2; *see also* C1_26686 (NMFS’s determination that the right whale population cannot sustain *any* deaths or serious injuries if the population is to recover); NMFS, *10 Things You Should Know About North Atlantic Right Whales*, <https://www.fisheries.noaa.gov/feature-story/10-things-you-should-know-about-north-atlantic-right-whales> (Oct. 17, 2019) (“Survival of this species depends on no more than one whale death per year”).

Because of their documented interests in the conservation of the North Atlantic right whale, Plaintiffs face “irreparable harm to their own interests stemming from the irreparable harm to the listed species.” *See Nat’l Wildlife Fed’n II*, 886 F.3d at 822; *see also* Bartlett Decl. ¶¶ 4–12, ECF No. 66-4 (describing one of Plaintiffs’ member’s aesthetic and other interests in right whales and concerns that continued entanglements mean fewer opportunities to observe the

whales and that the whales will be pushed closer to extinction); Milton Decl. ¶¶ 10–14, ECF No. 66-5 (same); Young Decl. ¶¶ 5–8, 21–25, ECF No. 66-6 (same); Hillgarth Decl. ¶¶ 9–12, ECF No. 66-7 (same); Patek Decl. ¶¶ 7–14, ECF No. 66-8 (same); Peach Decl. ¶¶ 11–15, ECF No. 66-9 (same); Shelley Decl. ¶¶ 8–13, ECF No. 66-10 (same).

2. The Requested Relief Would Reduce the Likelihood of Irreparable Harm

Plaintiffs’ request that the Court enjoin NMFS from allowing the lobster fishery to fish using static vertical lines in the proposed Southern New England Restricted Area would reduce the likelihood of irreparable harm to right whales, and thus to Plaintiffs’ members, in an area with demonstrably high year-round aggregations of right whales. When a court “ha[s] rejected [a] biological opinion . . . and it ha[s] concluded that continuation of the status quo could result in irreparable harm to a threatened species[,] [t]hose are precisely the circumstances in which . . . the issuance of an injunction is appropriate.” *Nat’l Wildlife Fed’n v. NMFS*, 422 F.3d 782, 796 (9th Cir. 2005). Thus, the relevant question is whether Plaintiffs’ requested relief will likely reduce the risk of harm to right whales as compared to the status quo. *See id.* at 797 (upholding district court’s issuance of injunctive relief based on evidence that the “plaintiffs’ request . . . would pose less risk for migrating fish than the proposed operations”).⁵

Plaintiffs’ requested relief will do just that. The status quo means that right whales will continue to experience entanglements in lobster gear. NMFS has concluded that right whales are at risk of entanglement anywhere they overlap with vertical lines in the water column. AR_8732;

⁵ Although the Court has not explicitly ruled on Plaintiffs’ ESA citizen-suit claims against NMFS in its capacity as the action agency that authorizes and manages the fishery, the agency unequivocally violated the ESA by relying on the invalid 2014 BiOp. The basis for Plaintiffs’ second claim against NMFS for violating the substantive no-jeopardy obligation of section 7(a)(2) of the ESA—the invalidity of the 2014 BiOp—has been decided, and the agency has no independent basis to support an assertion that its actions nonetheless comply with the ESA. Likewise, the agency has no basis to claim that it is in compliance with section 9.

see also 85 Fed. Reg. at 21,086 (NMFS’s recent statement that “lobster gear poses a potential risk to right whales in any area where right whale and lobster fishery distributions overlap”). NMFS has also stated that existing mitigation measures under the ALWTRP are insufficient to protect right whales from harmful entanglements. *See* P_16674 (April 2019 email from NMFS); *see also* AR_8732 (NMFS’s statement that “there is no place within the fished area along the East Coast of North America for which entanglement risk is zero”). Indeed, NMFS recently determined that 26 percent of the right whale population is entangled each year and the risk of an entanglement is increasing at a rate of 6.3 percent per year. AR_8724, AR_8732.

Plaintiffs’ requested interim injunctive relief will reduce the risk of entanglement by enjoining NMFS from authorizing the use of static vertical lines in a hotspot for right whales. The proposed Southern New England Restricted Area is adjacent to designated right whale critical habitat in Cape Cod Bay and the Great South Channel, which the agency has recognized as important feeding areas. *See* 59 Fed. Reg. 28,805 (June 3, 1994); 81 Fed. Reg. 4,837 (Jan. 27, 2016); *see generally* 16 U.S.C. § 1532(5) (defining critical habitat); 50 C.F.R. § 424.12 (criteria for designating critical habitat). In recent years, however, Southern New England has also become an important new habitat for right whales. Decl. of Michael Moore, PhD (Moore Decl.) ¶¶ 21–26. Scientists have determined that climate-driven changes have altered foraging patterns, and this area has become an important new feeding and socializing area for right whales. *Id.* ¶¶ 20, 23. The data show the whales use these waters in the greatest numbers during the winter and spring months, but also that they are present in Southern New England waters year-round. *Id.* ¶¶ 21–23, 25–26.

NMFS’s own data show increasing abundance and consistent aggregations of right whales in the area, particularly in the last five years. *See id.* ¶¶ 21, 22, 25; NMFS, *Interactive*

North Atlantic Right Whale Sightings Map [https://fish.nefsc.noaa.gov/psb/surveys/](https://fish.nefsc.noaa.gov/psb/surveys/MapperiframeWithText.html)

MapperiframeWithText.html (last visited May 14, 2020). Right whale aggregations are so common in this area that NMFS has repeatedly established voluntary speed restrictions and asked vessels to change their routes and lower their speeds to reduce ship strikes. Moore Decl. ¶ 25. More than 100 whales—one quarter of the entire population—were recently observed in the area south of Martha’s Vineyard and Nantucket at one time. *Id.* ¶ 26. Moreover, seven right whales have been found dead in Southern New England over the last three years, and entangled whales have recently been sighted in the area. *Id.* ¶¶ 27–30. For example, in December 2019, a 15-year-old male right whale was seen 20 miles south of Nantucket with three lines running out of his mouth; and in February 2020, a 19-year-old female right whale was seen with a fishing buoy stuck in her mouth. *Id.* ¶¶ 29–30. While these events do not necessarily mean the whales were killed or entangled in Southern New England, they demonstrate the whale’s increasing presence in the area. *See id.* ¶ 27.

This Court also recognized the importance of these waters to right whales in restoring the prohibition on gillnet fishing in the areas that overlap within the waters at issue here. *Conserv. Law Found.*, 422 F. Supp. 3d at 32–34. While the gillnet fishery cannot operate in certain portions of Southern New England, the lobster fishery can and does operate throughout Southern New England.

Any vertical line in this habitat area creates a risk of entanglement. *See, e.g.*, 85 Fed. Reg. at 21,086; AR_8732; Moore Decl. ¶ 35. The right whale’s increasing use of this area increases the likelihood that one or more whales will encounter and become entangled in vertical line used in the lobster fishery operating in that area. Moore Decl. ¶¶ 23, 50. The behavior of foraging right whales also increases the likelihood of entanglement in the area. *Id.* ¶ 23. The majority of

right whales seen in the area were feeding, moving slowly through the water column with their mouths wide open. *Id.* Such behavior significantly increases the risk of entanglement. *Id.*

Moreover, while any entanglement constitutes irreparable harm to right whales, the gear used in the offshore portions of the proposed Southern New England Restricted Area (i.e., waters greater than 12 nautical miles from shore) is heavy gear. Existing regulations require a minimum of 20 traps on each fishing trawl, and fishermen use thicker and longer lines to account for increased depth and currents. *See* 50 C.F.R. § 229.32(c)(2)(iii); Moore Decl. ¶ 39. This gear configuration increases the chances that an entanglement will cause a serious injury or mortality. Moore Decl. ¶¶ 39–40. Enjoining NMFS from authorizing the lobster fishery’s use of static vertical lines in the proposed Southern New England Restricted Area will eliminate the risk of entanglement in lobster gear in this foraging hotspot and reduce the risk of irreparable harm to individuals of this highly imperiled species. *Id.* ¶ 50–51.

Area and gear closures have a proven track record of success and play a paramount role in right whale conservation. NMFS has stated that targeted closures, such as the existing seasonal closure of Cape Cod Bay, “can have minimal impact to fishing while providing great benefit to whales.” AR_8732. NMFS believes the existing closure in Cape Cod Bay has been so successful at reducing the risk of entanglements in the area that the agency recently applied a 24 percent credit toward its goal of reducing the risk of entanglement-related serious injury and mortality off Massachusetts by 60 percent. *See* 84 Fed. Reg. 37,822, 37,823 (Aug. 2, 2019).

C. The Other Three Factors Favor the Interim Injunction

Because Plaintiffs have demonstrated the requested relief is likely to prevent irreparable harm to right whales and Plaintiffs’ members, that should end the Court’s inquiry and the interim injunction should issue. *See Nat’l Wildlife Fed’n II*, 886 F.3d at 817, 822. To the extent the Court

considers the other factors for injunctive relief, the result is the same as the remaining factors all tip sharply in favor of the interim injunction.

To begin, it is well established that monetary damages would be insufficient to remedy any irreparable harm to right whales that might occur from entanglements in lobster gear in the proposed Southern New England Restricted Area. *See Amoco Prod. Co.*, 480 U.S. at 545. Indeed, as this Court has recognized, “[i]t hardly merits recitation that the harm inflicted upon the whales by entanglement, and the resulting harms to the professional, aesthetic, and recreational interests of [plaintiffs’] members, are noncompensable by legal remedies.” *Conserv. Law Found.*, 422 F. Supp. 3d at 34. The insufficiency of legal remedies favors Plaintiffs’ requested injunction.

Moreover, the balance of the hardships and the public interest both tip sharply in favor of an injunction. Under clear and consistent caselaw, these factors *always* sharply favor an injunction in cases brought under the ESA. *See, e.g., Marbled Murrelet v. Babbitt*, 83 F.3d 1068, 1073 (9th Cir. 1996). “Congress has spoken in the plainest of words, making it abundantly clear that the balance has been struck in favor of affording endangered species the highest of priorities.” *Tenn. Valley Auth.*, 437 U.S. at 194; *see also Conserv. Law Found.*, 422 F. Supp. 3d at 34 (noting that “the public interest in preventing the extinction of the whale, which has been listed as endangered since the passage of the ESA, is beyond dispute”).

That is especially true here, where any economic injury caused by the requested injunctive relief is only temporary as it will expire upon NMFS’s issuance of a biological opinion that includes an ITS for any take in the lobster fishery and upon the measures necessary to authorize such take going into effect on the water. *See League of Wilderness Defenders v. Connaughton*, 752 F.3d 755, 766 (9th Cir. 2014) (holding that “irreparable environmental

injuries outweigh the temporary delay intervenors face in receiving a part of the economic benefits of the project”). Any alleged financial harm stemming from Plaintiffs’ requested relief simply cannot override Congress’s directive in the ESA that listed species be protected “whatever the cost.” *Tenn. Valley Auth.*, 437 U.S. at 184.

D. The Requested Injunction Appropriately Responds to NMFS’s ESA Violations

In addition to preventing irreparable harm, Plaintiffs’ request to enjoin NMFS from authorizing the use of static vertical lines in the lobster fishery in the proposed Southern New England Restricted Area appropriately responds to NMFS’s legal errors. *See S. Yuba River Citizens League v. NMFS*, 804 F. Supp. 2d 1045, 1054 (E.D. Cal. 2011) (holding that requested interim injunctive measures “must bear some relation to the deficiencies in the BiOp for which the court held that the defendants were liable for violation of the ESA” and issuing injunctive relief during pendency of remand on legally deficient biological opinion).

In fact, because the Court found the 2014 BiOp violates the ESA, Plaintiffs could seek to enjoin NMFS’s authorization of the entire fishery. *See id.* at 1055 (noting that “[i]n cases where a BiOp relating to a new project has been found to be inadequate, a court could enjoin the new project entirely”). That is particularly true here where NMFS’s ongoing authorization of the lobster fishery does not have a valid ITS and ongoing entanglements in lobster gear may very well be jeopardizing the right whale’s continued existence. *See id.*; *see also* C1_3744 (2010 BiOp not including ITS); C1_28422 (2012 BiOp not including ITS); C1_26812 (2014 BiOp not including ITS). Instead, Plaintiffs seek narrowly-tailored interim injunctive relief that will protect right whales from the risk of entanglement in an important new habitat area while NMFS develops a new biological opinion on the forthcoming rule to reduce the lobster fishery’s impacts to the right whale to legally acceptable levels and thereby enable the agency to issue an ITS.

Plaintiffs request that the interim injunctive relief remain in place until any measures necessary to reduce and mitigate take and issue a lawful ITS take effect on the water because of the history of significant lag time between NMFS’s issuance of final rules amending the ALWTRP and when fishermen have had to comply with those rules. *See, e.g.*, 73 Fed. Reg. 51,228 (Sept. 2, 2008) (extending effective date of final rule by an additional six months to give fishermen a total of 1.5 years to come into compliance with gear modifications required under amendments to ALWTRP); 79 Fed. Reg. 36,586, 36,587 (June 27, 2014) (giving fishermen in the northeast one year to comply with amended ALWTRP). In other words, status quo lobster fishing—which NMFS admits will entangle, injure, and kill right whales, *see, e.g.*, P_16674; AR_8724; AR_8732—will continue until new mitigation measures take effect, which will not necessarily coincide with when NMFS issues a new rule and a new biological opinion.

E. The Requested Relief Would Allow Experimental Ropeless Fishing

While Plaintiffs do not seek an order requiring ropeless fishing, the requested relief would allow NMFS to permit experimental fishing using ropeless gear, also known as “pop-up” or “buoyless” gear, in the proposed Southern New England Restricted Area. This gear allows traps on the seafloor to be remotely called to the surface and eliminates the static vertical lines in the water column that entangle whales. Moore Decl. ¶ 46–48. Specifically, the ropeless system (either a stowed rope and buoy or a lift bag) sits on the seafloor attached to the first trap in a trawl and contains an acoustic modem and GPS that records its location. *Id.* ¶ 47. When fishermen return to that location, a signal from a second paired modem on their boat using high-frequency sound waves triggers the buoy or a lift bag to come to the surface. *Id.* The traps can then be hauled up using traditional fishing practices. *Id.*

Some fishermen are already testing types of ropeless gear to fish lobster off the eastern

seaboard. *Id.* ¶ 48. Various prototypes are being tested and refined in trap/pot fisheries off both the U.S. Atlantic and Pacific coasts and in Canada. *Id.* In the FY20 Commerce, Justice, and Science Appropriations Bill, Congress allocated \$3 million to NMFS for right whale research and conservation efforts, \$1 million of which is directed to be expended on ropeless fishing pilot projects. The SAVE Right Whales Act has been introduced in both Houses of Congress to authorize appropriations of \$5 million annually for ten years to develop and test technological solutions to the twin crises of fishing gear entanglements and vessel strikes. *See* S. 2453, 116th Cong. (2019); H.R.1568, 116th Cong. (2019). NMFS itself has said that ropeless gear “is an emerging option that could alleviate a lot of th[e] risk” of entanglement and that “[t]he ability to use gear retrieval devices that do not require the use of stationary buoy lines in the water column would be a truly game changing development for right whales.” NMFS, *Dangers of Vessel Strikes and Entanglement*.

In 2018, NMFS issued an advanced notice of proposed rulemaking to allow the use of ropeless gear in areas currently closed to trap/pot fishing because doing so “could incentivize cooperative research that may lead to further technological developments from buoy-lineless fishing.” 83 Fed. Reg. 49,046, 49,047 (Sept. 28, 2018). While this proposal has apparently stalled, enjoining NMFS’s authorization of the use of static vertical lines by the lobster fishery in the proposed Southern New England Restricted Area would provide the same incentive and promote the development of gear that will create a safer ocean for right whales and help solve the entanglement crisis for good.

CONCLUSION

For the foregoing reasons, Plaintiffs respectfully request that the Court: (1) vacate and remand the 2014 BiOp as it pertains to right whales, with vacatur stayed until January 31, 2021 (or, in the alternative, remand the 2014 BiOp and order NMFS to issue a new biological opinion

and final rule by January 31, 2021); and (2) enjoin NMFS's authorization of the lobster fishery using static vertical lines in the proposed Southern New England Restricted Area.

Respectfully submitted this 15th day of May, 2020,

/s/ Kristen Monsell

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UNITED STATES DISTRICT COURT
DISTRICT OF COLUMBIA

CENTER FOR BIOLOGICAL DIVERSITY,
et al.,

Plaintiffs,

v.

WILBUR ROSS, *et al.*,

Federal Defendants, and

MAINE LOBSTERMEN'S ASSOCIATION,
INC., and
MASSACHUSETTS LOBSTERMEN'S
ASSOCIATION,

Defendant-Intervenors.

Civil Action Nos. 18-112 (JEB)
18-283 (JEB)

[PROPOSED] ORDER

Plaintiffs in Case 1:18-cv-112—the Center for Biological Diversity, Defenders of Wildlife, and the Humane Society of the United States—and Plaintiff in Case 1:18-cv-283—Conservation Law Foundation—have sought various remedies in this case. Upon consideration of the relevant papers, evidence, and arguments, it is ORDERED that:

1. The National Marine Fisheries Service's 2014 biological opinion on the American lobster fishery (titled "Endangered Species Act Section 7 Consultation on the Continued Implementation of Management Measures for the American Lobster Fishery [Consultation No. NER-2014-11076]") is hereby VACATED as it pertains to North Atlantic right whales and REMANDED to the agency, and vacatur is stayed until January 31, 2021; [or, alternatively,]

1. The National Marine Fisheries Service’s 2014 biological opinion on the American lobster fishery (titled “Endangered Species Act Section 7 Consultation on the Continued Implementation of Management Measures for the American Lobster Fishery [Consultation No. NER-2014-11076]”) is hereby REMANDED to the agency; and the agency is ORDERED to complete a new biological opinion and new final rule to amend the Atlantic Large Whale Take Reduction Plan by January 31, 2021; and
2. Federal Defendants are hereby ENJOINED from authorizing the American lobster fishery’s use of static vertical lines in the Southern New England Restricted Area (attached as Exhibit 1).¹ The injunction shall remain in place until the agency issues a biological opinion that includes an incidental take statement for right whales and any necessary mitigation measures are in effect on the water; and
3. Federal Defendants shall provide status reports to the Court every 30 days following entry of this Order to summarize the status of actions taken to comply with this Order; and

¹ The boundaries for the closure going clockwise from the northeastern most point are as follows:

41° 21.5’N, 69° 16’W
40° 37.02’N, 69° 16’W
40° 37.02’N, 70° 18.9’W
40° 37.02’N, 71° 20.6’W
41° 15.3’N, 71° 20.6’W
41° 15.3’N, 70° 18.9’W
41° 15.3’N, 70° 10.6’W
41° 15.3’N, 69° 57.9’W

4. This Court shall retain jurisdiction over this matter pending issuance of the new biological opinion and implementation of any necessary mitigation measures on the water.

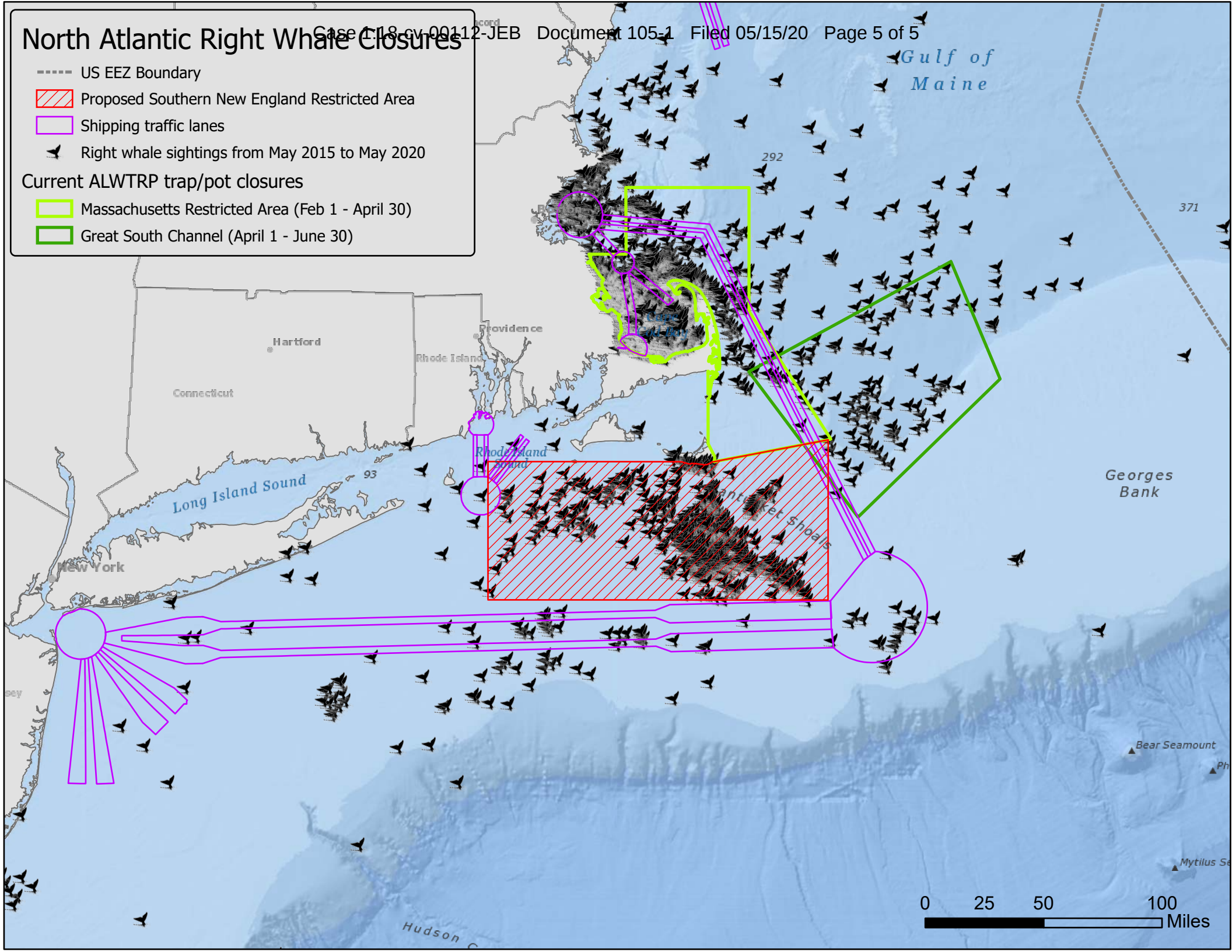
DATED: _____

HON. JAMES E. BOASBERG
United States District Judge

EXHIBIT 1

North Atlantic Right Whale Closures

- US EEZ Boundary
-  Proposed Southern New England Restricted Area
-  Shipping traffic lanes
-  Right whale sightings from May 2015 to May 2020
- Current ALWTRP trap/pot closures**
 -  Massachusetts Restricted Area (Feb 1 - April 30)
 -  Great South Channel (April 1 - June 30)



**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA**

CENTER FOR BIOLOGICAL DIVERSITY,
et al.,

Plaintiffs,

v.

WILBUR ROSS, *et al.*,

Federal Defendants, and

MAINE LOBSTERMEN'S ASSOCIATION,
INC., and
MASSACHUSETTS LOBSTERMEN'S
ASSOCIATION,

Defendant-Intervenors.

Civil Action Nos. 18-112 (JEB)
18-283 (JEB)

**EXPERT DECLARATION OF DR. MICHAEL MOORE, VET MB, PhD IN SUPPORT
OF PLAINTIFFS' REQUEST FOR INTERIM INJUNCTIVE RELIEF**

I, Michael Moore, declare the following:

1. I submit this declaration in support of Plaintiffs' Request for interim injunctive relief to establish a protected area ("Protected Area") in ocean waters south of the Islands of Nantucket and Martha's Vineyard ("Southern New England") that prohibits trap/pot fishing with static vertical lines. The statements I make are true and correct to the best of my knowledge and, in the case of my opinions, I believe them to be true.

2. I have been employed at the Woods Hole Oceanographic Institution (WHOI) since 1986. My current title is Senior Scientist (Biology Department) and Director, WHOI Marine Mammal Center. WHOI is dedicated to advancing knowledge of the ocean and its

connection with the Earth system through a sustained commitment to excellence in science, engineering, and education, and to the application of this knowledge to problems facing society.

3. I am a member of the Society for Marine Mammalogy, the American Veterinary Medical Association, a Board Member of the North Atlantic Right Whale Consortium, and the inaugural Chair and a current Vice Chair of the Ropeless Consortium.

4. I have a bachelor's degree, a master's degree, a degree in veterinary medicine and surgery from the University of Cambridge in the United Kingdom, and a PhD from the Massachusetts Institute of Technology/ WHOI Joint Program in Biological Oceanography. I have specialized in diagnosing causes of death in marine mammals, especially North Atlantic right whales ("NARW" or "right whales"), for more than 20 years. I have also published widely on right whale health and welfare.

5. I am the past Chair of the National Oceanic and Atmospheric Administration ("NOAA Fisheries" also known as the National Marine Fisheries Service) Working Group Unusual Marine Mammal Mortality Events review panel, and a member of the NOAA Fisheries Atlantic Scientific Review Group. I am also recognized as a Necropsy Team Leader authorized by the NOAA Fisheries Marine Mammal Health and Stranding Response Program to undertake cause of death examinations on right whales and other species of marine mammals. I have published 151 peer-reviewed studies and have led or contributed to 9 working groups related to right whale mortality and injury. My curriculum vitae is attached to this Declaration as Attachment 1, and a list of peer-reviewed and technical publications I have written or contributed to is attached to this Declaration as Attachment 2.

6. I previously submitted an expert declaration to this Court in support of a motion for a permanent injunction to restore the boundaries of the former Nantucket Lightship Closed Area and Closed Area 1 until a Section 7 consultation under the Endangered Species Act is

completed. It is my understanding that shortly after that case was decided NOAA issued a final rule closing those areas to gillnet fishing until further notice.

7. For this declaration I reviewed, again, the most recent scientific information about the current status and population trends of right whales, available data collected and tracked by NOAA Fisheries and others for causes of morbidity and mortality for right whales off the North American eastern seaboard, distribution of sightings in New England waters, and the potential for entanglement in trap/pot fisheries. Based on this information and my 20 plus years of field experience as a veterinary scientist working to assist disentanglement efforts and perform necropsies, it is my expert opinion that trap/pot fisheries in New England that deploy vertical lines in the water column attached to bottom gear pose a significant risk of entanglement to right whales. Entanglement in this gear contributes to the annual exceedance of the Potential Biological Removal allowed by the Marine Mammal Protection Act (MMPA) (1972) as modeled in annual stock assessment reports (SAR - draft NOAA 2019), and sublethal stressors that reduce reproductive fitness, and is part of the irreparable harm currently being done to the species.

Introduction to the North Atlantic Right Whale

8. Right whales once ranged between West Africa, Norway, Greenland, Atlantic Canada, and the eastern United States (U.S.) down to northern Florida. Protected from commercial whaling since 1935, they have undergone substantial and increasing sublethal and lethal trauma from vessel collisions and fishing gear entanglement in recent decades. The species is now found primarily off the coast of North America from Florida to the Gulf of St. Lawrence. Right whales filter feed on dense clouds of small planktonic copepods and elect patches to feed on based on net energy gain. These copepods can range from the water's surface to the seafloor, and from the Mid-Atlantic to the sub-Arctic, depending on seasonal and year-to-

year variations in climatic, oceanographic and biological conditions (Baumgartner & Mate 2003ⁱ, Mayo *et al.* 2018ⁱⁱ, Mayo & Marx 1990ⁱⁱⁱ, Mayo *et al.* 2001^{iv}).

9. In the U.S., critical habitat for North Atlantic right whales was first designated in 1994 and then expanded in 2016 to incorporate, among other things, additional and essential feeding grounds in the Gulf of Maine and in the Great South Channel. 59 Fed. Reg. 28,805 (June 3, 1994); 81 Fed. Reg. 4837 (Jan. 27, 2016). The figure below is available on the NOAA Fisheries website and shows those designations in New England. This designated critical habitat is adjacent to new foraging habitat increasingly used by right whales in Southern New England.

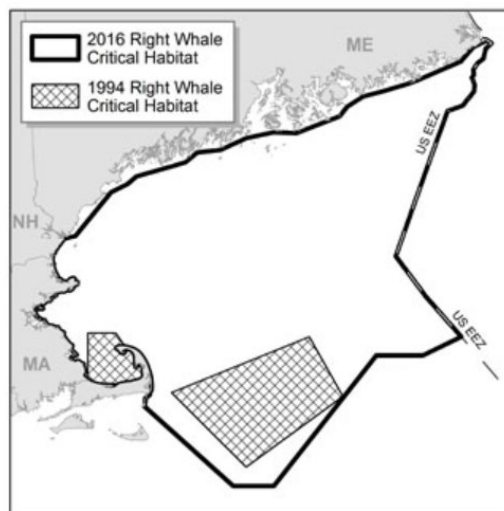


Figure 1: Comparison of 1994 and 2016 Right Whale Critical Habitat Designations. Source: https://www.greateratlantic.fisheries.noaa.gov/mediacenter/2016/january/25_noaa_expands_critical_habitat_for_endangered_north_atlantic_right_whales.html.

Right Whale Population Trends

10. The North Atlantic right whale population has been tracked closely since 1980, using models based on the number of individual right whales sighted in each year. Animals can be identified individually by the unique patterns on their heads, and by scars elsewhere on the body. Images of individuals sighted are cataloged (North Atlantic Right Whale Consortium 2019^v), enabling a detailed understanding of changes in the health, distribution and survival of

individuals and thus the species. The species grew at ~1-2 percent from 1980 to 2010. Thereafter there has been a significant decline, exacerbated by the documented loss of 17 animals in 2017 in Canadian and U.S. waters—4 percent of the population. At that point, the NOAA Fisheries Working Group on Unusual Marine Mammal Mortality Events declared an Unusual Mortality Event. <https://www.fisheries.noaa.gov/national/marine-life-distress/active-and-closed-unusual-mortality-events>. A further 3 animals died in 2018, 10 died in 2019, and one more is presumed dead in 2020. Known mortalities substantially underrepresent the total as carcasses can sink or decompose and disintegrate unreported offshore (Moore *et al.* 2020 In press^{vi}).

11. Today, about 400 of these whales remain, including fewer than 85 breeding females (2019 North Atlantic Right Whale Report Card^{vii}). Only twenty-two calves have been born in the last four calving seasons, which is down from an average of approximately 20 calves per season over the 10 years prior. The lack of calves is thought to result both from climatic shifts in optimal prey resources and from energy drain from the drag of sublethal fishing gear entanglements (Record *et al.* 2019^{viii}; van der Hoop *et al.* 2017^{ix}).

Threats from Fixed Gear Fisheries

12. Vertical lines known to entangle right whales are used in both trap/pot fisheries and gillnet fisheries. A recent scientific paper, Sharp *et al.* 2019, summarized an analysis of right whale mortalities between 2003 and 2018 as follows:

Seventy mortalities of North Atlantic right whales *Eubalaena glacialis* (NARW) were documented between 2003 and 2018 from Florida, USA, to the Gulf of St. Lawrence, Canada. These included 29 adults, 14 juveniles, 10 calves, and 17 of unknown age class. Females represented 65.5% (19/29) of known sex adults. Fourteen cases had photos only; 56 carcasses received external examinations, 44 of which were also necropsied. Cause of death was determined in 43 cases, of which 38 (88.4%) were due to anthropogenic trauma: 22 (57.9%) from entanglement, and 16 (42.1%) from vessel strike. Gross and histopathologic lesions associated with entanglement were often severe and included deep lacerations caused by constricting line wraps around the flippers, flukes, and head/mouth; baleen plate mutilation; chronic extensive bone lesions from impinging line,

and traumatic scoliosis resulting in compromised mobility in a calf. Chronically entangled whales were often in poor body condition and had increased cyamid burden, reflecting compromised health. Vessel strike blunt force injuries included skull and vertebral fractures, blubber and muscle contusions, and large blood clots. Propeller-induced wounds often caused extensive damage to blubber, muscle, viscera, and bone. Overall prevalence of NARW entanglement mortalities increased from 21% (1970–2002) to 51% during this study period. This demonstrates that despite mitigation efforts, entanglements and vessel strikes continue to inflict profound physical trauma and suffering on individual NARWs. These cumulative mortalities are also unsustainable at the population level, so urgent and aggressive intervention is needed to end anthropogenic mortality in this critically endangered species.

Thus, entanglement is the most important diagnosed cause of death in this species: 22/43 (51 percent) from entanglement, versus 16/43 (37 percent) vessel strike (Sharp *et al.* 2019^x).

13. Understanding the extent of mortalities attributed to entanglements and vessel strikes is complicated by factors that have likely led to underestimations of significant injury and mortality. I summarized these in a publication (Moore *et al.* 2004^{xi}):

It is important to note that ship struck whales may come to shore or be sighted more easily than whales dying from gear entanglement or debilitation. Both the latter cases are more likely to sink if feeding has been precluded for a significant time prior to death, resulting in a significant loss of the low density body lipids, making the carcass negatively buoyant. Furthermore, whereas shipping density decreases rapidly with distance from shore, much of the heavier fixed fishing gear is on the offshore half of the continental shelf, reducing the likelihood that rapidly fatal entanglements will be identified, as such cases once dead are likely to go further offshore with the prevailing offshore wind and currents in much of the North American Eastern seaboard.

14. Colleagues and I also recently published a review of the behavior of whale carcasses at sea (Moore, M., G. Mitchell, T. Rowles, G. Early, 2020^{xii}):

Investigators often face the daunting task of elucidating a complex series of events, in reverse order, from when and where an animal is found, to diagnose the cause of death. Various scenarios are possible: an animal could die at sea remaining there or floating ashore, or strand on a beach alive, where it dies and, if cast high enough, remain beached to be scavenged or decompose. An animal that rests low on a beach may refloat again, using increased buoyancy from decomposition gas and favorable tides, currents and wind. Here we review the factors responsible for the different outcomes, and how to recognize the provenance of a cetacean mortality found beached or floating at sea. In conclusion, only some carcasses strand, or remain floating. Negatively buoyant animals that die at depth, or on the surface, and sink, may never surface, even after decomposition gas accumulation, as in cold, deep waters gas may fail to adequately reduce the density of a carcass, precluding it from returning to the surface.

15. There has also been a marked change in the nature of where mortalities are discovered over time. Between 1970-2002, 30 percent (Moore *et al.* 2004^{xiii}) of mortalities were discovered floating at sea, versus 73 percent between 2003-2018 (Sharp *et al.* 2019^{xiv}). This probably reflects three factors: (1) increased aerial survey effort offshore (“offshore” here means greater than 12 nautical miles from shore), (2) relative movement offshore of some fixed gear fisheries such as lobster, and (3) the increased use by right whales of fixed-gear-dense offshore areas of the Gulf of St. Lawrence in Canada (Hayes *et al.* 2018^{xv}).

16. Entanglements have had significant impacts on the right whale population. A recent study (Kenney 2018^{xvi}) showed:

...a relatively simple approach to estimate what the population trajectory since 1990 might have been under 4 different scenarios of reduced entanglement mortality. Under the best-case scenarios, the population at the end of the time-series would have been 25-30% higher than observed at present. If the population had not experienced nearly 3 decades of increasing entanglement, it could have been much more resilient to a disaster year like 2017.

Thus, *every* mortality is of huge significance to the potential for the species to avoid extinction.

17. In addition to entanglement being a major mortality factor, it is also a substantial sublethal detriment to right whale health. A review (Knowlton *et al.* 2012^{xvii}) of 626 entangled right whales between 1980 and 2009 stated:

519 (82.9%) had been entangled at least once and 306 of the 519 (59.0%) had been entangled more than once.... On average, 25.9% of adequately photographed animals acquired new wounds or scars from fishing gear annually with no significant trend over time detected. However, the annual percentage of animals observed with rope on the body increased significantly during the study period, suggesting that it is becoming more difficult for whales to free themselves completely from fishing gear.

Such high annual rates of entanglement remain a serious conservation concern for right whales because entanglements can have both lethal and sublethal effects.

18. Studies my colleagues and I have conducted of the effect of fishing gear drag on swimming right whales are equally concerning, summarized in van der Hoop *et al.* (2017)^{xviii}:

Drag from fishing gear contributes up to 8% of the 4-year female reproductive energy budget, delaying time of energetic equilibrium (to restore energy lost by a particular entanglement) for reproduction by months to years. In certain populations, chronic entanglement in fishing gear can be viewed as a costly unnatural life-history stage, rather than a rare or short-term incident.

19. NOAA Fisheries provided a document to the Atlantic Large Whale Take Reduction Team that listed 164 right whale entanglements between 2000 and 2018. https://archive.fisheries.noaa.gov/garfo/protected/whaletrp/trt/meetings/April%202019/2000-2018_right_whale_incident_data_3_19_19v.xlsx (NOAA Fisheries' 2000-2018 Right Whale Incident Data Spreadsheet). Forty-seven of those had some degree of attribution as to actual or likely fishery. Of those, 26 (55.3 percent) mentioned trap/pot gear as being involved in the entanglement. Of those, 15 or 16 cases resolved (became unentangled), but that is still a very significant number, especially given the huge preponderance of trap/pot endlines in the water. Even for a whale that becomes unentangled, the residual harm can be lethal.

Southern New England Waters are Critically Important for Foraging, Migrating, and Socializing Right Whales

20. In the last decade, right whales have shifted their geographic range due to climate change (Davis *et al.* 2017^{xix}; Record *et al.* 2019^{xx}). The Gulf of Maine has been one of the fastest warming ecosystems on the planet as measured by sea surface temperatures; this rapid warming likely caused right whales to shift in search of adequate sources of prey (Davis *et al.* 2017^{xxi}). Prior to this shift, most right whales foraged in the western Gulf of Maine in the winter and spring and the eastern Gulf of Maine and Scotian Shelf in the summer and autumn.

21. For the last ten years, however, the right whale population has increasingly used the Cape Cod Bay (as much as half the population) and waters south of Nantucket and Martha's Vineyard in Southern New England, especially during the winter and spring months. By late May, right whales usually leave Cape Cod Bay and spread out where they have been documented in significant numbers north in Canadian waters, further offshore (east) on Georges Bank, and

south of Cape Cod, including the mid-Atlantic. Data suggest some right whales stay in Southern New England waters year-round (Davis *et al.* 2017^{xxii}).



Figure 2: Opportunistic sightings of right whales: Left: January 1, 2011-December 31, 2014. Right: May 1, 2015-May 1, 2020. Note the marked increase in sightings in Southern New England waters. Source: NOAA Right Whale Advisory Sighting System available at: <https://fish.nefsc.noaa.gov/psb/surveys/MapperiframeWithText.html>.

Although using opportunistic sightings data can present challenges (no area is systematically surveyed, effort is not corrected for, and there is potential to count an individual whale more than once), it is an excellent proxy for habitat used by right whales.

22. Another source of data is aerial surveys. Survey effort in Southern New England is sporadic but it demonstrates high use in Southern New England for certain months of the year.

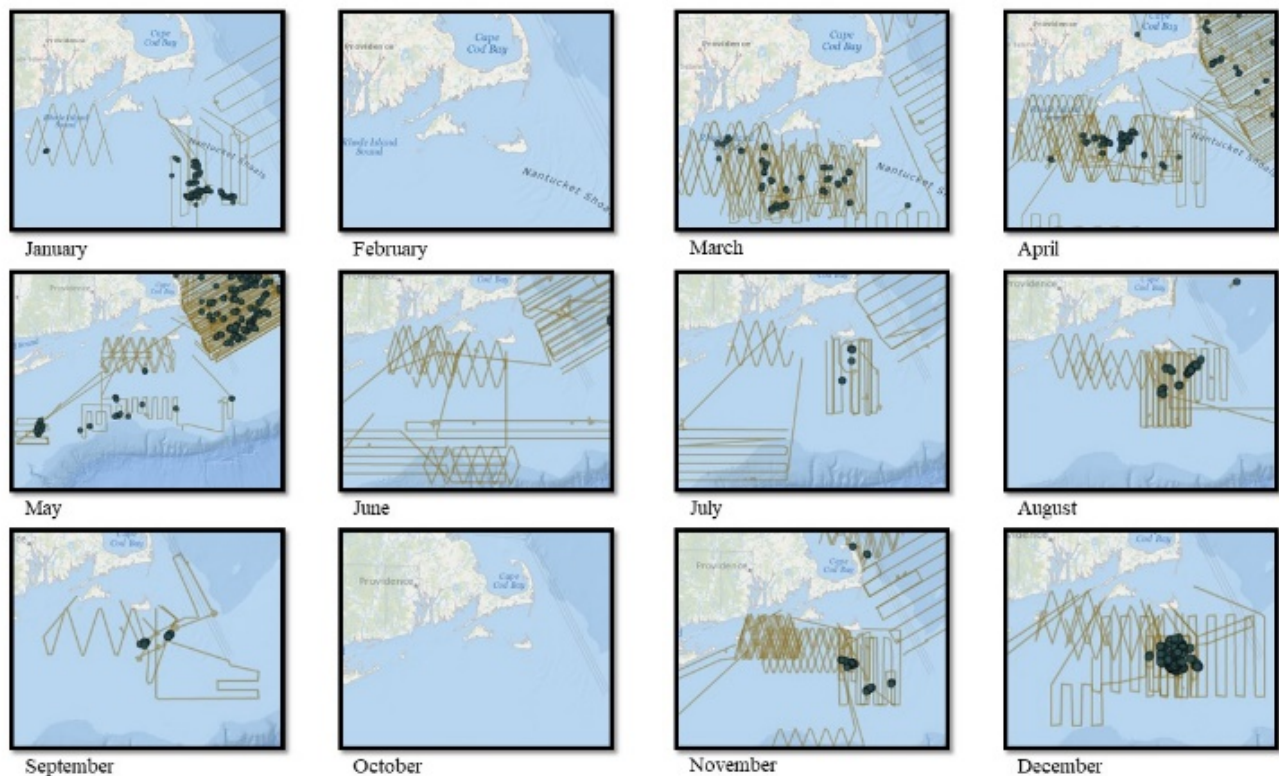


Figure 3: Visual aerial survey detections in Southern New England waters between January 1, 2015 and December 31, 2019. Note that no surveys flew in February or October, thus the absence of whales in those months does not mean that no whales were present in the area. Data available on WhaleMap at: <https://whalemap.ocean.dal.ca/WhaleMap/>.

23. The increase in visual sightings in recent years shown above is also reflected by acoustic detections of right whales in Southern New England (Davis *et al.* 2017^{xxiii}). The Davis *et al.* paper confirmed earlier understandings that right whales use the entire eastern seaboard of North America for most of the year and that, with shifting distributions over the past decade, areas formerly thought of as a migratory corridor, such as Southern New England and the Great South Channel, now have a year-round presence of right whales. Most recent documentations in those areas have included foraging and social behavior (Leiter *et al.* 2017^{xxiv}):

On 52 occasions feeding or Surface Active Groups (SAG) behaviors were recorded, and the remaining 65 sightings were categorized as none/other (Fig. 5). Feeding behavior was recorded for 39 (33%) of the sightings. Feeding was seen in all years of the study period (2010–2015), and exclusively during the months of March and April. There were 13 instances of SAG behavior recorded, involving a total count of 61 whales. The average

SAG group size was 4.7 whales, with a range of 2 to 14 whales. This behavior occurred during all years (2010–2015), with the exception of 2011, and was primarily observed during the month of March.

Thus, the majority of sightings were associated with feeding. When these whales feed, their mouths are wide open while they slowly move through the water column at whatever depth the prey resource is optimal. Thus, wherever there is rope in their path, the entanglement risk is substantially increased. SAGs are where groups of right whales are observed at or near the surface in tightly woven interactions that involve random and fairly rapid jockeying for position between each other, often with clear evidence of sexual intercourse between a female and one or more males. The overall sense from watching these events is that the whales are oblivious to what is around them. Thus again, entanglement risk is significant.

24. To reduce the threat of ship strikes to right whales, NOAA Fisheries establishes voluntary vessel speed restriction zones – called Dynamic Management Areas (DMA) – whenever aggregations of three or more right whales are reported.

25. DMAs have been regularly established in New England waters south and east of Nantucket and Martha's Vineyard over the last several years due to significant aggregations of whales.

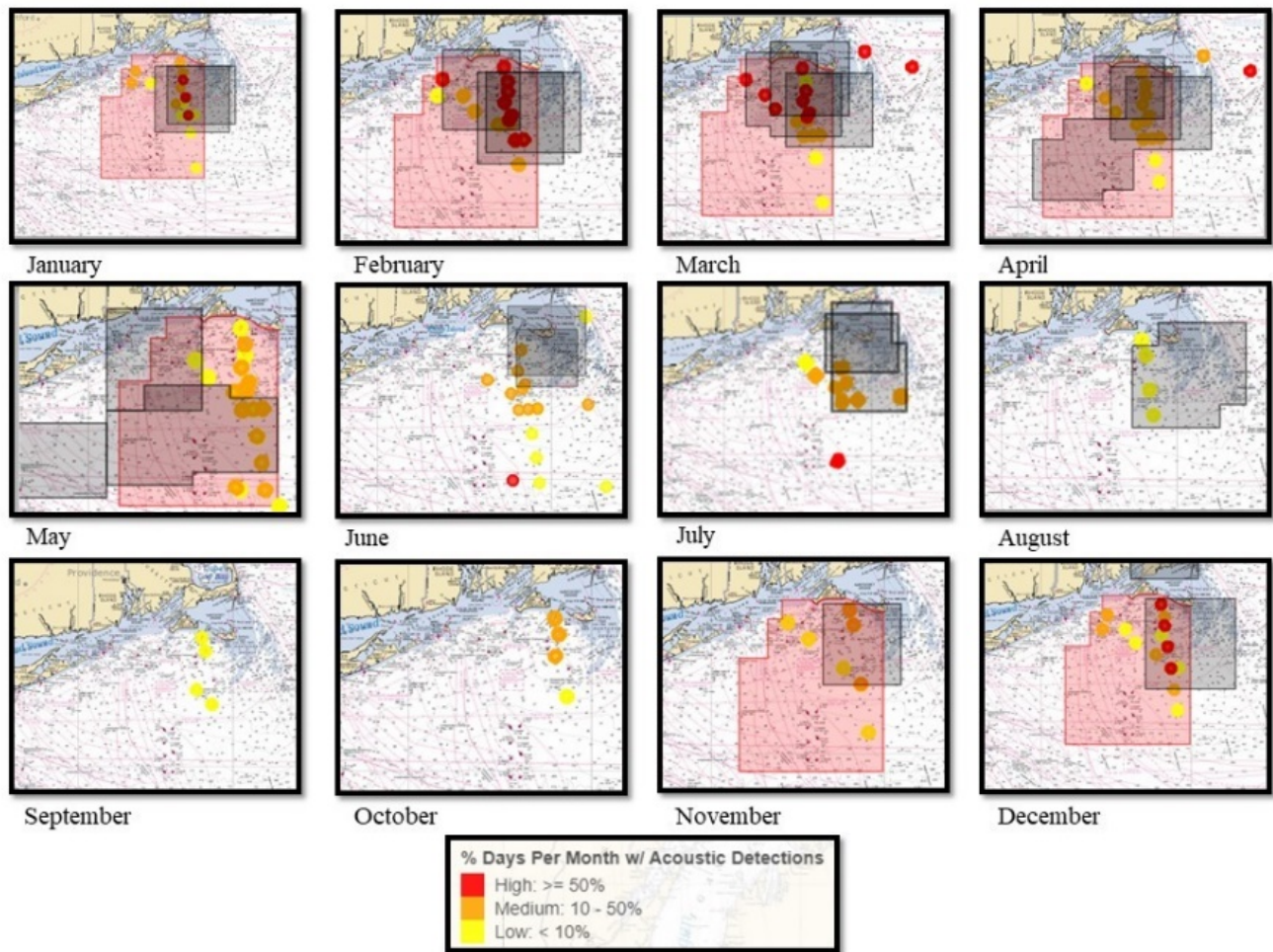


Figure 4: The grey boxes represent DMAs by month for 2017-2019 (January through August) and 2016-2018 (September through December). The circles represent acoustic detections by month between 2010-2018. The red box represents statistical area 537 for reference, but it is not available as an optional layer February – June. Data used to create these maps available at: <https://www.nefsc.noaa.gov/rcb/interactive-monthly-dma-analyses/january-interactive-trt.html>.

26. During one DMA in 2019 (Figure 5), more than 100 whales (one quarter of the entire population) were in the area south of Martha's Vineyard and Nantucket at one time. This significant concentration of whales overlaps with the Protected Area sought by Plaintiffs.

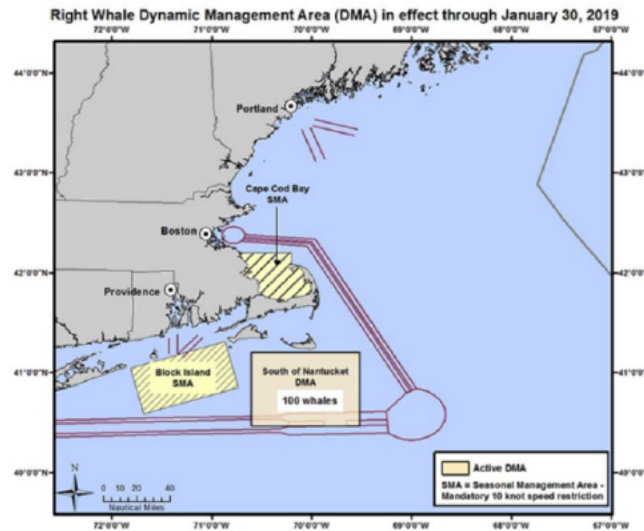


Figure 5:

https://www.greateratlantic.fisheries.noaa.gov/mediacenter/2019/01/28_voluntary_vessel_speed_restriction_zone_in_effect_south_of_nantucket_to_protect_right_whales.html.

27. In addition to increased sightings of live right whales, at least 7 dead right whales in the last three years have stranded (washed up on shore or towed to shore from sea) in Southern New England. These strandings were due to both entanglements and ship strikes. While these strandings do not necessarily establish that the entanglements were due to gear set in the proposed Protected Area, they do demonstrate that whales use the area and need additional protections.

USA					
2017	April	#4694	F	Barnstable, MA	Blunt force trauma (vessel strike)
2017	August	Unk	M	Martha's Vineyard, MA	Probable entanglement
2017	August	#2123	F	Cape Cod, MA (offshore)	Undetermined; could not be examined
2017	October	Unk	M	Nashawena Island, MA	Suspect entanglement
2017	November	#2611	F	Martha's Vineyard, MA	Undetermined; advance decomposition
2018	January	#3893	F	Virginia Beach, VA (offshore)	Chronic entanglement (gear present)
2018	August	Unk	M	Monomoy, MA	Probable entanglement
2018	October	#3515	F	Nantucket, MA (offshore)	Probable acute entanglement
2019	September	#1226	M	Long Island, NY (offshore)	Pending
2020	January	Calf of 2360	U	Georgia (offshore)	Presumed mortality; Sharp force trauma (vessel strike)

Figure 6: <https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2020-north-atlantic-right-whale-unusual-mortality-event>.

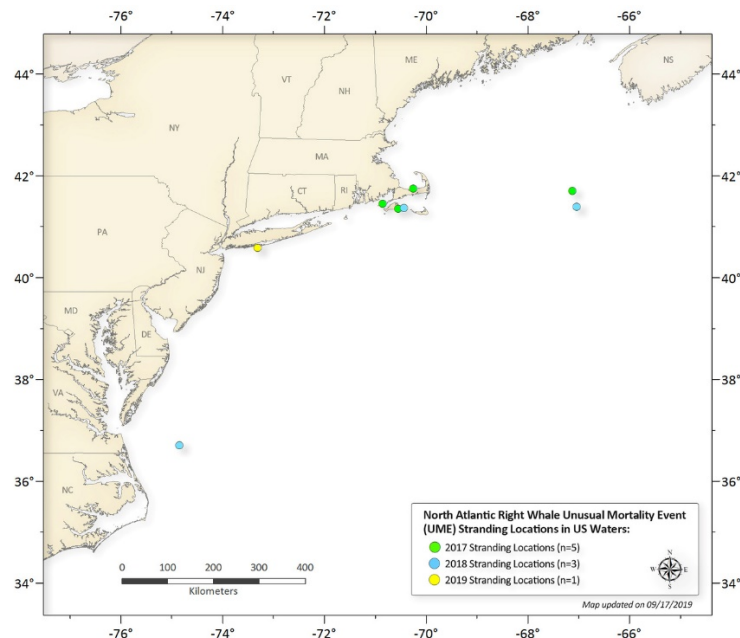


Figure 7: Map of North Atlantic right whale stranding locations along the Atlantic coast in U.S. waters. <https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2020-north-atlantic-right-whale-unusual-mortality-event>. The November 2017 presentation on the strandings by Michael Asaro to the Atlantic Large Whale Take Reduction Team also describes these strandings.

https://archive.fisheries.noaa.gov/garfo/protected/whaletrp/trt/meetings/2017%20Nov/asaro_usst_randings_nov2017.pdf.

28. In addition to strandings, live but severely entangled whales are most often sighted and reported where there is extensive vessel activity. For example, an 8 year old female named “Sundog” (#3823) was first sighted by a recreational boater entangled in U.S. lobster gear on September 22, 2016. She was seen gear free on March 7, 2017, after a disentanglement operation on Stellwagen Bank.

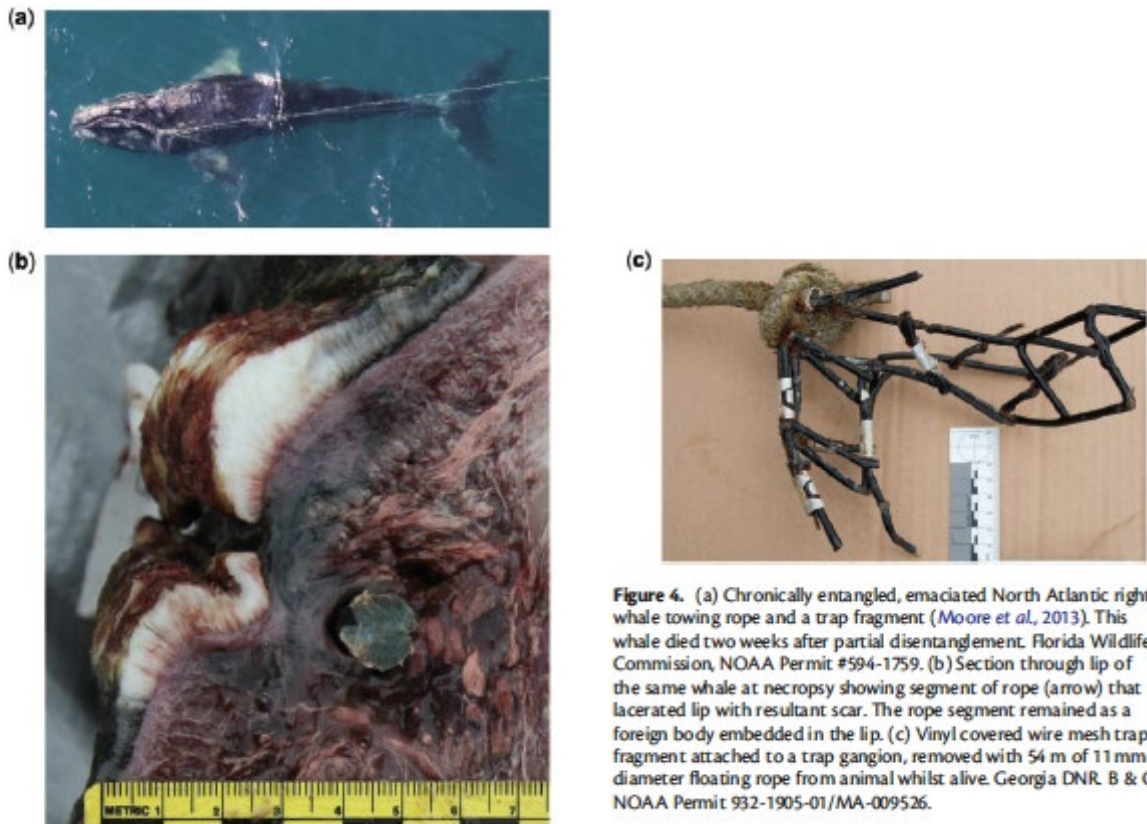
29. More recently, on December 21, 2019, a 15 year old male right whale (#3466) was spotted 20 miles south of Nantucket with three lines trailing from his mouth. He was spotted again in January. Disentanglement efforts could not be coordinated due to weather and this whale has not been sighted again.

30. And on February 24, 2020, scientists sighted a 19 year old female right whale named “Dragon” (#3180) 45 miles south of Nantucket with a fishing buoy lodged in her mouth. Her condition was described by scientists as “extremely emaciated and gray, suggesting she may have been entangled and unable to close her mouth for months.”

<https://www.usatoday.com/story/news/nation/2020/02/28/right-whale-dragon-entangled-fishing-bouy-appears-ailing/4909501002/>. Disentanglement efforts could not be coordinated due to weather and this whale has not been sighted again.

31. These seriously injured, entangled whales are most likely dead by now, and they could well be counted as serious injuries by NOAA Fisheries for the annual stock assessment report in due course.

32. As a veterinarian, I believe that these entangled animals also represent a serious animal welfare issue. As an example, I was able to examine #3911 (posthumously named “Bayla”) in great detail shortly after she died (*see* photographs below). Sighted gear free and plump on February 29, 2010, she was later sighted severely emaciated and entangled east of St. Augustine, Florida on December 25, 2010. She had 180 feet of 3/8 inch line removed, including a vinyl-covered wire mesh trap fragment attached to a trap gangion, but died soon after she was disentangled. The entangling gear was identified as a trap/pot of unknown origin. The line was embedded in her right lip (*see* photographs below from Moore 2019^{xxv}). The pain of such chronic trauma is hard to fathom. As is so often the case, the nature of the trap fishery involved was unclear, however, given the overwhelming preponderance of lobster gear present in right whale habitat, the fact the recovered gear had mesh and rope diameter consistent with that used by the lobster fishery should be taken into consideration. Her bones now reside in the Georgia Aquarium.



Threats from the Northeast Trap/Pot Fishery

33. Federal lobster permit holders are designated to a lobster management area (“LMA”) and must tag all traps.

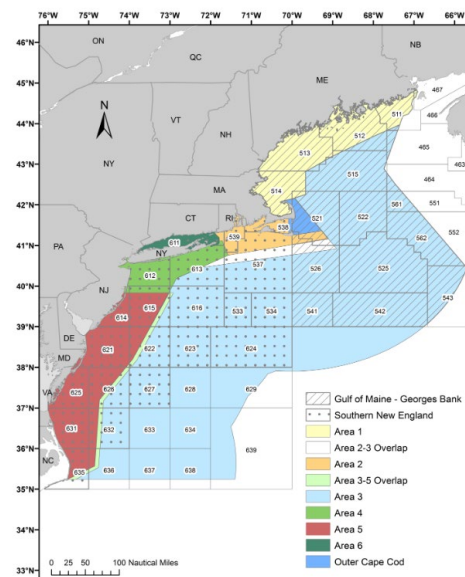


Figure 8: <http://www.asmfc.org/species/american-lobster> (map showing LMAs).

34. NOAA Fisheries has estimated that there are at least 1 million vertical fishing lines in the path of right whales as they migrate, forage, and socialize along the east coast. (Hayes *et al.* 2018^{xxvi}). Of these, NOAA Fisheries recently testified that “lobster fishing accounts for over 97% of the vertical lines on the east coast.” Michael Asaro Declaration in *CLF v. Ross*.

35. Furthermore, NOAA Fisheries has reaffirmed that “lobster gear poses a potential risk to right whales in any area where right whale and lobster fishery distributions overlap.” 2020 List of Fisheries, 85 Fed. Reg. 21079, 21086 (April 16, 2020).

36. Depending upon the LMA fished, there will be diverse local environmental conditions including tides, currents, and bottom habitat. There will also be differences in the length of active fishing seasons, the number of nights between hauling traps (soak time), the number of traps tied together to form a “trawl,” and the number of vertical lines required.

37. Vessels operating in the proposed Protected Area (which incorporates three LMAs known as EEZ Nearshore Management Area 2, LMA 2/3 Overlap, and EEZ Offshore Management Area 3), may each fish up to 1,945 traps at any given time (depending upon the area and permit).

38. In Southern New England waters, the trap/pot fishery targets both lobster and Jonah crabs under a Federal lobster permit.

39. In the proposed Protected Area, the regulations require a minimum of 10 traps per trawl (LMA2 between 3-12 nm from shore), 15 traps per trawl (LMA2 greater than 12 nm from shore) or 20 traps per trawl (LMA 2/3 overlap and LMA3) traps per trawl, as well as at least two surface buoys. *See, e.g.*, gear guide available here: <https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-mammal-protection/atlantic-large-whale-take-reduction-plan#outreach>.

Typically, the more traps per trawl, the longer the lines and the heavier the gear is.

40. In recent years, the majority of rope seen on and removed from right whales has been heavy, large-diameter rope (Hayes *et al.* 2018^{xxvii}; Sharp *et al.* 2019^{xxviii}; NOAA Fisheries' 2000-2018 Right Whale Incident Data Spreadsheet). This gear, which has a higher breaking strength, is consistent with line used in the offshore lobster fishery or the Canadian snow crab fishery. An analysis of entanglement cases found only severe injuries resulting from higher breaking strength line (Knowlton *et al.* 2016^{xxix}); a whale is more likely to drown immediately anchored in heavy gear or to drag it around for months, eventually causing death.

41. Under the Atlantic Large Whale Take Reduction Plan ("ALWTRP"), among other restrictions on where and how fishing gear can be set, there are two seasonal trap/pot closures for commercial fisheries in the Northeast: (1) the Massachusetts Restricted Area is closed to all trap/pot fishing between February 1 and April 30 (Figure 9); and (2) the Great South Channel Restricted Area is closed to all trap/pot fishing between April 1 and June 30 (Figure 10).



Figure 9: <https://www.fisheries.noaa.gov/webdam/download/94698537>.



Figure 10: <https://www.fisheries.noaa.gov/webdam/download/94698537>.

Protected Area Sought

42. The boundaries of the protected area Plaintiffs seek in Southern New England are shown below in red.

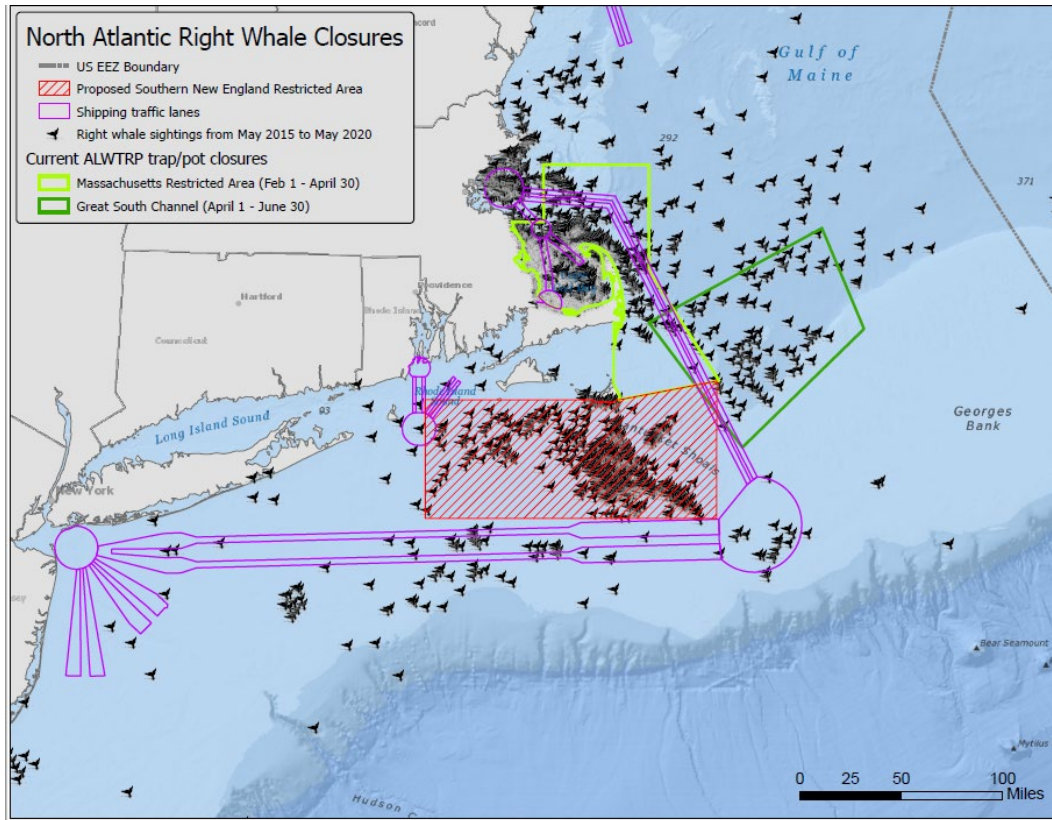


Figure 11: Plaintiffs' proposed Southern New England Restricted Area. Created using the following data sources: Shipping lanes – NOAA. Download link: <https://nauticalcharts.noaa.gov/data/gis-data-and-services.html#enc-direct-to-gis>; Current ALWTRP trap/pot closures – digitized from maps in <https://www.fisheries.noaa.gov/webdam/download/94698537>; Right whale sightings – digitized from <https://fish.nefsc.noaa.gov/psb/surveys/MapperiframeWithText.html>; US EEZ boundary: Marineregions.org.: <https://www.marineregions.org/downloads.php>; Basemap: ESRI.

The coordinates for the area going clockwise from the northeastern most point are as follows:

41° 21.5'N, 69° 16'W
 40° 37.02'N, 69° 16'W
 40° 37.02'N, 70° 18.9'W
 40° 37.02'N, 71° 20.6'W
 41° 15.3'N, 71° 20.6'W
 41° 15.3'N, 70° 18.9'W
 41° 15.3'N, 70° 10.6'W
 41° 15.3'N, 69° 57.9'W

43. The entanglement risks in Southern New England waters are significant; there are risks of entanglement mortality and also risks from entanglements that do not directly kill the animals yet materially reduce their ability to successfully produce and rear new calves, a major key to species recovery.

44. To address the acute entanglement risk posed by trap/pot gear in Southern New England waters, the Commonwealth of Massachusetts recently proposed a seasonal closure (February 1 – April 30) to fixed fishing gear to protect right whales under the Atlantic Large Whale Take Reduction Plan <https://www.mass.gov/service-details/conservation-of-protected-marine-species> (Massachusetts Right Whale Conservation Plan 2020).

45. It is unclear what, if anything, will come of the Commonwealth's proposal to NOAA Fisheries. However, as discussed above, the last 5 years of sighting data demonstrates that year-round protections, as well as closures of the additional waters to the west of the Commonwealth's proposal, are necessary to adequately protect the species from entanglement risk in Southern New England.

Ropeless Fishing

46. Ropeless fishing—also known as “on-demand” or “buoyless” fishing gear—has the potential to create a safer ocean for right whales and for other species also threatened by gear rope. The technology necessary to retrieve devices from the bottom of the ocean floor has been around for decades. More recently, this technology has been used to retrieve fishing gear acoustically. There is a range of ropeless gear technology in development that could offer a strong alternative to vertical lines in the water. The advantages to fishermen using ropeless gear include reduced gear loss, expanded fishing opportunities during closures, improved enforcement and therefore less illegal fishing, and reduced interactions with wildlife.

47. Ropeless fishing systems allow connected traps on the seafloor to be remotely called to the surface and eliminate the permanent vertical lines in the water column that entangle whales. These systems can show the gear owner and other interested parties (such as other trap fishers, mobile fishing gear operators, and law enforcement agencies), the location of bottom traps through GPS and/or acoustic trap locations displayed on wheelhouse plotters. Specifically, the ropeless system (depending upon the manufacturer either a stowed rope and buoy, a lift bag, or a spool as shown below) sits on the seafloor attached to the first trap and contains an acoustic modem. The surface deployment location is recorded by GPS, some systems also communicate the bottom location acoustically. Fishermen then return to the location, and a second paired modem on their boat uses high-frequency sound waves to trigger the buoy or a lift bag to come to the surface. The traps can then be hauled using traditional fishing practices.

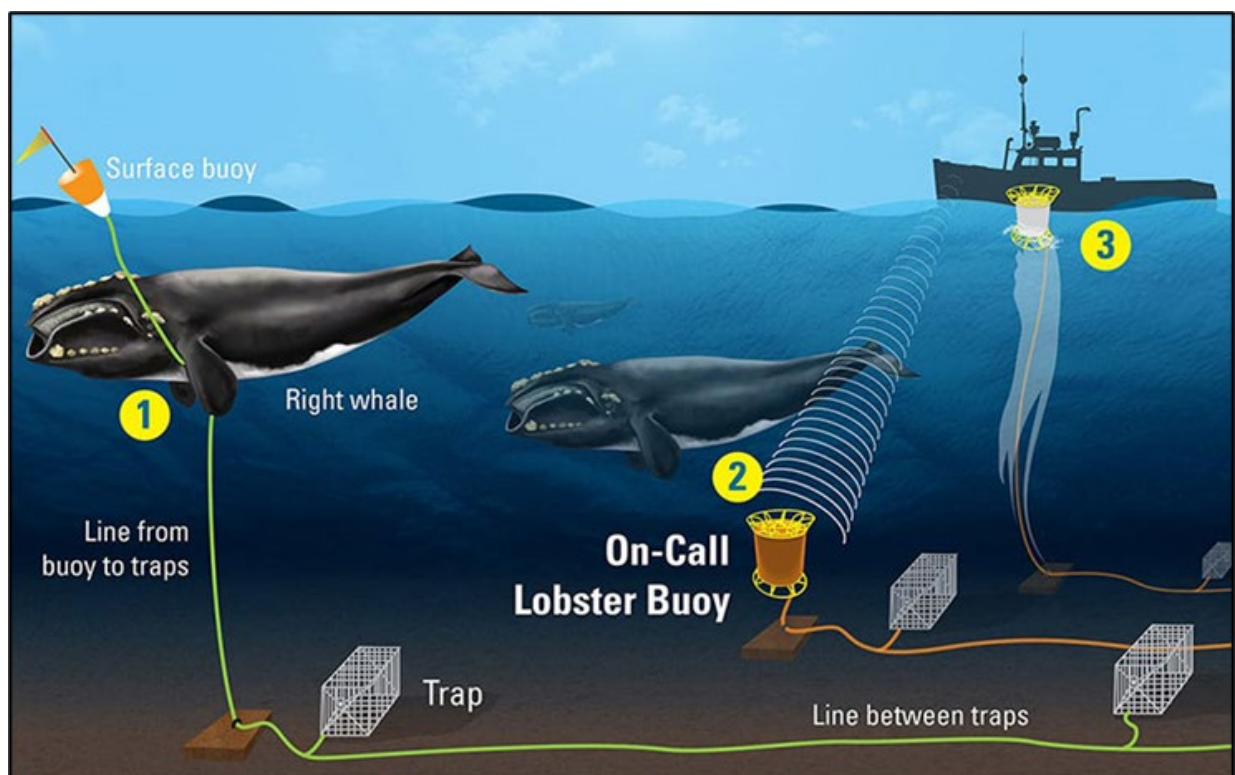


Figure 12: On-Demand Fishing Gear (Illustration by Eric Taylor, WHOI Graphic Services. Link: <https://www.whoi.edu/oceanus/feature/how-would-on-call-buoys-work/>).

48. Ropeless fishing would effectively eliminate lines from the water column, allowing sustainable coexistence between whales and trap fishers. To establish a data clearing house, colleagues and I established the Ropeless Consortium (“RC”) (ropeless.org). At the 2019 Ropeless Consortium meeting, fisher feedback demonstrated that ropeless technologies are essentially ready for use. They have been tested in California, the Gulf of St. Lawrence, Nova Scotia and Massachusetts. They are routinely used commercially in New South Wales, Australia. And there is serious consideration of their use in the Dungeness crab fishery in California.

49. Although the economies of scale that would be expected to develop with more wide-scale adoption of ropeless fishing are not in place yet, enabling the proposed Protected Area to be open to fishing traps without vertical lines in the water column will protect right whales and help provide the necessary incentive for the industry to develop systems that are affordable, reliable and safe in each of their hands. The NOAA Northeast Fisheries Science Center has a ropeless gear cache designed to promote development in this direction.

Conclusions about Impacts of the Northeast American Lobster Trap/Pot Fishery Operating in Southern New England on the Right Whale Population

50. As shown above, the proposed Protected Area has become a foraging hotspot for right whales. While there is no way to know the overall number of vertical lines used in the fishery in that area because NOAA Fisheries does not require sufficient reporting, those lines are used and distributed throughout the area. The increased use of the area by right whales increases the risk of entanglement, especially when feeding with their mouths open. The primary way to mitigate that risk is to reduce the number of vertical lines deployed in all fixed gear fisheries, including the American lobster fishery.

51. Based on this evidence and my 20+ years of professional experience with human-caused effects on right whales, it is my expert opinion that allowing traditional trap/pot fishing to

continue in the proposed Protected Area is likely to lead to entanglement, causing potential injury or death, to one or more right whales. Because of the precarious status of this species, a year-round prohibition on NOAA Fisheries' authorization of the use of static vertical lines in the American lobster fishery (but allowing ropeless gear) in the proposed Protected Area is necessary to avoid these effects which are likely to have population-level impacts on the North Atlantic right whale species. Short of closing down the entire fishery, protecting the area proposed by Plaintiffs is an important aspect of preventing further right whale entanglements until new, comprehensive regulatory changes are effective, while also being a major incentive to the development and adoption of affordable, safe and efficient ropeless systems.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Executed on May 15th, 2020, at Woods Hole, Massachusetts.

A handwritten signature in dark ink, appearing to read "Michael J. Moore", followed by a long horizontal flourish.

MICHAEL J. MOORE, Vet. M.B., Ph.D.

Attachments: (1) Current CV; (2) List of Peer-reviewed and Technical Publications.

Literature Cited

-
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- ⁱⁱ Mayo, C. A., L. Ganley, C. A. Hudak, S. Brault, M. K. Marx, E. Burke and M. W. Brown. 2018. Distribution, demography, and behavior of North Atlantic right whales (*Eubalaena glacialis*) in Cape Cod Bay, Massachusetts, 1998–2013. 34:979-996.
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- ^v North Atlantic Right Whale Consortium. 2019. <http://rwcatalog.neaq.org>.
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- ^{viii} Record et al. 2019. Rapid climate-driven circulation changes threaten conservation of endangered North Atlantic Right Whales. *Oceanography* 32.132:169.
- ^{ix} van der Hoop, J., P. Corkeron and M. Moore. 2017. Entanglement is a costly life-history stage in large whales. *Ecology and evolution* 7:92-106.
- ^x Sharp, S., W. McLellan, D. Rotstein, A. Costidis, S. Barco, K. Durham, T. Pitchford, P.-Y. Daoust, T. Wimmer, E. Couture, L. Bourque, T. Frasier, B. Frasier, D. Fauquier, T. Rowles, P. Hamilton and M. Moore. 2019. Gross and histopathologic diagnoses from North Atlantic right whale *Eubalaena glacialis* mortalities between 2003 and 2018. *Dis. Aq. Org.* 135:1-31.
- ^{xi} Moore, M., A. Knowlton, S. Kraus, W. McLellan and R. Bonde. 2004. Morphometry, gross morphology and available histopathology in Northwest Atlantic right whale (*Eubalaena glacialis*) mortalities (1970 to 2002). *Journal Cetacean Research and Management* 6:199-214.
- ^{xii} Moore, M., G. Mitchell, T. Rowles and G. Early. Dead Cetacean? Beach, Bloat, Float, Sink. *Frontiers in Marine Science* doi: 10.3389/fmars.2020.00333. In Press. <https://www.frontiersin.org/articles/10.3389/fmars.2020.00333/full>.

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- ^{xiii} Moore, M., A. Knowlton, S. Kraus, W. McLellan and R. Bonde. 2004. Morphometry, gross morphology and available histopathology in Northwest Atlantic right whale (*Eubalaena glacialis*) mortalities (1970 to 2002). *Journal Cetacean Research and Management* 6:199-214.
- ^{xiv} Sharp, S., W. McLellan, D. Rotstein, A. Costidis, S. Barco, K. Durham, T. Pitchford, P.-Y. Daoust, T. Wimmer, E. Couture, L. Bourque, T. Frasier, B. Frasier, D. Fauquier, T. Rowles, P. Hamilton and M. Moore. 2019. Gross and histopathologic diagnoses from North Atlantic right whale *Eubalaena glacialis* mortalities between 2003 and 2018. *Dis. Aq. Org.* 135:1-31.
- ^{xv} Hayes SA, Gardner S, Garrison L, Henry A, Leandro L. 2018. North Atlantic right whales - Evaluating their recovery challenges in 2018. NOAA Tech Memo NMFS NE. 247; 24 p. Online at: <https://doi.org/10.25923/w9cy-5844>.
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<https://academic.oup.com/icesjms/advance-article/doi/10.1093/icesjms/fsy194/5288134:fsy194-fsy194>
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IN THE UNITED STATES DISTRICT COURT

Attachment 1: Current Curriculum Vitae

MICHAEL MOORE

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Woods Hole MA 02543 U.S.A.
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EXPERIENCE

1991 to present Senior Scientist (2016 to present), Director Marine Mammal Center (2011 to present), Senior Research Specialist (2006 to 2016), Research Specialist (1995 to 2006), Visiting Investigator (1993 to 1995), Postdoctoral Investigator (1991 to 1993): Biology Department, Woods Hole Oceanographic Institution.

1998 to present Program Director (1998 to 2000), Veterinarian (2001 to 2005), Cape Cod Stranding Network. Now International Fund for Animal Welfare, Marine Mammal Rescue Research (2005 to present).

1997 to 2006 Lecturer, Boston University Marine Program.

1985 to 1986 Veterinarian, Laboratory for Marine Animal Health (Marine Biological Laboratory), Dept. Avian & Aquatic Animal Medicine, N.Y.S. College Veterinary Medicine.

1983 to 1985 Associate Veterinarian, Bulger Animal Hospital, N. Andover, MA Veterinarian.

1983 International Whaling Commission, Hvalfjordur, Iceland.

1979 to 1980 Assistant Scientist, Ocean Research and Education Society (R/V Regina Maris).

1979 to 1982 Field Research Assistant, Zoology Department, University of Cambridge, England.

DEGREES

1986 to 1991 PhD WHOI/MIT Joint Program in Biological Oceanography.

1979 to 1983 Vet MB Department of Clinical Veterinary Medicine, University of Cambridge, England.

1975 to 1979 B.A. Pembroke College, University of Cambridge, England.

ACADEMIC AND PROFESSIONAL HONORS

2018 Stanley Watson Chair (WHOI).

2006 Fellow – WHOI Ocean Life Institute.

2003 Outstanding Service Award, Cape Cod Stranding Network.

1983	Sismey Prize in Medicine & Surgery.
1981	Glaxovet Parasitology Prize.
1977	University of Cambridge, Foundation Scholar.
1976	Foundress Memorial Prize, Pembroke College, University of Cambridge.
1975	Exhibition - Pembroke College, University of Cambridge.

LICENSURE

National: Certified A.V.M.A. Educational Commission for Foreign Veterinary Graduates.

State Veterinary License: Massachusetts.

Northeast Region, National Marine Fisheries Service Authorization to maintain tissue parts from stranded marine mammals.

EDUCATION

GRADUATE STUDENTS

ADVISED

WHOI/ MIT Joint PhD Program in Biological Oceanography

Julie van der Hoop, 2011 to 2016 – PhD

Regina Campbell-Malone, 2001 to 2007 – PhD

Boston University Marine Program

Nadine Lysiak, 2003 to 2008 – PhD

Carolyn Miller, 1998 to 2005 – PhD

Melinda Sweeny, 2000 to 2003 – MA

Stefani Valentini, 1997 to 1998 – MA

University of Massachusetts Dartmouth

Michael Morss, 1996 to 1998 – MA

College of the Atlantic

Colby Moore, 2007 to 2009 – MA

Royal Veterinary College

Ashley Barratclough, 2013 – MS

European University Institute of Sea, Brest France

Perrine LeFaou, 2007 to 2008 – MS

University College London

Maria Martins, 2018 to 2019 – MS

COMMITTEE

WHOI/ MIT Joint PhD Program in Biological Oceanography

Nicholas MacFarlane, 2010 to 2015 – PhD

Max Kaplan, 2014 to Present – PhD

University of Connecticut

Andrea Bogomolni, 2009 to 2014 – PhD

Duke University Marine Lab

Rachel Cassoff, 2013 to 2017 – PhD

University of Maine Orono

Becky Woodward, 2005 to 2009 – PhD

Jeremy Winn, 2009 to 2011 – MA

DEFENSE CHAIR (WHOI/ MIT)

Susan Parks, 2003 – PhD

Maya Yamato, 2013 – PhD

Camryn Braun, 2018 – PhD

POST DOCTORAL SCHOLAR

Becky Woodward, 2010 to 2012

POST DOCTORAL INVESTIGATORS

Yara Bernaldo de Quiros, 2013 to 2015

Alex Shorter, 2001 to 2013

Julie van der Hoop, 2016 to 2017

GUEST STUDENTS

University of Keil

Jasmin Huett, 2020

University College London

Maria Martins, 2018-2019

Kansas State University, College of Veterinary Medicine

Michael Denk, 2018-2019

University of Cambridge

Hannah Cubaynes, 2018

University College London

Maria Martins, 2018-2019

Wentworth Institute of Technology

Bailey Avila, 2017

Duke University Marine Lab

Samantha Emmert, 2014 – Summer Fellow Undergraduate

Jessica Richardson, 2011 to 2012 – Duke/ WHOI Fellow

Smith College

Caroline Kerouack, 2012 – Undergraduate

University of Pennsylvania

Rachel Cassoff, 2010 – DVM candidate

College of Charleston

Carmen Wiegandt, 2013 – Undergraduate

Tufts University School of Vet Med

Melissa Joblon, 2014 – DVM candidate

Stephanie Levesque, 2014 – MA

Meghan Hartwick, 2011 to 2012 – MA

UCLA

Eden Maloney, 2010 – Undergraduate

Cornell University

Karen Tracy, 2010 – Undergraduate

University of Tolima, Colombia

Carolina Gutierrez, 2007 – Summer Fellow

COURSES TAUGHT

WHOI/MIT Joint PhD Program in Biological Oceanography

Fall 1999 – Topics in Behavior – Marine Mammal Anatomy

Spring 2003 – Topics in Behavior – Comparative Anatomy of Air-Breathing

Marine Vertebrates

Spring 2004 – Marine Mammal Toxicology

Spring 2010 – Gast JP topics course – Ocean and Human Health

Boston University Marine Program

October 1997 – Marine Mammals – Anatomy section
October 1998 – Marine Mammals – Anatomy section
February 1999 – Marine Mammal Anatomy
University of Pennsylvania/ Cornell University
1989 to present – Aquavet Program
University of Chicago
2015 – Whales Course

OTHER MENTORING

As Director of the WHOI Marine Mammal Center, I have used that position to support WHOI colleagues in that discipline, including Aran Mooney, Amy Apprill, Gareth Lawson, Mark Baumgartner and Laela Sayigh, both fiscally and for some in terms of career development. National and international role as mentor and consultant for large whale trauma investigations.

MAJOR CRUISES

Winter flounder survey for Massachusetts Water Resources Authority – annual April cruise, 1990 to present (Chief Scientist)
Large whale survey and biopsy, RV Abel J. Falkland Islands to South Georgia – January and February 1997 (Chief Scientist)
Right whale body condition surveys, Bay of Fundy – August 1995 to 2002 (Chief Scientist)
North Atlantic historic right whaling habitat survey, 15 months, 18,000 miles – 2001/2002 (Skipper)
Survey of Basque whaling sites in Labrador Straits – July 2004 and Lower N Shore Quebec – July 2005 (Skipper)
Field studies, Dolphin Quest, Honolulu – 2014
Field studies, Chicago Zoological Society dolphin health assessments, Sarasota, FL – 2011 to present
Field studies, UBC open water facility, Vancouver, BC – 2012, 2013 (PI)
Acoustic behavioral studies Bay of Fundy – August 2004 (Skipper)
Sperm whale physiology – RV Alucia, Kaikoura New Zealand – March 2013 (Chief scientist).
Blue whale photogrammetry, Gulf of Corcovado, Chile RV Centinella – Feb/ Mar 2015 (PI)
Humpback whale photogrammetry and blow sampling, Stelwagen Bank – July 2015 (PI)
Right whale photogrammetry and blow sampling, East of Amelia Island, FL – Feb 2016 and 2017 (PI)
Right whale photogrammetry and blow sampling, Cape Cod Bay, MA – Feb 2016 to present (PI)

NECROPSIES UNDERTAKEN

42 right whales, 12 humpback whales, 6 minke whales, 1 fin whale, 1 blue whale, 1 sperm whale, and numerous smaller species. With substantial local student involvement (FL to Quebec, and Argentina).

SOCIETY MEMBERSHIP

Society for Marine Mammalogy
American Veterinary Medical Association

COMMITTEE/ PANEL/ TASKFORCE MEMBERSHIP

WHOI

Marine Mammal Center Director (2011 to present)
Staff Committee (2006 to 2008)
Sea Water Users Committee (1988 to present), Chair (2011 to present)
Information Systems Council (1995 to 1997)
Institutional Animal Care and Use Committee Veterinarian (1987 to present)

EXTERNAL

Ropeless Consortium: Chair (2018 to 2019), Vice Chair (2019 to present)
NOAA Working Group Marine Mammal Unusual Mortality Events (2012 to 2019),
Chair (2015-2019)
NOAA Atlantic Scientific Review Group (2012 to present)
NOAA Right whale/fishery gear interaction workshops (2008 to 2014)
MWRA Outfall Monitoring Science Assessment Panel – periodically in past decade
South Georgia Heritage Trust Trustee (2005 to 2015)
National Institute of Environmental Health Sciences Site Review Team (June 1998
and June 2003)
New Bedford Whaling Museum Trustee (2005 to 2011, 2015 to present)
Right Whale Consortium: Board Member (1999 to present), Vice President (2002 to
2004), President (2004 to 2007)
Barnstable County MMR Scientific Advisory Panel (1996 to 1997)
Various regional panel discussions on MWRA issues (1993 to 1995)
Sippican Lands Trust Trustee (1993 to 2003)
Mass Water Resources Authority Outfall Monitoring Taskforce (1992 to 1993)
Annual presentations to MWRA Science Review meetings (1992 to present)
Island Foundation Inc.: Corporator (1984 to present), President (2003 to 2007)

JOURNAL REVIEW

EDITOR

Diseases of Aquatic Organisms: Aquatic Mammals Subject Editor (2006 to 2015,
2017 to present)
Endangered Species Research Special Issue Editor (2016)

REVIEWER

Marine Pollution Bulletin, ICES Journal of Marine Science, Marine Environmental
Research, Aquatic Toxicology, Science, Nature, Marine Mammal Science, J
Mammalogy, J Cetacean Research and Management, J Mammalogy,
Endangered Species Research, Aquatic Mammals, J Wildlife Disease, Marine
Ecology Progress Series.

WORKSHOPS and PRESENTATIONS (Recent)

INVITED PRESENTATIONS

Atlantic Veterinary College – Animal Welfare in Practice: Marine Mammal Stranding. Prince Edward Island, Canada (September 2018).
TEDx. Provincetown (June 2018).
ONR Diving Physiology Workshop – Presenter. Santa Cruz, CA (2018).
IWC/ONR/NOAA Tagging Workshop – Steering Committee and Invited Presenter. Silver Spring, Maryland (2018).
National Stranding Conference – Plenary talks on Unmanned Aerial System applications, documentation of case reports and definitions, and diagnosing vessel trauma. Location (September 2016).
Biennial Marine Mammal Society Meeting – Unmanned Aerial Systems workshop, Invited Presenter. San Francisco, California (2015).
University of Massachusetts Dartmouth Art Department – Invited Lecturer. Dartmouth, MA (February 2015).
Woods Hole Film Festival – Invited Panel discussion of Chasing Bayla (Boston Globe) (August 2015).
Global Whale Entanglement Response Network Workshop – Invited Presenter. Provincetown, MA (2015).
Marion Natural History Society – Invited Lecturer. Marion, MA (February 2015 and February 2016).
NOAA Serious Injury Workshop – Invited Participant. Seattle, WA (2014).
International Whaling Commission – Invited to teach workshop on large whale necropsy technique. La Paz Mexico (2013) and St. Maarten (2014).
Biennial Marine Mammal Society Meeting – Right Whale Workshop Invitee Dunedin, NZ (December 2013).
Tufts Veterinary School – Marine mammal forensics invited lecturer. Grafton, MA (2013).
International Whaling Commission – Large Whale Euthanasia Workshop, Invited Participant. London (2013).
Stellwagen Bank National Marine Sanctuary Advisory Council – Science Alternate. Location (2013)
St. Andrew's University, Sea Mammals Research Unit – Invited Seminar. Scotland (2013).
WSPA Marine Debris Workshop – Invited Participant. Miami, FL (2013).
IWC Marine Debris Workshop – Invited Participant. Woods Hole, MA (2013).
New England Aquarium, Population Consequences of Disturbance Workshop – Invited Participant. Boston, MA (2013).
WHOI Summer Student Fellow Orientation on IACUC. Woods Hole, MA (2010 to present).
Aquavet 2, Marine mammal forensics – Invited Lecturer. Woods Hole, MA (2013 to present).
IWC Scientific Committee – Invited talk on Marine Mammal Forensics. Jeju, Korea (2013).
WHOI Workshop – Convened and chaired workshop: Implications of Arctic industrial growth and strategies to mitigate future vessel and fishing gear impacts. Anchorage, AK.
NOAA CINAR Workshop: Defining criteria for diagnosing human interaction in marine mammals – convened, chaired and lead resulting monograph publication. Woods Hole, MA (2012).

Huntsman Aquarium – Invited Lecturer on right whale conservation via Skype.
St. Andrews NB, Canada (2012).
NOAA Marine Mammal Breath Analysis Workshop SWFSC – Invited
Participant. La Jolla, CA (2012).
NOAA Large whale euthanasia workshop – Invited Presentation. Virginia Beach,
VA (2011).
Global Whale Disentanglement Response Network – Workshop on large whale
disentanglement, Invited Presentation. Provincetown, MA (2011).
UBC, Vancouver – Invited Seminar: 'Large Whale Forensics: A Management
Tool.' Vancouver (2011).
NEAq Reverse Engineering Workshop – Invited Participant. Woods Hole, MA
(2011).
World Society Protection of Animals Conference – Invited Speaker. United
Kingdom (2011).
IWC Southern Right Whale Die Off Workshop – Invited Paper. Puerto Madryn,
Argentina (2010).
IWC Large Whale Entanglement Workshop – Invited Paper. Maui, HI (2010).
National Stranding Conference, Forensics Workshop – Invited Paper.
Shepherdstown, WV (April 5 - 9 2010).
WHOI, Gas Kinetics Workshop – Invited Participant. Woods Hole, MA (2010)
Convened and chaired three workshops on large whale medical intervention at
sea. Woods Hole, MA (2000, 2002, 2007).

WORKSHOPS AND MEETING PRESENTATIONS

North Atlantic Seal Research Consortium
University of Massachusetts Dartmouth (2019)
Salem State University (May 2015), participant
Ropeless Consortium
New Bedford, MA (2018), co-chair
New Bedford, MA (2009, 2010, 2011, 2013)
Ropeless Workshop. Woods Hole, MA (2018), co-chair
Right Whale Consortium
New Bedford, MA (2018)
Halifax, NS (2017)
Biennial Marine Mammal Society Meeting
Halifax, NS (2017)
San Francisco (2015)
Wildlife Society Annual Meeting: NOAA Unmanned Aerial Systems Workshop.
Pittsburgh, PA (2014), Participant
Biennial Marine Mammal Society Meeting. Dunedin, NZ, (December 2013),
spoken presentation
WHOI Workshop on the impact of gillnets on marine mammals. Woods Hole,
MA (2010)
NOAA Gear Innovations Workshop. New Bedford, MA (2010)
NOAA National Working Group on Unusual Marine Mammal Mortalities.
Location (2011)
PCAD Workshop. Boston (2010)

Marine Mammal Society Biennial Meeting. Quebec City (2009), two talks
Ocean Human Health Gordon Conference. Biddeford, ME (2010), talk

Attachment 2: List of Peer-reviewed and Technical Publications**Publications (151 total)****2020**

1. Myers, H. and M. Moore. 2019. Preprint - <https://darchive.mblwhoilibrary.org/handle/1912/24899>. Reducing effort in the U.S. American lobster (*Homarus americanus*) fishery to prevent North Atlantic right whale (*Eubalaena glacialis*) entanglements may support higher profits and long-term sustainability. Marine Policy. In Press.
2. Moore, M., G. Mitchell, T. Rowles and G. Early. Dead Cetacean? Beach, Bloat, Float, Sink. *Frontiers in Marine Science*. doi: 10.3389/fmars.2020.00333. In Press.
3. Martins, M., C. Miller, P. Hamilton, J. Robbins, D. Zitterbart and M. Moore. Respiration cycle duration and seawater flux through open blowholes of humpback (*Megaptera novaeangliae*) and North Atlantic right (*Eubalaena glacialis*) whales. *Marine Mammal Science*. In Press.
4. Denk, M.A., A. Fahlman, S. Dennison-Gibby, Z. Song and M.J. Moore. Hyperbaric Tracheobronchial Compression in Cetaceans and Pinnipeds. *J. Exp. Biol.* 223, jeb217885. doi:10.1242/jeb.217885.
5. Carroll, E. L., P. H. Ott, L. F. McMillan, B. Galletti Vernazzani, P. Neveceralova, E. Vermeulen, O. E. Gaggiotti, A. Andriolo, C. S. Baker, C. Bamford, M. Moore et al. 2020. Genetic diversity and connectivity of southern right whales (*Eubalaena australis*) found in the Brazil and Chile-Peru wintering grounds and the South Georgia (Islas Georgias del Sur) feeding ground. *Journal of Heredity*. In press.
6. Christiansen, F., S. M. Dawson, J. W. Durban, H. Fearnbach, C. A. Miller, L. Bejder, M. Uhart, M. Sironi, P. Corkeron, W. Rayment, E. Leunissen, E. Haria, R. Ward, H. A. Warick, I. Kerr, M. S. Lynn, H. M. Pettis and M. J. Moore. 2020. Population comparison of right whale body condition reveals poor state of the North Atlantic right whale. *Marine Ecology Progress Series* 640:1-16.
7. Cubaynes, H.C., W.G. Rees, J.A. Jackson, M. Moore, T.L. Sformo, W.A. McLellan, M.E. Niemeyer, J.C. George, J. van der Hoop and J. Forcada. Spectral reflectance of whale skin above the sea surface: a proposed measurement protocol Remote Sensing in Ecology and Conservation. doi: 10.1002/rse2.155, 2020.

2019

8. Christiansen, F., M. Sironi, M. J. Moore, M. Di Martino, M. Ricciardi, H. A. Warick, D. J. Irschick, R. Gutierrez and M. M. Uhart. Estimating body mass of free-living whales using aerial photogrammetry and 3D volumetrics. *Methods in Ecology and Evolution* 10:2034-2044.

9. Myers, H.J., M.J. Moore, M.F. Baumgartner, S.W. Brilliant, S.K. Katona, A.R. Knowlton, L. Morissette, H.M. Pettis, G. Shester and T.B. Werner. Ropeless fishing to prevent large whale entanglements: Ropeless Consortium report. *Marine Policy*. 107: p. 103587.
10. Hunt, K.E., N.S. Lysiak, C.J. Matthews, C. Lowe, A. Fernández Ajó, D. Dillon, C. Willing, M.P. Heide-Jørgensen, S.H. Ferguson, and M.J. Moore. Multi-year patterns in testosterone, cortisol and corticosterone in baleen from adult males of three whale species. *Conservation physiology*. 6(1): p. coy049.
11. Moore, M.J. How we can all stop killing whales: a proposal to avoid whale entanglement in fishing gear. *ICES Journal of Marine Science*. 76.4:781-786.
12. Richardson, K., R. Asmutis-Silvia, J. Drinkwin, K.V. Gilardi, I. Giskes, G. Jones, K. O'Brien, H. Pragnell-Raasch, L. Ludwig, and K. Antonelis, M Moore et al. Building evidence around ghost gear: Global trends and analysis for sustainable solutions at scale. *Marine Pollution Bulletin*. 138: p. 222-229.
13. Martins, M. C. I., L. Sette, E. Josephson, A. Bogomolni, K. Rose, S. M. Sharp, M. Niemeyer and M. Moore. Unoccupied aerial system assessment of entanglement in Northwest Atlantic gray seals (*Halichoerus grypus*). *Marine Mammal Science*. <https://doi.org/10.1111/mms.12590>.
14. Sharp, S., W. Mclellan, D. Rotstein, A. Costidis, S. Barco, K. Durham, T. Pitchford, P.-Y. Daoust, T. Wimmer, E. Couture, L. Bourque, T. Frasier, B. Frasier, D. Fauquier, T. Rowles, P. Hamilton and M. Moore. Gross and histopathologic diagnoses from North Atlantic right whale *Eubalaena glacialis* mortalities between 2003 and 2018. *Dis. Aq. Org.* 135(1), pp.1-31.
15. Fahlman, A., K. McHugh, J. Allen, A. Barleycorn, A. Allen, J. Sweeney, R. Stone, G. Bedford, M. J. Moore and F. Jensen. Resting metabolic rate and lung function in wild offshore common bottlenose dolphins, *Tursiops truncatus*, near Bermuda. *Frontiers in Physiology* 9: 886.

2018

16. van der Hoop, J., A. Fahlman, K.A. Shorter, J. Gabaldon, J. Rocho-Levine, V. Petrov, and M.J. Moore. Swimming energy economy in bottlenose dolphins under variable drag loading. *Frontiers in Marine Science*. <https://doi.org/10.3389/fmars.2018.00465>.
17. Werth, A.J., D. Rita, M.V. Rosario, M.J. Moore, and T.L. Sformo. 2018. How do baleen whales stow their filter? A comparative biomechanical analysis of baleen bending. *Journal of Experimental Biology* 221(23): p. jeb189233.
18. Moore, M., A. Pembroke, E. Nestler, M. Hall, L. Lefkovitz, M. Lambert and K. Keay. 2018. Toxics source reduction and sewage upgrades eliminated winter flounder liver neoplasia (1984-2017) from Boston Harbor, MA, U.S.A. *Diseases of Aquatic Organisms* 131:239-243. doi: <https://doi.org/10.3354/dao03299>.
19. Norman, S.A., K.R. Flynn, A.N. Zerbini, F. Gulland, M.J. Moore, S. Raverty, D.S. Rotstein, B.R. Mate, C. Hayslip and D. Gendron. 2018. Assessment of wound healing

- of tagged gray (*Eschrichtius robustus*) and blue (*Balaenoptera musculus*) whales in the eastern North Pacific using long-term series of photographs. *Marine Mammal Science* 34(1): 27-53.
20. de Quirós, Y.B., M. Hartwick, D.S. Rotstein, M.M. Garner, A. Bogomolni, W. Greer, M.E. Niemeyer, G. Early, F. Wenzel and M. Moore. 2018. Discrimination between bycatch and other causes of cetacean and pinniped stranding. *Diseases of Aquatic Organisms* 127(2): 83-95.
 21. Fahlman, A., K. McHugh, J. Allen, A. Barleycorn, A. Allen, J. Sweeney, R. Stone, G. Bedford, M. J. Moore and F. Jensen. 2018. Resting metabolic rate and lung function in wild offshore common bottlenose dolphins, *Tursiops truncatus*, near Bermuda. *Frontiers in Physiology* 9: 886.
 22. Lysiak, N. S., S. J. Trumble, A. R. Knowlton and M. J. Moore. 2018. Characterizing the Duration and Severity of Fishing Gear Entanglement on a North Atlantic Right Whale (*Eubalaena glacialis*) Using Stable Isotopes, Steroid and Thyroid Hormones in Baleen. *Frontiers in Marine Science* 5: 168.
 23. Párraga, D. G., M. Moore and A. Fahlman. 2018. Pulmonary ventilation–perfusion mismatch: a novel hypothesis for how diving vertebrates may avoid the bends. *Proc. R. Soc. B* 285(1877): 20180482.
 24. Fahlman, A., M. Brodsky, R. Wells, K. McHugh, J. Allen, A. Barleycorn, J. Sweeney, D. Fauquier and M. Moore. 2018. Field energetics and lung function in wild bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay Florida. *R. Soc. Open Sci.* 5(1): 171280.

2017

25. Hunt, K. E., N. S. Lysiak, M. Moore and R. M. Rolland. 2017. Multi-year longitudinal profiles of cortisol and corticosterone recovered from baleen of North Atlantic right whales (*Eubalaena glacialis*). *General and Comparative Endocrinology* 254: 50-59.
26. Rolland, R.M., W.A. McLellan, M.J. Moore, C.A. Harms, E.A. Burgess and K.E. Hunt. 2017. Fecal glucocorticoids and anthropogenic injury and mortality in North Atlantic right whales (*Eubalaena glacialis*). *Endanger Species Res* 10:3354.
27. Aprill, A., C. Miller, M. Moore, J. Durban, H. Fearnbach, and L. Barrett-Lennard. Extensive core microbiome in drone-captured whale blow supports a framework for health monitoring *Systems* 2 (5), e00119-17.
28. Moore, M., and A. Zerbini. Dolphin blubber/axial muscle shear: implications for rigid trans-dermal intra-muscular tracking tag trauma in whales. *J Exp Biol:jeb.* 165282.
29. Guerra, M., L. Hickmott, J. van der Hoop, W. Rayment, E. Leunissen, E. Slooten and M. Moore. 2017. Diverse foraging strategies by a marine top predator: sperm whales exploit pelagic and demersal habitats in the Kaikōura submarine canyon. *Deep Sea Research Part I: Oceanographic Research Papers*.
30. Hunt, K.E., N.S. Lysiak, M. Moore and R.M. Rolland. 2017. Multi-year longitudinal profiles of cortisol and corticosterone recovered from baleen of North Atlantic right whales (*Eubalaena glacialis*). *General and Comparative Endocrinology* 254:50-59.

31. van der Hoop, J., P. Corkeron and M. Moore. 2017. Entanglement is a costly life-history stage in large whales. *Ecology and Evolution* 7 (1):92-106.
32. Fahlman, A., M. J. Moore and D. Garcia-Parrag. 2017. Respiratory function and mechanics in pinnipeds and cetaceans. *Journal of Experimental Biology* 220.10: 1761-1773.
33. Shorter, K.A., Y. Shao, L. Ojeda, K. Barton, J. Rocho-Levine, J. van der Hoop and M. Moore. 2017. A day in the life of a dolphin: Using bio-logging tags for improved animal health and well-being. *Marine Mammal Science* 33(3): 785–802.
34. Fiore, G., E. Anderson, C. Garborg, M. Murray, M. Johnson, M. Moore, L. Howle and K. Shorter. 2017. From the track to the ocean: using flow control to improve marine bio-logging tags. *PLOS One*. <https://doi.org/10.1371/journal.pone.0170962>.
35. Asmutis-Silvia, R., S. Barco, T. Cole, A. Henry, A. Johnson, A. Knowlton, S. Landry, D. Mattila, M. Moore, J. Robbins and J. van der Hoop. Rebuttal to published article "A review of ghost gear entanglement amongst marine mammals, reptiles and elasmobranchs" by M. Stelfox, J. Hudgins, and M. Sweet. *Marine Pollution Bulletin* 117 (1-2):554.
36. van der Hoop, J.M., D.P. Nowacek, M.J. Moore and M. Triantafyllou. 2017. Swimming kinematics and efficiency of entangled North Atlantic right whales. *Endangered Species Research* 32:1-17. doi: 10.3354/esr00781.

2016

37. Kraus, S.D., R.D. Kenney, C.A. Mayo, W.A. Mclellan, M.J. Moore and D.P. Nowacek. 2016. Recent scientific publications cast doubt on North Atlantic right whale future. *Frontiers in Marine Science* 3:137.
38. van der Hoop, J.M., P. Corkeron, A.G. Henry, A.R. Knowlton and M.J. Moore. Predicting lethal entanglements as a consequence of drag from fishing gear. *Marine Pollution Bulletin*. 10.1016/j.marpolbul.2016.11.060.
39. van der Hoop, J.M., P. Corkeron, M.J. Moore. Energetic impacts of entanglement in North Atlantic right whales (*Eubalaena glacialis*). *Ecology and Evolution*. doi: 10.1002/ece3.2615.
40. Wiley, D., C. Mayo, E. Maloney and M. Moore. In press. Vessel Strike Mitigation Lessons from Direct Observations Involving Two Collisions between Non-Commercial Vessels and North Atlantic Right Whales (*Eubalaena glacialis*). *Marine Mammal Science*.
41. Durban, J., M. Moore, Chiang, L. Ghickmott, A. Bocconcelli, G. Howes, P.A. Bahamonde, W.L. Perryman, and D.J. LeRoi. 2016. Photogrammetry of blue whales with an unmanned hexacopter. *Marine Mammal Science*, doi: 10.1111/mms.12328.
42. Fahlman, A., J. van der Hoop, M.J. Moore, G. Levine, J. Rocho-Levine and M. Brodsk. In Press. Estimating energetics in cetaceans from 1 respiratory frequency: why we need to understand physiology. *Open Biology*. Contribution: assisted with manuscript.
43. Hunt, K., N. Lysiak, M. Moore and R. Rolland. In Press. Longitudinal progesterone

profiles in baleen from female North Atlantic right whales (*Eubalaena glacialis*) match known calving history. Conservation Physiology. Contribution: collected a major time series of right whale baleen for this study. Assisted with data interpretation and manuscript.

44. Fahlman, A., M. Moore, A. Trites, D. Rosen, M. Haulena, N. Waller, T. Neale, Y. Ming, S. Thom. In Press. Dive, food, and exercise effects on blood microparticles in Steller sea lions (*Eumetopias jubatus*): exploring a biomarker for decompression sickness. American Journal of Physiology. Contribution: secured ONR support, PI, planned experiment, undertook fieldwork, contributed to data analysis and manuscript.
45. Sharp, S. M., C. T. Harry, J. M. Hoppe, K. M. Moore, M. E. Niemeyer, I. Robinson, K. S. Rose, W. B. Sharp, S. Landry, J. Richardson and M.J. Moore. 2016. A comparison of postrelease survival parameters between single and mass stranded delphinids from Cape Cod, Massachusetts, USA. Marine Mammal Science. 32: 161–180. doi: 10.1111/mms.12255. Contribution: established the stranding network and developed the clinical protocols that enabled the study, made the clinical triage decisions, assisted with manuscript, advised the lead author during this her DVM student thesis.

2015

46. van Der Hoop, J.M., A.S.M. Vanderlaan, T.V.N. Cole, A.G. Henry, L. Hall, B. Mase-Guthrie, T. Wimmer and M.J. Moore. 2015. Vessel Strikes to Large Whales Before and After the 2008 Ship Strike Rule. Conservation Letters 8:24-32. Contribution: conceived of the study, PI of project, advised the student lead author, assisted with manuscript.
47. van der Hoop, J.M., P. Corkeron, J. Kenney, S. Landry, D. Morin, J. Smith and M.J. Moore. 2015. Drag from fishing gear entangling North Atlantic right whales. Marine Mammal Science. Contribution: conceived of the study, PI of project, assisted with field work, advised the PhD student lead author, assisted with manuscript.

2014

48. Joblon, M.J., M.A. Pokras, B. Morse, C.T. Harry, K.S. Rose, S.M. Sharp, M.E. Niemeyer, K.M. Patchett, W.B. Sharp and M.J. Moore. 2014. Body Condition Scoring System for Delphinids Based on Short-beaked Common Dolphins (*Delphinus delphis*). Journal of Marine Animals and Their Ecology 7:5-13. Contribution: advised the DVM student, conceived of the project, gave veterinary oversight to the case material, assisted with the manuscript.
49. van Der Hoop, J.M., A. Fahlman, T. Hurst, J. Rocho-Levine, K.A. Shorter, V. Petrov and M.J. Moore. 2014. Bottlenose dolphins modify behavior to reduce metabolic effect of tag attachment. Journal of Experimental Biology 217:4229-4236. Contribution: PI of project, advised PhD student arranged for experimental opportunity, assisted with field work, contributed to manuscript.
50. van Der Hoop, J., M. Moore, A. Fahlman, A. Bocconcelli, C. George, K. Jackson, C. Miller, D. Morin, T. Pitchford, T. Rowles, J. Smith and B. Zoodsma. 2014. Behavioral impacts of disentanglement of a right whale under sedation and the

- energetic cost of entanglement. *Marine Mammal Science* 30:282-307. Contribution: advised student, developed sedation system, PI of project, undertook field work and tag deployment, assisted with manuscript.
51. Shorter, K.A., M.M. Murray, M. Johnson, M. Moore and L.E. Howle. 2014. Drag of suction cup tags on swimming animals: Modeling and measurement. *Marine Mammal Science* 30:726-746. Contribution: PI of project, assisted with project design and field work, assisted with manuscript.
 52. Sharp, S.M., J.S. Knoll, M.J. Moore, K.M. Moore, C.T. Harry, J.M. Hoppe, M.E. Niemeyer, I. Robinson, K.S. Rose, W.B. Sharp and D. Rotstein. 2014. Hematological, biochemical, and morphological parameters as prognostic indicators for stranded common dolphins (*Delphinus delphis*) from Cape Cod, Massachusetts, U.S.A. *Marine Mammal Science* 30:864-887. Contribution: established the stranding network and developed the clinical protocols that enabled the study, made the clinical triage decisions, assisted with manuscript, advised the lead author during this her DVM student internship.
 53. Nousek-Mcgregor, A.E., C.A. Miller, M.J. Moore and D.P. Nowacek. 2014. Effects of body condition on buoyancy in endangered North Atlantic right whales. *Physiological and Biochemical Zoology* 87:160-171. Contribution: generated some of the data upon which the study was made, assisted with manuscript.
 54. Moore, M.J. 2014. How we all kill whales. *Ices Journal of Marine Science* 71:760-763.
 55. Moore, C.D., A. Fahlman, M.J. Moore, D. Willoughby, K. Robbins and S.J. Trumble. 2014. Significance of Muscle Fiber Type in Biopsied Elephant Seals. *Integrative and Comparative Biology* 54:E144. Contribution: assisted with laboratory experiments and manuscript preparation.
 56. Moore, C.D., D.E. Crocker, A. Fahlman, M.J. Moore, D.S. Willoughby, K.A. Robbins, S.B. Kanatous and S.J. Trumble. 2014. Ontogenetic changes in skeletal muscle fiber type, fiber diameter and myoglobin concentration in the Northern elephant seal (*Mirounga angustirostris*). *Frontiers in Physiology* 5. Contribution: assisted with laboratory experiments and manuscript preparation.
 57. Moore, C., M. Moore, S. Trumble, M. Niemeyer, B. Lentell, W. Mclellan, A. Costidis and A. Fahlman. 2014. A comparative analysis of marine mammal tracheas. *Journal of Experimental Biology* 217:1154-1166. Contribution: assisted with laboratory experiments and manuscript preparation.
 58. Harms, C.A., W.A. Mclellan, M.J. Moore, S.G. Barco, E.O. Clarke III, V.G. Thayer and T.K. Rowles. 2014. Low-residue euthanasia of stranded Mysticetes. *Journal of Wildlife Diseases* 50:63-73. Contribution: helped develop study concept, and methods, assist with manuscript.
 59. Garcia-Parraga, D., J.L. Crespo-Picazo, Y. Bernaldo De Quiros, V. Cervera, L. Marti-Bonmati, J. Diaz-Delgado, M. Arbelo, M.J. Moore, P.D. Jepson and A. Fernandez. 2014. Decompression sickness ('the bends') in sea turtles. *Diseases of Aquatic Organisms* 111:191-205. Contribution: contributed earlier observations that lead in part to this study, assisted with data interpretation, and manuscript layout, content and editing.

60. Barratclough, A., P.D. Jepson, P.K. Hamilton, C.A. Miller, K. Wilson and M.J. Moore. 2014. How much does a swimming, underweight, entangled right whale (*Eubalaena glacialis*) weigh? Calculating the weight at sea, to facilitate accurate dosing of sedatives to enable disentanglement. *Marine Mammal Science* 30:1589-1599. Contribution: conceived of the study, advised the student, designed the analysis, and assisted with manuscript.
61. Apprill, A., J. Robbins, A.M. Eren, A.A. Pack, J. Reveillaud, D. Mattila, M. Moore, M. Niemeyer, K.M.T. Moore and T.J. Mincer. 2014. Humpback whale populations share a core skin bacterial community: Towards a health index for marine mammals? *PLoS ONE* 9. Contribution: assisted with sample collection and manuscript.

2013

62. van der Hoop, J.M., M.J. Moore, S.G. Barco, T.V.N. Cole, P.Y. Daoust, A.G. Henry, D.F. Mcalpine, W.A. Mclellan, T. Wimmer and A.R. Solow. 2013. Assessment of management to mitigate anthropogenic effects on large whales. *Conservation Biology* 27:121-133. Contribution: conceived of the study, generated good portions of the data over many years of beach necropsy, assisted with analysis and manuscript.
63. Taylor, J.K.D., J.W. Mandelman, W.A. Mclellan, M.J. Moore, G.B. Skomal, D.S. Rotstein and S.D. Kraus. 2013. Shark predation on North Atlantic right whales (*Eubalaena glacialis*) in the southeastern United States calving ground. *Marine Mammal Science* 29:204-212. Contribution: contributed necropsy cases to the study and assisted with manuscript.
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