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Seafood Watch
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RE: Comments on the Draft Assessments for: American lobster (*Homarus americanus*) – United States; American lobster (*Homarus americanus*) – Canada: Northwest Atlantic; and Snow Crab (*Chionoecetes opilio*) – Canada Atlantic Coast

Dear Monterey Bay Aquarium Seafood Watch Program staff,

On behalf of our more than three million members and online activists, the Natural Resources Defense Council (NRDC) respectfully submits the following comments on the Draft Assessments for American lobster (*Homarus americanus*) – United States; American lobster (*Homarus americanus*) – Canada: Northwest Atlantic; and Snow Crab (*Chionoecetes opilio*) – Canada Atlantic Coast.ⁱ Our comments focus on considerations pertaining solely to the critically endangered North Atlantic right whale and are largely relevant to all three Draft Assessments (we have noted fishery-specific items, as appropriate).

NRDC is in strong support of the overall recommendation by Seafood Watch that consumers “avoid” purchase of American lobster caught by trap in the United States and Northwest Atlantic Canada, as well as Snow Crab caught by pot off Canada’s Atlantic Coast. In our view, this recommendation reflects the best available scientific information regarding the status of the North Atlantic right whale and the level of mortality, injury, and sublethal impacts to the species presently resulting from each of the three fisheries, as well as the limited effectiveness of the risk reduction strategies currently in place.

Below, we briefly elaborate on our support for Seafood Watch’s recommendation to “avoid” purchase of American lobster and Snow Crab and, in doing so, aim to highlight some recent scientific information that may be incorporated into the Final Assessments.

1. North Atlantic right whales are declining towards extinction at an accelerating rate (corresponding Criterion 2.1 – Abundance)

The North Atlantic right whale is one of the most endangered large whales on Earth. Since 2010, significant shifts in the species’ distribution have occurred that correspond to climate change-driven shifts in the distribution of their primary prey species, *Calanus finmarchicus*.ⁱⁱ These distributional shifts have brought the species into increased conflict with human activities, with devastating consequences.

North Atlantic right whales have experienced an accelerating decline since 2011 with numbers plummeting from an estimated 451 individuals in 2016 to an estimated 336 individuals in 2020 – a loss of more than 20 percent of the species in just five years.ⁱⁱⁱ Even more concerning, fewer than 70 of the remaining individuals are thought to be reproductively-active females—the lifeblood of the species.^{iv} Science is unequivocal that the decline is a direct result of human impacts, and primarily a combination of fisheries bycatch (entanglements) and vessel strikes; no juvenile or adult right whale has died of natural causes in since at least 2003.^v

Calving rates have also significantly declined and continue to fluctuate across years, in part due to the direct and indirect harm to reproductive females caused by human impacts, as well as nutritional stress resulting from the changes in prey quantity and quality brought about by climate change.^{vi} The number of calves born in what are now considered “successful” calving seasons still remain below previous levels and the number births are too few to counteract the number of deaths.^{vii} Calf survival is also a serious concern—five calves have been lost during the last three calving seasons, four from human-caused mortalities.^{viii}

In sum, even a single mortality further jeopardizes the survival of the North Atlantic right whale, and direct and indirect harm to reproductive females must be alleviated if the species is ever to recover.

2. Mortality, injury, and sublethal impacts resulting from interactions with the American lobster and snow crab fisheries is a primary driver of the decline of the North Atlantic right whale (corresponding Criterion 2.2 – Fishing Mortality)

Entanglements in commercial fishing gear, including gear associated with the American lobster and snow crab fisheries, are driving the North Atlantic right whale to extinction.^{ix} The potential biological removal level for the species, as determined by the United States (U.S.) National Marine Fisheries Service (NMFS, also termed “NOAA Fisheries”), has been revised to 0.7.^x In light of the revised PBR level and the best available scientific information on the species decline, NMFS announced in November 2021 that the risk of entanglement in the U.S. American lobster fishery must be reduced by approximately 90 percent^{xi}—1.5 times greater than the 60 percent risk reduction target that formed the basis of the 2021 Final Rule.^{xii}

Current levels of mortality far exceed sustainable levels. Observed deaths represent only a small proportion of actual deaths. From 2010 to 2017, only 29 percent of North Atlantic right whale deaths were observed. Of the remaining 71 percent, entanglement-related deaths significantly outnumbered deaths by vessel strikes or other causes.^{xiii} When cryptic mortalities are accounted for, North Atlantic right whales suffered an average of more than 31 deaths and serious injuries each year from 2015 through 2019, the vast majority caused by entanglements in commercial fishing gear.^{xiv}

Eighty-five percent of surviving individuals bear scars indicating they have been entangled at least once, and the scars from more than half this group indicate they have been entangled at least twice.^{xv} The pervasive sub-lethal effects of entanglement, including impaired reproductive potential and negative

health effects currently undermine any opportunity for the species to recover and may eventually lead to individual mortalities.^{xvi} North Atlantic right whale juveniles, adults, and lactating females show reduced body condition relative to growing populations of southern right whales.^{xvii} Calf body length appears to be strongly determined by the condition of a calf's mother, suggesting that the poor condition of lactating females may cause a reduction in calf growth rates, with implications for calf survival or an increase in female calving intervals.^{xviii} In addition, new research shows that North Atlantic right whales are shrinking in size over time, likely due to the chronic effects of entanglement.^{xix}

Gear is neither present on all documented entanglements nor retrievable from nearly half of such entanglements. Only a fraction of retrieved gear can be traced to a single country of origin (U.S. or Canada), let alone a particular geographic region within that country. However, risk of entanglement occurs whenever North Atlantic right whales and vertical buoy lines associated with trap/pot gear co-occur in space and time. It is clear from the co-occurrence of North Atlantic right whales and the American lobster fishery in the U.S. and Canada and the Snow Crab fishery off Canada's Atlantic Coast, the number and density of vertical buoy lines associated with those fisheries, the location and timing of observed entanglements and scarring, and the origin of the gear entangling animals when it is discernable, that these three fisheries pose a significant entanglement risk. Moreover, preliminary analysis conducted by the New England Aquarium that probabilistically apportioned individual entanglement events to different regions suggests that the Gulf of Maine and Canada present the regions with the highest levels of risk of entanglement.^{xx}

In light of the information above, we wholeheartedly agree with the precautionary approach adopted by Seafood Watch in the Draft Assessments. We also suggest that more explicit consideration of cryptic mortalities and sublethal impacts, as well as new information on entanglement apportionments, would further support the "avoid" recommendation.

3. Strategies to reduce the risk of entanglement in all three fisheries are insufficient, currently unproven, and, in some cases, ineffective (corresponding Criterion 3.2 – Bycatch Strategy)

Effective bycatch reduction strategies are immediately required if the extinction of the North Atlantic right whale is to be averted. Current strategies for the American lobster fishery in the U.S. and Canada, and for the Snow Crab fishery off Atlantic Canada are insufficient, currently unproven, and, in some cases, expected to be ineffective in reducing risk to the required level. We summarize considerations specific to the American lobster fishery in the U.S. and collectively for the two Canadian fisheries, below.

A. American lobster – United States

National requirements are not met for the North Atlantic right whale in the United States. The regulations issued by NMFS in 2021 to reduce the risk of entanglement of North Atlantic right whales in the Northeast American lobster fishery in federal waters ("2021 Final Rule")^{xxi} are insufficient to meet the legal requirements of the Marine Mammal Protection Act (MMPA) and recover the species.

The management strategies required by the 2021 Final Rule are based on a risk reduction target of 60% originally premised in a PBR of 0.9 derived from the 2018 population estimate of 411 whales, and through assigning 50% of the unobserved entanglements of unknown origin from 2009 through 2018 to U.S. fisheries.^{xxii} However, best available scientific information indicates that the population size in 2020 was only 336 whales and that current PBR is 0.7.^{xxiii} Moreover, NMFS' 60% risk reduction target does not account for unobserved mortalities or sublethal impacts.^{xxiv} In light of this new information, NMFS announced in November 2021 that a revised risk reduction target of approximately 90% is now necessary to recover the species and the agency now plans to commence a process for establishing additional management measures in the Northeast American lobster fishery to meet this revised risk reduction target.^{xxv}

In addition to an under-protective risk reduction target, the management strategies required of the fishery by NMFS to meet that target will likely be ineffective. One of the four categories of risk reduction measures included in the 2021 Final Rule is described as “weak rope or weak insertions.”^{xxvi} NMFS’ rationale for including this category of weak rope or weak insertions breaking at 1,700 lbs. or less at various depths on a buoy line is based on the assumption that it will “increase the likelihood that a large whale would break the line prior to becoming entangled in a manner that causes a serious injury or mortality.”^{xxvii} However, the agency’s assumption is based on a purely theoretical exercise that has never been tested and proven in the field. The authors of the single scientific peer-reviewed paper upon which the concept of weak rope as a mitigation measure was developed only go so far as to “suggest” that “adult right whales . . . can break free from [] weaker ropes and thereby avoid a life-threatening entanglement.”^{xxviii} It is all too easy to imagine a scenario where weak rope still becomes entangled around the head and mouth of an adult right whale, seriously injuring the baleen and impeding long-term foraging success. Juveniles and calves that have a much lower force output than adult right whales are also expected to experience no reduced risk of mortality and serious injury as a result of weak rope measures.^{xxix} There is thus currently no available and objective evidence that the current strategy to manage the fishery’s impacts on the North Atlantic right whales will be effective.

Moreover, the 2021 Final Rule and associated 2021 Biological Opinion^{xxx} commits several legal violations of the Endangered Species Act (ESA) and the MMPA:

First, the 2021 Biological Opinion anticipates that lethal take of North Atlantic right whales in the American lobster fishery will continue to occur at an average annual rate of 3.17 mortalities and serious injuries per year, but the Biological Opinion does not authorize this lethal take, in violation of the ESA. Further, although the Biological Opinion incidental take statement purports to authorize the non-lethal take of North Atlantic right whales at an average annual rate of 9.14 percent of the population, this is unlawful because NMFS has not in parallel authorized any incidental take of the North Atlantic right whale under MMPA section 101(a)(5)(E). Thus, NMFS is currently in violation of the ESA for allowing—but not legally authorizing—both lethal and non-lethal incidental take of North Atlantic right whales in both state and federal waters in the American lobster fishery.

Second, NMFS is in violation of the Marine Mammal Protection Act because although under section 118 of the MMPA it continues to authorize commercial lobster fishing, it has never authorized the incidental take of North Atlantic right whales in that fishery as required by MMPA section 101(a)(5)(E).

Third, NMFS is in violation of the MMPA because the September 2021 revisions to the Atlantic Large Whale Take Reduction Plan—even if fully successful—do not bring the mortality and serious injury of the North Atlantic right whale in the American lobster fishery to below PBR as required by the statute. The agency anticipates that—even if fully successful—the American lobster fishery will continue to kill or seriously injure 3.17 North Atlantic right whales annually, a level far above a PBR of 0.7. Moreover, this violation is longstanding. Since 1997, NMFS has never complied with its statutory obligations under the MMPA to establish and revise measures in the Atlantic Large Whale Take Reduction Plan to bring North Atlantic right whale mortality and serious injury in the commercial American lobster fishery to below PBR, let alone to the Zero Mortality Rate Goal.

The above-described concerns regarding the impacts of the American lobster fishery on North Atlantic right whales, NMFS' own admission that the 60% risk reduction target is wholly under-protective, the ineffectiveness of current management measures, and questions regarding the current legality of the fishery, collectively support the proposed recommendation made by Seafood Watch in the Draft Assessment for consumers to “avoid” purchasing from this fishery.

B. American lobster – Canada: Northwest Atlantic and Snow Crab - Canada Atlantic Coast

Several management strategies have been implemented by Fisheries and Oceans Canada (DFO) following the elevated number of North Atlantic right whale entanglements in 2017. As described in the Draft Assessment, these strategies include static and dynamic fisheries closures, mandatory gear marking requirements, and improved by-catch reporting. In addition, weak links and reduced breaking strength rope are currently being tested and several field trials of “ropeless” fishing systems are underway, including a trial authorized for commercial catch of Snow Crab in 2021.^{xxxix}

While fishery closures provide a tangible means of reducing risk of entanglement, it is clear that closures to date have been insufficient in reducing the numbers of entanglements occurring in Canadian waters to sustainable levels. As discussed above, the potential effectiveness of weak links and breaking strength rope is extremely limited and should not be relied upon as a bycatch reduction strategy. Gear marking and improved reporting requirements are important for understanding the relative risk posed by different fisheries and to help target and tailor management actions, but they do not in and of themselves reduce the risk of entanglement. Thus, we agree with Seafood Watch's assessment that current bycatch strategies are insufficient to meet the requirements of Criterion 3.2.

The steps taken to advance ropeless fishing systems by DFO and Canadian fisheries, and the snow crab fishery in particular, are extremely promising. We also acknowledge some limited testing has been undertaken in the U.S. American lobster fishery and hope to see these rapidly scaled up.^{xxxix} We agree, however, that these measures “need to be widespread and sustained to minimize this threat [of

entanglement].^{”xxxiii} In general, NRDC views participation in partnerships to advance ropeless fishing systems and the subsequent commercial deployment of ropeless fishing systems as a key indicator of a sustainable trap or pot fishery operating in areas that overlap with large whale and sea turtle habitat, in both U.S. and Canadian waters, as well as internationally.

We thank you for continuing to serve as a trusted resource to seafood consumers in the U.S. and internationally by providing scientifically sound and precautionary guidance. Please don't hesitate to contact us if you have any questions or if we can provide any further information.

Sincerely,

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ⁱ Seafood Watch Program. Draft Assessments for “American lobster (*Homarus americanus*) – United States.” <https://www.seafoodwatch.org/globalassets/sfw/pdf/expert-review/020722/seafood-watch-us-american-lobster-report-524.pdf>; American lobster (*Homarus americanus*) – Canada.” <https://www.seafoodwatch.org/globalassets/sfw/pdf/expert-review/020722/seafood-watch-canada-american-lobster-report-1001.pdf>; and “Snow Crab (*Chionoecetes opilio*) – Canada Atlantic Coast.” <https://www.seafoodwatch.org/globalassets/sfw/pdf/expert-review/020722/seafood-watch-canada-snow-crab-report-802.pdf>.

ⁱⁱ Meyer-Gutbrod, Erin L., et al. "Ocean regime shift is driving collapse of the North Atlantic right whale population." *Oceanography* 34.3 (2021): 22-31. https://www.researchgate.net/profile/Charles-Greene-5/publication/354289168_Ocean_Regime_Shift_is_Driving_Collapse_of_the_North_Atlantic_Right_Whale_Population/links/61305eed0360302a00736ea7/Ocean-Regime-Shift-is-Driving-Collapse-of-the-North-Atlantic-Right-Whale-Population.pdf.

ⁱⁱⁱ Pettis, Heather M., et al. “North Atlantic Right Whale Consortium 2021 Annual Report Card.” Report to the North Atlantic Right Whale Consortium (2022) at Table 1. https://www.narwc.org/uploads/1/1/6/6/116623219/2021report_cardfinal.pdf.

^{iv} NOAA Fisheries. “North Atlantic Right Whale Calving Season 2022.” <https://www.fisheries.noaa.gov/national/endangered-species-conservation/north-atlantic-right-whale-calving-season-2022>. “Researchers estimate there are fewer than 70 reproductively active North Atlantic right whale females remaining.”

^v Sharp, Sarah M., et al. "Gross and histopathologic diagnoses from North Atlantic right whale *Eubalaena glacialis* mortalities between 2003 and 2018." *Diseases of Aquatic Organisms* 135.1 (2019): 1-31 at 23. <https://www.int-res.com/articles/feature/d135p001.pdf>. “Over the past 16 yr, there were no documented natural mortalities for adult or juvenile NARWs.” Time period referred to is 2003-2018.

^{vi} Moore, Michael J., et al. "REVIEW Assessing North Atlantic right whale health: threats, and development of tools critical for conservation of the species." *Diseases of aquatic organisms* 143 (2021): 205-226 at 211. <http://www.int-res.com/articles/feature/d143p205.pdf>. “Incidents of moderate and severe entanglements have become more prevalent in the last decade (Knowlton et al. 2016). These are known to cause health impacts and reduced survival, especially in reproductive females (Fauquier et al. 2020).” See, also, Stewart, Joshua D., et al. "Decreasing body lengths in North Atlantic right whales." *Current Biology* 31.14 (2021): 3174-3179. <https://www.sciencedirect.com/science/article/abs/pii/S096098222100614X>; and Christiansen, Fredrik, et al. "Population comparison of right whale body condition reveals poor state of the North Atlantic right whale." *Marine Ecology Progress Series* 640 (2020): 1-16. <http://www.int-res.com/articles/feature/m640p001.pdf>.

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- vii NOAA Fisheries. "North Atlantic Right Whale Calving Season 2022." <https://www.fisheries.noaa.gov/national/endangered-species-conservation/north-atlantic-right-whale-calving-season-2022#:~:text=North%20Atlantic%20right%20whales%20are%20approaching%20extinction%20with%20fewer%20than%20350%20remaining>. "With the current number of females and the necessary resting time between births, 20 newborns in a calving season would be considered a relatively productive year. However, given the estimated rate of human-caused mortality and serious injury, we need approximately 50 or more calves per year for many years to stop the decline and allow for recovery.
- viii Pettis, Heather .M., et al. "North Atlantic Right Whale Consortium 2020 Annual Report Card." Report to the North Atlantic Right Whale Consortium (2021) at Tables 3 and 4. https://www.narwc.org/uploads/1/1/6/6/116623219/2020narwcreport_cardfinal.pdf; Pettis, Heather .M., et al. "North Atlantic Right Whale Consortium 2021 Annual Report Card." Report to the North Atlantic Right Whale Consortium (2022) at Table 3. https://www.narwc.org/uploads/1/1/6/6/116623219/2021report_cardfinal.pdf.
- ix NOAA Fisheries. "2017-2022 North Atlantic Right Whale Unusual Mortality Event." <https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2022-north-atlantic-right-whale-unusual-mortality-event>. Note that vessel strikes are the second major factor contributing to the species' decline.
- x NOAA Fisheries. "Draft 2021 Atlantic Regional Marine Mammal Stock Assessment Report" at Table 1, stating the revised PBR for North Atlantic right whales is 0.7. <https://media.fisheries.noaa.gov/2021-10/Draft%202021%20NE%26SE%20SARs.pdf>. Potential Biological Removal, or "PBR," is defined by the MMPA as "the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population." <https://www.fisheries.noaa.gov/laws-and-policies/glossary-marine-mammal-protection-act>.
- xi NOAA Fisheries. "Information Webinar: Update on Right Whale Population and Mortality Estimates." Atlantic Large Whale Take Reduction Team Webinar (Nov. 2, 2021) at 43. <https://media.fisheries.noaa.gov/2021-11/Nov%202%20presentation%20to%20ALWTRT.pdf>.
- xii NOAA Fisheries. "Final Rule to Amend the Atlantic Large Whale Take Reduction Plan to Reduce Risk of Serious Injury and Mortality to North Atlantic Right Whales Caused by Entanglement in Northeast Crab and Lobster Trap/Pot Fisheries." Final Rule. (Sep. 17, 2021). <https://www.fisheries.noaa.gov/action/final-rule-amend-atlantic-large-whale-take-reduction-plan-reduce-risk-serious-injury-and>.
- xiii Pace III, Richard M., et al. "Cryptic mortality of North Atlantic right whales." *Conservation Science and Practice* 3.2 (2021): e346. <https://conbio.onlinelibrary.wiley.com/doi/pdfdirect/10.1111/csp2.346>.
- xiv NOAA Fisheries. "Information Webinar: Update on Right Whale Population and Mortality Estimates." Atlantic Large Whale Take Reduction Team Webinar (Nov. 2, 2021) at 38. <https://media.fisheries.noaa.gov/2021-11/Nov%202%20presentation%20to%20ALWTRT.pdf>.
- xv Moore, Michael J. "How we can all stop killing whales: a proposal to avoid whale entanglement in fishing gear." *ICES Journal of Marine Science* 76.4 (2019): 781-786 at 782. <https://core.ac.uk/download/pdf/237709545.pdf>.
- xvi Moore, Michael J., et al. "REVIEW Assessing North Atlantic right whale health: threats, and development of tools critical for conservation of the species." *Diseases of aquatic organisms* 143 (2021): 205-226 at 212. <http://www.int-res.com/articles/feature/d143p205.pdf>. "Both vessel strikes and entanglement continue to impact right whale reproductive success. Thus, to enable species recovery, reduction in mortalities have to be accompanied by substantial reduction of sub-lethal trauma as well."
- xvii Christiansen, Fredrik, et al. "Population comparison of right whale body condition reveals poor state of the North Atlantic right whale." *Marine Ecology Progress Series* 640 (2020): 1-16. <http://www.int-res.com/articles/feature/m640p001.pdf>.
- xviii *Id.*
- xix Stewart, Joshua D., et al. "Decreasing body lengths in North Atlantic right whales." *Current Biology* 31.14 (2021): 3174-3179. <https://www.sciencedirect.com/science/article/abs/pii/S096098222100614X>,
- xx NOAA Fisheries. "Atlantic Large Whale Take Reduction Team Reduction February 24, 2022 Team Meeting." Informational Webinar. Agenda item: 3:05-3:30pm Apportionment of entanglement events by Amy Knowlton (New England Aquarium). <https://www.fisheries.noaa.gov/event/atlantic-large-whale-take-reduction-february-24-2022-team-meeting>.
- xxi NOAA Fisheries. "Final Rule to Amend the Atlantic Large Whale Take Reduction Plan to Reduce Risk of Serious Injury and Mortality to North Atlantic Right Whales Caused by Entanglement in Northeast Crab and Lobster Trap/Pot Fisheries." Final Rule. (Sep. 17, 2021). <https://www.fisheries.noaa.gov/action/final-rule-amend-atlantic-large-whale-take-reduction-plan-reduce-risk-serious-injury-and>.
- xxii *Id.* at 51.971)
- xxiii NOAA Fisheries. "Draft 2021 Atlantic Regional Marine Mammal Stock Assessment Report" at Table 1, stating the revised PBR for North Atlantic right whales is 0.7. <https://media.fisheries.noaa.gov/2021-10/Draft%202021%20NE%26SE%20SARs.pdf>.
- xxiv Pace III, Richard M., et al. "Cryptic mortality of North Atlantic right whales." *Conservation Science and Practice* 3.2 (2021): e346. <https://conbio.onlinelibrary.wiley.com/doi/pdfdirect/10.1111/csp2.346>; Moore, Michael J., et al. "REVIEW Assessing

North Atlantic right whale health: threats, and development of tools critical for conservation of the species." *Diseases of aquatic organisms* 143 (2021): 205-226 at 212. <http://www.int-res.com/articles/feature/d143p205.pdf>.

^{xxv} NOAA Fisheries. "Information Webinar: Update on Right Whale Population and Mortality Estimates." Atlantic Large Whale Take Reduction Team Webinar (Nov. 2, 2021) at 43. <https://media.fisheries.noaa.gov/2021-11/Nov%20%20presentation%20to%20ALWTRT.pdf>.

^{xxvi} 2021 Final Rule at 51,973.

^{xxvii} 85 Fed. Reg. at 86,885.

^{xxviii} Knowlton, Amy R., et al. "Effects of fishing rope strength on the severity of large whale entanglements." *Conservation Biology* 30.2 (2016): 318-328 at 326. <https://conbio.onlinelibrary.wiley.com/doi/pdfdirect/10.1111/cobi.12590>.

^{xxix} Knowlton, Amy, et al. "Whale Release Ropes," Presentation at the Consortium for Wildlife Bycatch Reduction, at slide 7. https://www.mmc.gov/wp-content/uploads/Knowlton2_Marine-Mammal-Commission-Knowlton2-VERSION-2.pdf.

^{xxx} NMFS, "Biological Opinion on 10 Fishery Management Plans in the Greater Atlantic Region and the New England Fishery Management Council's Omnibus Habitat Amendment 2," (May 27, 2021).

<https://www.fisheries.noaa.gov/resource/document/biological-opinion-10-fishery-management-plans>.

^{xxxi} Seafood Watch Program. Draft Assessments for "American lobster (*Homarus americanus*) – Canada" at 74.

<https://www.seafoodwatch.org/globalassets/sfw/pdf/expert-review/020722/seafood-watch-canada-american-lobster-report-1001.pdf>; Cormier, Phillippe. "Using ropeless in closed fishing areas: Sea trials of snow crab fishing gear in the Gulf of St.

Lawrence." Presentation at the 2021 Ropeless Consortium Meeting. (Oct. 19, 2021). <https://ropeless.org/wp-content/uploads/sites/112/2021/10/2021RopelessAnnualMeetingBooklet.pdf>; Publix. "Fishing for Improvement." Describing support for ropeless fishing system tests in Canada. https://sustainability.publix.com/meat_seafood/fishery-improvement-projects/.

^{xxxii} Moore, Michael J., et al. "On-Demand Fishing – A Status Report to the Ropeless Consortium" (Jan. 14, 2022).

https://ropeless.org/wp-content/uploads/sites/112/2022/01/01_14_22-On-Demand-status-report-1.pdf. The consortium has noted that "on-demand systems have evolved and improved substantially in the past two years...[c]urrently, experienced, trained operators can use these systems reliably. They have been shown to be functional, have less risk of moving in heavy weather, and more easily relocated if displaced by mobile gear."

^{xxxiii} Seafood Watch Program. "Draft Assessment: Snow Crab (*Chionoecetes opilio*) – Canada Atlantic Coast" at 79.

<https://www.seafoodwatch.org/globalassets/sfw/pdf/expert-review/020722/seafood-watch-canada-snow-crab-report-802.pdf>.