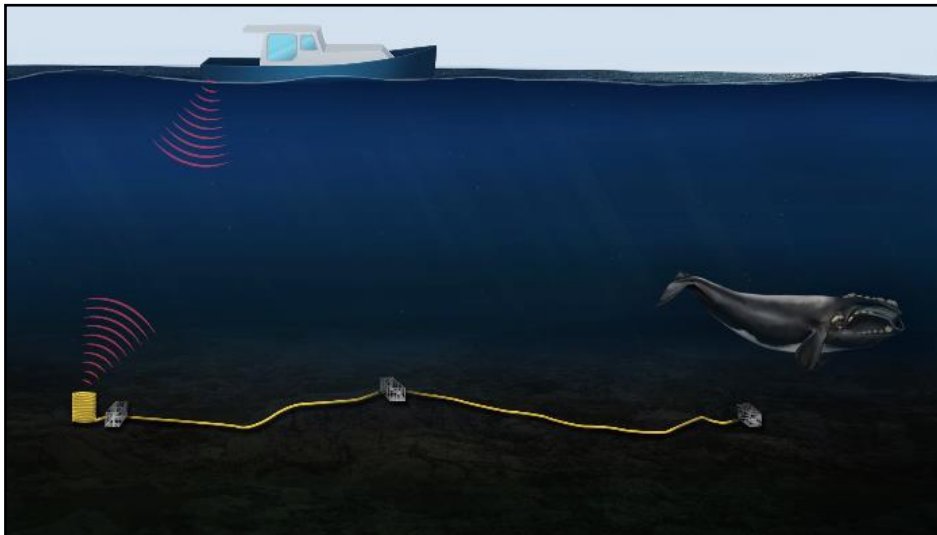


Ropeless Consortium Annual Meeting



New Bedford Whaling Museum
New Bedford, MA USA
24 October 2022
www.ropeless.org





Ropeless Consortium

Annual Meeting

24 October 2022

New Bedford Whaling Museum

MEETING FORMAT AND AGENDA

Pre-Meeting:

Prior to the meeting, all registered participants will receive a unique meeting site login code that will allow them to view all pre-recorded presentations in advance of the meeting. All presentations should be view **in advance of the meeting** as they will not be shared live. The four-digit number preceding the presentation title corresponds to the video number on the meeting site.

Participants (both onsite and remote) may submit questions/comments for presenters using the meeting site chat function in advance of the meeting.

Live Meeting:

Remote participants will be able to view the meeting, including live discussions, using their unique login code on the meeting site.

Following introductions to each session, a discussion panel will take place with all presenters within that session. Presenters who are onsite will gather at the front of the auditorium and presenters who are remote will be pulled in to the auditorium by projection feed. The panel will take questions/comments from both onsite and remote meeting participants. Remote participants should use the chat function on the meeting site to submit questions and comments.

All meeting materials (both static and live) are intended for registered participants only and may not be shared in any capacity. All participants have agreed to the meeting Code of Conduct. There is no recording (including but not limited to video, audio, screenshots, or photography) or sharing (including social media) of any material (including but not limited to presentations, presentation content, discussions) without explicit consent of the presenter, speaker, moderator, etc.

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*Time listed are EDT

24 October 2022

0815-0845AM Check in

900AM Keynote/Opening

920AM Session 1: Developers

Sean Brilliant, Moderator

01.01 SMELTS advancements of on-demand ropeless fishing to eliminate entanglement risk of North Atlantic right whales and other at-risk whales through partnership and collaboration

- Richard Riels, SMELTS.org

01.02 EdgeTech Trap Tracker Application improvements and the new marking and positioning improvements using our acoustic technology CAPRI.

- Robert Morris, EdgeTech

01.03 LobsterLift: A ropeless, self-surfacing, modular lobster trap retrieval system that prioritizes the needs of fishers

- Cormac Hondros-McCarthy, Lobster Lift, LLC

01.04 The advancement of gear marking in the ropeless fishing industry

- Bob Melvin, Teledyne

01.05 Status update of Ropeless RISER-: A ropeless fishing system with automated gear location and integral chart plotter display and control

- Harold Vincent, Ropeless Systems, Inc.

01.06 Development and demonstration of economically viable ropeless fishing systems for single-Line trap fisheries

- Bart Chadwick, Sub Sea Sonics

01.07 Rapid Change: The case of the Cape Town (South Africa) octopus fishery's transition to On-Demand "Ropeless" fishing

- Marco Flagg, Desert Star Systems, LLC

01.08 Longsoaker Fishing Systems Guardian ropeless gear solution

- Russ Mullins, Longsoaker Fishing Systems

Discussion Panelists: Presenters above

1000AM Session 2: Gear Location Marking

Michael Moore, Moderator

Introductions

Where are we going with gear location marking?

- Mark Baumgartner, Woods Hole Oceanographic Institution

Stakeholder identified needs for buoyless gear location marking

- Sean Brilliant, Canadian Wildlife Federation

02.01 EarthRanger Geolocation Solutions

- Christin Khan, Northeast Fisheries Science Center

02.02 Subsea gear location development, ropeless gear risk assessment, and feasibility modeling: A summary of ongoing and upcoming research related to ropeless fishing in the Gulf of Maine

- Kevin Staples, Maine Department of Marine Resources

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02.03 The rmwHUB: Development and testing of an international virtual fishing gear marking tool

- Kim Sawicki, University of Massachusetts, Dartmouth/Sustainable Seas Technology

Discussion Panelists: Presenters above, Philippe Cormier

1130AM Lunch

1230PM Session 3: Trials

Sean Brilliant, Moderator

03.01 Collaboration with fishers demonstrates the multiple benefits of pop-up fishing systems in southern California

- Kurt Lieber, Ocean Defenders Alliance

03.02 Optimal areas for ropeless fishing in the Gulf of Maine to reduce large whale entanglement

- Rachel Bratton, University of Massachusetts, Boston

03.03 Testing 3 different ropeless technologies for snow crab fishing in the Gulf of St. Lawrence

- Lyne Morissette, M – Expertise Marine, Inc.

03.04 Update on efforts to reduce right whale and marine wildlife entanglement and reduce gear loss in the New England sink gillnet ground fishery using SMELTS ropeless raft systems and Blue Ocean Gear Farallon buoys

- Richard Klyver, Blue Planet Strategies

Discussion Panelists: Presenters above

115PM Session 4: Ropeless Fishing

Mark Baumgartner, Moderator

Introduction

- Sean Brilliant, Canadian Wildlife Federation

04.01 Overview of on-demand fishing progress in US Northwest Atlantic: A collaboration

- Eric Matzen, NOAA Fisheries/Northeast Fisheries Science Center

04.02 CanFISH: A gear lending program providing access and training to the commercial fishing industry to facilitate on-demand fishing in Atlantic Canada

- Elizabeth Vézina, Canadian Wildlife Federation

04.03 Using ropeless in closed fishing areas: Sea trials of snow crab fishing gear in the Gulf of St. Lawrence

- Philippe Cormier, CORBO Engineering

04.04 Making “ropeless” real in the South Atlantic black sea bass pot fishery

- Kim Sawicki, University of Massachusetts, Dartmouth/Sustainable Seas Technology

Discussion Panelists: Presenters above, Alden Gaudet, Adam Kenney, Martin Noel, Rob Martin, Marc Palombo, and TBD

230PM Break

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300PM Session 5: Regulatory Process and Permitting

Michael Moore, Moderator

05.01 From Experimental to Commercial Rope-on-demand/Ropeless Fishing in Atlantic Canada

- Edward Trippel, Integrated Resource Management, Fisheries and Oceans Canada

05.02 NOAA's Ropeless Roadmap: A strategy to develop on-demand fishing

- Michael Asaro, Northeast Fisheries Science Center

05.03 A progress update from the Mass. DMF on-demand fishing gear scoping project

- Noah Oppenheim, Homarus Strategies

Discussion Panelists: Presenters above, GARFO, DFO, Regina Asmutis-Silvia, Erica Fuller

345PM Session 6: Enforcement

Mark Baumgartner, Moderator

Discussion Panelists: Caleb Gilbert, Jeff Mercer, Corey Webster, and TBD

430PM Discussion - Moving Ropeless Forward

515PM Wrap Up

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The rmwHUB: Development and testing of an international virtual fishing gear marking tool

Alexander, R.¹, Beck, M.¹, Boon, M.¹, Brown, M.¹, Capotosto, D.¹, Chadwick, D. B.¹, Cyr, C.¹, Fiotakis, J.¹, Flagg, C.¹, Flagg, M.¹, Hondros-MacCarthy, C.¹, Kershaw, F.¹, Langemec, C.¹, Lieber, K.¹, MacEachern, E.¹, McFarlane, J.¹, Morris, R.¹, Mullins, R.¹, Ross, A.¹, Shegog, M.¹, Shester, G.¹, Sirois, M.¹, Silver, D.¹, Stevenson, A.¹, Sullivan, J.¹, Sybrandy, A.¹, Toth, A.¹, Tu, N.¹, Yates, T.¹, Zetterlind, V.¹, Sawicki, K.^{1,2,3}

¹*The Ropeless Manufacturer's Workgroup rmwHUB Project*

²*Fish Behavior and Conservation Engineering, School for Marine Science and Technology, University of Massachusetts, Dartmouth, New Bedford, Massachusetts, 02744, United States*

³*Sustainable Seas Technology, Ocala, Florida, 34481, United States (ksawicki@umassd.edu)*

Previous research and feedback from global fishing communities indicated the need for a low or no-cost gear marking system to mark positions of gear on the seafloor without the use of endlines or visible marker buoys. This tool is needed in regions where marine animal entanglements, poaching, and gear loss is experienced at an unsustainable rate. It was determined that such a system would benefit not just on-demand fishers, but enforcement personnel, fisheries management, and other fixed and mobile gear fishers. The Ropeless Manufacturer's Workgroup (RMW) HUB Project is an industry-standards cooperative which was initially funded in 2021 by the Marine Mammal Commission to design such a tool. Second year funding in 2022 from the same award and regional projects has now facilitated the development of this virtual multi-manufacturer (interoperable) gear marking portal, coined the "rmwHUB", which is currently in its preliminary testing phase. The rmwHUB acts as a standardized gear-marking backend data exchange, allowing unified access and sharing of gear marking data from all types of ropeless fishing techniques and technologies, including grappling, galvanic-timed releases, electronic/timed releases, and acoustic release products. This system will allow fishermen to locate equipment quickly, avert other fisher's marked gear, and avoid activities that may cause unintended

gear loss. The rmwHUB will also allow regional regulatory and enforcement bodies to determine their specific needs and preferences for data access and reporting without creating duplicative and costly programming changes between the manufacturer's applications. The rmwHUB is currently undergoing testing internationally with funding from multiple on-demand projects. Results from this testing will enable federal and regional management bodies to create data management products and craft regulatory changes to allow ropeless fishing in areas where it is needed to conserve endangered species, protect catch, and avoid gear loss.

NOAA's Ropeless Roadmap: A Strategy to Develop On-Demand Fishing

Asaro, M. J.¹

¹*Northeast Fisheries Science Center, 166 Water Street, Woods Hole, Massachusetts, 02543, United States (michael.asaro@noaa.gov)*

NOAA's Ropeless Roadmap describes the current state of on-demand, or "ropeless," fishing and outlines a path for increasing adoption of this technology in U.S. East Coast commercial fisheries. We discuss this developing technology and forecast its future path based on the status of gear development, ongoing regulatory changes, and the need to decrease whale entanglements and associated mortality under the Endangered Species Act and Marine Mammal Protection Act. The need for on-demand fishing is driven by the urgent conservation crisis facing the endangered North Atlantic right whale (*Eubalaena glacialis*). As the need for larger and longer seasonal restricted areas increases to protect right whales, on-demand fishing represents the best solution to separate rope and right whales in areas of highest risk. The Ropeless Roadmap explores the potential for on-demand fishing gear to provide substantial reductions in entanglement risk for fixed gear trap/pot fisheries in a rapidly changing Atlantic ecosystem. We recognize that there are many partners who are key to this process and strategy, particularly state fishery managers and fishery management councils and commissions. Our intent is to share this plan for input and move forward in close collaboration with our partners. We welcome continued feedback on the Ropeless Roadmap via <https://bit.ly/3GHOIDE>

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incorporate the perspectives of all stakeholders involved in these processes and to ensure that all voices are heard to help guide our next steps. We intend to revise the Ropeless Roadmap over time and would like it to serve as a living document to provide NOAA's vision for proceeding through this rapidly evolving landscape.

Optimal areas for ropeless fishing in the Gulf of Maine to reduce large whale entanglement

Bratton, R. M.¹, Werner, T.B.²

¹*University of Massachusetts Boston, 100 Morrissey Blvd, Boston, Massachusetts, 02125, United States (rachelmairibratton@gmail.com)*

²*OAI Consulting, 4007 N Abingdon St, Arlington, Virginia, 22207, United States*

Ropeless fishing offers a promising reduction in risk to whales by eliminating trap/pot endlines and groundlines frequently implicated in entanglement. Despite expected benefits, the feasibility of implementing large-scale ropeless fishing in the Northeast trap/pot fishery remains uncertain. To identify the most promising pilot sites for implementing ropeless fishing in the Gulf of Maine, we created maps examining trap/pot trawl length, trap/pot trawl density, bottom-fished gear density, and fishing closures. Sites of high suitability, characterized by high average trawl length and low likelihood of gear conflict, were identified in offshore areas overlapping with active mobile gear closures. Regions of high suitability included the southeastern Outer Cape Cod Lobster Management Area (LMA), within LMA 2 south of the Outer Cape Cod area, throughout the LMA 2-3 overlap area, and in most areas of LMA 3. Each of the four seasonal restricted areas proposed to allow ropeless fishing with an Exempted Fishing Permit (EFP) by the Atlantic Large Whale Take Reduction Plan in 2021 contained pockets of high suitability. These findings aid the development of ropeless fishing in the Gulf of Maine by encouraging early gear adoption in areas likely to have positive outcomes for fishers.

Development and Demonstration of Economically Viable Ropeless Fishing Systems for Single-Line Trap Fisheries

Chadwick, B.¹, Sybrandy, A.², Sawicki, K.³

¹*Sub Sea Sonics, San Diego, California, 92107, United States (bart.chadwick@subseasonics.com)*

²*Pacific Gyre, Oceanside, California, 92056, United States*

³*Sustainable Seas Technologies, Middle Haddam, Connecticut, 06456, United States*

Our conservation engineering project is focused on providing economical ropeless fishing systems to support the sustainability of single-line trap fisheries. Sustainment of these fisheries in the face of restrictions related to marine mammal entanglements requires access to the ropeless technologies that minimize these risks. However, most of these technologies have been developed with a focus on deep water, multi-trap trawls with commensurate high levels of sophistication and cost, leaving them out of reach to the inshore single-line trap fisher. Single-line trap fisheries such as crabs, lobsters, shrimp, crayfish, fish, and whelks represent a broad swath of both the commercial and recreational fishing economy, and are generally conducted by individual or family operations that do not have the resources to capitalize, operate and maintain expensive and complex ropeless systems. To preserve and strengthen these fisheries for the future, simple, low-cost ropeless fishing technologies are required that do not put an undue burden on the single-line trap fisher. Here we will report on progress toward expanding the range of low-cost releases to include an acoustic option, removing the redundancy and complexity of secondary gear marking apps, collaborating on standardization of the gear marking interface, and expanding testing and acceptance of the equipment among fishermen, regulators and others within the fishing community.

Using ropeless in closed fishing areas: Sea trials of snow crab fishing gear in the Gulf of St. Lawrence

Cormier, P.¹, Haché, R.², Morissette, L.³, Gionest, J.², Noël, M.⁴, Daoud, D.^{1,5}

¹*CORBO engineering, Caraquet, New Brunswick, E1W 1B6, Canada (pcormier@corboinc.com)*

²*Association des Crabiers Acadiens, Shippagan, New Brunswick, E8S 1M8, Canada*

³*M – Expertise Marine, Sainte-Luce, Québec, G0K 1P0, Canada*

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⁴Association des Pêcheurs Professionnels Crabiers Acadiens, Shippagan, New Brunswick, E8S 1M8, Canada

⁵ECONOV, Moncton, New Brunswick, E1C 5T9, Canada

Over the past four years, we have witnessed a positive transformation of the fishers' perception towards ropeless gear as commercial fishers become increasingly aware of the need to coexist with the North Atlantic Right Whales (NARW). In collaboration with scientists and engineers, fishers from Association des crabiers acadiens (ACA) and Association des Pêcheurs Professionnels Crabiers Acadiens (APPCA) tested different ropeless snow crab gear systems since 2018. In 2022, the group prosecuted a "real life" experimental fishery under a special experimental fishing license. ACA was issued an experimental fishing licence that allowed 21 snow crab professional fishers to access fishing areas that were closed to commercial fishing due to the observed presence of NARW. Each fisher was allowed 50 additional experimental ropeless traps to prosecute this "real life" experimental fishery. This allowed us to investigate new ways of harvesting snow crab safely without requiring the presence of ropes in the water column. This new project aims to build on the knowledge gained during the last 3 years on how to coexist with NARW and developing the best working solutions for ropeless fishing gear. They addressed issues raised previously by fishermen who experienced the EdgeTech technology, adapted the technology to be more efficient, and trained fisheries officers for the establishment of a permanent commercial fisheries structure in closed areas. If well adapted and implemented, this technology could allow the full commercial fishery in closed areas in the near future. The key findings of this new Atlantic Fisheries Fund project are presented.

Rapid Change: The case of the Cape Town (South Africa) octopus fishery's transition to On-Demand "Ropeless" fishing

Flagg, M. A.¹, Nell, G.², Marius²

¹Desert Star Systems LLC, 3261 Imjin Rd, Marina, California, 93933, United States
(marco.flagg@desertstar.com)

²SA Sensational Seafood, Cape Town, South Africa

Octopus is a specialized experimental pot and trap fishery in False Bay, Cape Town. Operating since the 1990's with evolving entanglement prevention measures in place, the fishery nonetheless encountered a series of whale entanglements in 2019. This led to a closure of the fishery with a two-week notice, but a provision that the fishery can re-open with effective mitigation. SA Sensational Seafood identified Desert Star's "Coastal" version of their Ropeless Fisher system. This simplified on-demand system is ON/OFF switch operated, and available at a price point suitable for the fishery. Conditions at South Africa's "Cape of Storms" are legendarily rough, and equipment is also subject to severe marine fouling. Nonetheless, following adaptations and validation in collaboration with the University of Cape Town, the company's license was restored in late 2020, and fishing has resumed solely "ropeless" since.

This presentation, taking the form of a conversation between SA Sensational Seafood president Garry Nel, captain Marius and Desert Star's CEO Marco Flagg reviews the fishery's operational experience with its rapid transition to a commercial "ropeless" practice, the challenges encountered and ongoing improvements.

LobsterLift: a ropeless, self-surfacing, modular lobster trap retrieval system that prioritizes the needs of fishers

Hondros-McCarthy, C.¹, Carome, W.¹, Zhu, E.¹

¹LobsterLift LLC, Lowell, Massachusetts, 01851, United States (lobsterliftllc@gmail.com)

Fewer than 350 North Atlantic right whales remain, with 83% of individuals showing scars from entanglement with rope. The outlook for this species is dire. LobsterLift is developing a modular, low-cost, ropeless solution that will allow fishers and whales to coexist. The LobsterLift device consists of a pneumatic and electronic assembly, housed in a robust enclosure, connected to a *Polyform* buoy. Triggered using an off the shelf subsurface acoustic transducer, the LobsterLift inflates a buoy, bringing traps from the seafloor to the surface. During the design process, we rigorously tested enclosures in the deep, sheltered waters at Bar Harbor, ME. This helped to identify weak points in our prototype

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designs and guided us in implementing improvements. In July 2022, we returned to Bar Harbor to test the current design. Our enclosures were watertight in overnight tests at depths up to 175 ft, and in short-term tests at over 240 ft depth. The full LobsterLift system, controlled by our smartphone application, was rigorously tested internally, with fishers, and with fishing gear specialists from NOAA at depths up to 152 ft. The pneumatics, electronics, and communication systems performed without failure (n = 156 deployments). We proved capabilities of the system to be reliably recovered, reset, and redeployed in less than three minutes. Time between sending an ‘inflate’ signal from the smartphone to the buoy reaching the surface ranged from 9.07 seconds (28 ft depth) to 55 seconds (152 ft depth). We are focused on providing a robust design to lobstermen while pursuing pathways forward to increase functionality and further reduce cost.

EarthRanger Geolocation Solutions

Khan, C. B.¹, Galvez, B.¹, Matzen, E.¹, Milliken, H.¹, Lefcourt, J.², Doehring, C.², Lujan, V.²

¹NOAA Fisheries/NEFSC, 166 Water St, Woods Hole, Massachusetts, 02536, United States
(christin.khan@noaa.gov)

²Allen Institute for Artificial Intelligence, Seattle, Washington, United States

On-demand fishing removes the risk of entanglement posed by vertical lines and could save right whales from extinction while continuing to support coastal fishing communities. A major obstacle to moving this effort forward has been the need to develop an affordable system to track gear deployments in the ocean, and make their locations known to the fishers, enforcement agencies, and nearby vessels. NOAA Fisheries has been collaborating with the Allen Institute for Artificial Intelligence to harness their EarthRanger platform to integrate gear deployments from multiple manufacturers into a centralized cloud database and display gear locations together on one display. On-demand gear locations were successfully integrated from EdgeTech through their TrapTracker database, the SMELTS/Teledyne system through their Seacloud database, and the Blue Ocean Gear smart buoy through their BluVue database. Viewing gear from different manufacturers in a shared platform brings us one step closer to addressing the

geolocation challenges associated with on-demand fishing. As we continue to support the development of on-demand fishing, we welcome feedback from the community.

Update on efforts to reduce right whale and marine wildlife entanglement and reduce gear loss in the New England sink gillnet ground fishery using SMELTS ropeless raft systems and Blue Ocean Gear Farallon buoys

Klyver, R. Z.¹, Fleming, R.¹, Riels, R.², Rand, K.², Melvin, B.³, Morris, R.⁴, Opshaug, K.⁵, Martens, B.⁶, Baumwell, L.⁷, Deuel, K.⁷, Bogomolni, A.⁸

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³Teledyne Marine, Benthos, North Falmouth, Massachusetts, 02556, United States

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⁵Blue Ocean Gear, 980 S Amphlett Blvd, San Mateo, California, 94402, United States

⁶Maine Coast Fisherman’s Association, 93 Pleasant Street, Brunswick, Maine, 04011, United States

⁷The Pew Charitable Trusts, 901 E St NW # 10, Washington, D.C., 20004, United States

⁸Island Foundation, 589 Mill Street, P.O. Box 1605, Marion, Massachusetts, 02738, United States

An estimated 19 percent of global marine fisheries landings comes from gillnet fisheries (SAUP, 2011). A global review found about 5.7% of nets are annually lost (Richardson, 2019). Lost nets continue to kill marine life and reduce fishery and ocean health. Pioneering whale disentanglement expert Dr. Jon Lien suggested that acoustic releases for gillnets should be developed to reduce whale entanglements (Pers. Comm. Moore, M, 1979). More recently in a global assessment by Reeves, et al. prioritized, “large whale lethal entanglement in gillnet ropes not just nets”, (Reeves, 2016). We provide results from a NFWF funded grant to conduct the first global tests to remove vertical endlines and surface buoys with SMELTS ropeless systems in the New England sink

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gillnet fishery and to test innovative gear marking and tracking technology. This research is designed to reduce the risk of entanglement for critically endangered right whales and other protected marine species. Likewise, this project outfits gillnets with Blue Ocean Gear “Farallon” Smart Buoys to mark the gear location via satellite to both track the gear and reduce lost gear. Six SMELTs gillnet rafts (GR26) were outfitted to test two on-demand systems: Teledyne and EdgeTech. Initial tests took place between August 27 and December 14 of 2021 in Maine waters inshore of Jeffrey’s Ledge. Danforth anchors were replaced with ropeless gear units, while smart buoys successfully collected surface gear marking data though this 3.5-month period. A second phase of testing began in June 2022 with partner fishermen from Chatham, MA and has proven very successful. We report on work completed and these recent fishing tests and future research in development.

Collaboration With Fishers Demonstrates the Multiple Benefits of Pop-Up Fishing Systems in Southern California

Lieber, K.¹, Beck, M.², Silver, D.², Sawicki, K.³, Kershaw, F.⁴

¹*Ocean Defenders Alliance, 19744 Beach Blvd, Box #446, Huntington Beach, California, 92648, United States (kurt@oceandefenders.org)*

²*Endangered Habitats League, 8424 Santa Monica Blvd, Suite A 592, Los Angeles, California, 90069, United States*

³*Sustainable Seas Technology, PO Box 23, Middle Haddam, Connecticut, 06456, United States*

⁴*Natural Resources Defense Council, 40 West 20th Street, New York, New York, 10011, United States*

Vertical buoy lines associated with multi-species fisheries in Southern California pose several challenges for fishers and marine ecosystems, including gear loss that is costly for fishers and contributes to marine debris, poaching, and the risk of whale and sea turtle entanglement. Entanglements of endangered whales and sea turtles have increased off the West Coast in recent years due to the effects of climate change. Increased entanglement risk has consequential impacts for fisheries, including temporary closures of fishing areas (as have been

required for the California Dungeness crab fishery). To help address these concerns, we formed a collaboration with fishers located in Southern California to test a variety of pop-up fishing systems as potential alternatives to traditional fishing gear. Some fishers were already independently exploring these solutions. Here, we report on the initial pilot testing phase of the project (“Phase 1”) that took place during 2021/2022. Phase 1 focused on socializing the idea of pop-up fishing systems as a solution to multiple challenges associated with vertical line buoy gear, enabling fishers to explore and work with a wide variety of gear types, and testing the efficacy of an interoperable virtual gear marking system in coordination with the state’s enforcement agency. A short video describing our work is included as part of the presentation. We are now embarking on Phase 2 of the project, which will include an expanded testing effort with additional fishers and fisheries and run through the spring of 2023. Our hope is that fisher-based testing efforts like these will lead to greater recognition of the multiple benefits of pop-up fishing systems.

Overview of On-Demand Fishing Progress in US Northwest Atlantic: A Collaboration

Matzen, E.,¹ Amico, M.,² Asmutis-Silvia, R.,³ Fuller, E.⁴, Galvez, B.², Khan, C.¹, Milliken, H.¹, Moore, M.⁵, Sharp, B.⁶

¹*NOAA Fisheries/NEFSC, 166 Water Street, Woods Hole, Massachusetts, 02543, United States (eric.matzen@noaa.gov)*

²*Integrated Statistics in support of NOAA Fisheries, 166 Water Street, Woods Hole, Massachusetts, 02543, United States*

³*Whale and Dolphin Conservation, 7 Nelson St., Plymouth, Massachusetts, 02360, United States*

⁴*Conservation Law Foundation, 62 Summer St., Boston, Massachusetts, 02110, United States*

⁵*Woods Hole Oceanographic Institution, 86 Water St., Woods Hole, Massachusetts, 02543, United States*

⁶*International Fund for Animal Welfare, 290 Summer Street, Yarmouth Port, Massachusetts, 02675, United States*

Since 2018 the Northeast Fisheries Science Center (NEFSC) has collaborated with members of the pot/trap fishing industry, conservation NGOs, researchers, and engineers to advance the

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development of on-demand systems that are feasible in a variety of commercial fishing conditions. This gear has the potential to reduce or eliminate the entanglement risk buoy lines pose to endangered North Atlantic right whales and to enable fishing in areas closed to fishing with static vertical lines. As a direct result of input from fishermen using the gear under normal fishing operations, significant improvements in the design of the on-demand systems are in place. In addition, this collaboration addresses concerns related to testing, permitting, and outreach and resulted in the formation of a gear lending library. This library contains on-demand systems from multiple manufacturers and allows fishermen to trial a variety of gear, provide feedback to improve the operability of these systems, familiarize themselves with on-demand systems, and alleviate potential misconceptions regarding the gear. The Gear Research Team at the NEFSC has spent considerable time training and providing these on-demand systems in multiple fishing ports from Maine to North Carolina. The results of this work have led to: improved technical and operational success of these systems; a foundation for best practices on use of this gear in areas of high current, poor weather, and low light conditions; and safe handling of this gear. Additionally, this collaborative effort is helping to develop electronic methods to avoid gear conflict (see Khan et. al.). This work has succeeded in moving the development of new fishing practices forward because of the willingness of fishermen, NGOs, academics, state and federal scientists, managers and enforcement officers to work together to help fishermen access areas closed to vertical lines while also minimizing the risk of whale entanglements.

The Advancement of Gear Marking in the Ropeless Fishing Industry

Melvin, B. R.¹, Farrell, S.¹

¹*Teledyne Marine, 49 Edgerton Drive, North Falmouth, Massachusetts, 02556, United States (bob.melvin@teledyne.com)*

Ropeless fishing has gone through many phases and iterations and is still to this day carving out a clear position in the fishing industry. The importance of gear marking is paramount. Highlighting all the benefits of precise gear positioning *and* making this

position known to all other fishers by use of a cloud database, has the following benefits: prevents gear conflict/overlap, visibility to regulators, allows fisher full transparency of where their gear lies for recovery, and more. Teledyne Marine, in partnership with SMELTS, has landed on an innovative and direct method to apply an existing technology, USBL (Ultra Short Base Line) to this problem. Using our DAT (Directional Acoustic Transponder), Teledyne has the ability to determine the direction from which a message is received over an acoustic link along with the range to determine the position of a trap on the seafloor. Recently the DAT was hull mounted on the F/V Resolve and sea tests are evaluating the accuracy and efficiency of the system. Recent advances also include linking trap data from our Track It application to Earth Ranger in real time when a data connection exists.

This is where Teledyne is now, but our vision is to make the technology more accessible and fisher-friendly by incorporating a fully integrated chart-plotter system in partnership with RayMarine. It is widely recognized that fishers rely heavily on their chart plotters for navigation, identifying key points of interest, quickly marking waypoints etc. so keeping this piece of technology in the ropeless fishing system is crucial. Teledyne envisions combining the best of the DAT technology and TrackIt USBL software with the best of the navigation technology (chart plotters) enabling fishers to easily navigate to/from trap locations, deploy, locate, and recover gear.

Using ropeless in closed fishing areas: Sea trials of snow crab fishing gear in the Gulf of St. Lawrence

Morissette, L.¹, Desbois, D.², Cormier, P.³, Smith, M.²

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In 2022, Association des Crabiers Gaspésiens (Québec, Canada) started a 2-year project with the Whalesafe Gear Adoption Fund, aiming to test, in real conditions, three (3) ropeless (gear on demand) systems on snow crab fishing grounds of CFA 12 (Gulf of St. Lawrence). Edgetech and Ashored systems were tested in 2022 and DevOcean will be tested next year. Our methodology and protocols are the same than what was done by our colleagues of New-Brunswick, as this will allow to combine our results and knowledge into a standardized framework that can benefit all snow crab fishermen in Canada and abroad, and thus support/create a community of innovative and involved fishermen. This does not only contribute to an innovative way of evaluating the potential of these technologies, but also to 1) Enable Quebec fishermen to position themselves as leaders in the development of solutions for sustainable fisheries and the protection of endangered species; 2) Reduce the risk of mortality of species at risk (particularly the North Atlantic right whale) in the Gulf of St. Lawrence; and 3) Allow fishing activities to be maintained in otherwise closed areas. As fishing gear on demand systems seems to be the solution with the best potential (according to the wide range of options that were tested by different groups in Canadian waters), it is now crucial to test as many systems as possible in order to understand which are the best solutions according to different areas, different depths, different oceanographic conditions where the snow crab fishery takes place. Our results from this year's trials will be presented, with an emphasis on the new conditions these systems were tested in, and the gain in knowledge we got from these results. The deployment of the 2nd year of sea trials will also be presented for 2023.

EdgeTech Trap Tracker Application improvements and the new marking and positioning improvements using our acoustic technology CAPRI

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This paper will describe new features and additions to the Trap Tracker application. EdgeTech is adding one major improvement to the Trap Tracker system.

This is our new Continuous Acoustic Position Ranging Improvement CAPRI. When in the transit mode the system will send out ID requests every 2 to 5 minutes depending on vessel speed. Whenever a deployed underwater unit is within range it will respond with the unique ID of that system and the App will calculate the range. The ID, the range, and the position of the vessel will be reported to and stored in the Trap Tracker cloud database. All vessels traveling within range will send the same information to the Cloud and in most cases will report multiple ranges with each passing. As the data is collected in the cloud, the processing to improve the position accuracy is performed in the cloud and then reported as the new position of the deployed system. Not only does this continuously improve the accuracy of reported positions it also eliminates or severely reduces Ghost gear.

Guardian Ropeless System

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Longsoaker Fishing Systems (LFS) has had a strong desire to be a leader in ropeless gear innovation. With a heavy reliance on first-hand, commercial trap fishing experience and a thorough understanding of challenges faced by most commercial fishing operations, LFS has developed the Guardian Ropeless System to provide a solution that not only protects North Atlantic Right Whales (NARWs) from vertical line entanglement but also provides an economically viable and operationally manageable option for fishers. The Guardian is a simple rope management device that retrofits existing traps in minutes. It securely fastens the line and buoy on the trap until release to the surface is desired. For offshore applications, the Guardian is adapted for use on a weighted line retention sled that is attached to each end of the trawl. The patent-pending design of the Guardian allows for quick re-rigging and minimal risk of failure due to operator error and other unforeseen operational challenges. The Guardian relies on a wide assortment of Galvanic Time Releases (GTRs) to release the buoys to the surface at a pre-set time, however, most electronic timers and

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acoustic releases can easily be adapted to trigger the Guardian. Reduction in vertical lines in normal situations is estimated to be over 90%. Both the Guardian and the GTRs are relatively inexpensive and highly scalable with manageable lead times. The Guardian has been extensively tested in East and West Coast trap fisheries and is consistently the preferred solution for fishermen who conduct testing.

A progress update from the Mass. DMF on-demand fishing gear scoping project

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Earlier this year, the Massachusetts Division of Marine Fisheries in partnership with Homarus Strategies released a white paper *Assessing the Feasibility of On-Demand Gear in New England Lobster Fisheries* (available at bit.ly/ropeless-report). The report comprehensively characterizes the issues and challenges associated with the integration of on-demand fishing gear technology into New England fisheries. The analysis focused on four discrete issue areas: utility, technology, legal & regulatory affairs, and socioeconomics. Following the report's release, a second phase of the project was launched, which will develop a socioeconomic model for the use of on-demand gear in Massachusetts state and federal waters lobster fisheries. Here we present a recap of the *Feasibility* report, a discussion of its use to date in policy discussions and design, and a preliminary summary of the work completed to date on the socioeconomic model that members of the Ropeless Consortium and the public may find interesting and useful.

SMELTS Advancements of On-Demand Ropeless Fishing to Eliminate Entanglement Risk of North Atlantic Right Whales and Other At-Risk Whales Through Partnership and Collaboration

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North Atlantic right whales are susceptible to chronic injury and death from entanglement in commercial fixed gear fisheries E.g., Lobster, Crab and Groundfish fisheries. SMELTS patented lifting engine for recovering fixed fishing gear from the seafloor with acoustic communication and controlling the filling of buoyant lift-bags removes the need for fishers and scientists to use persistent vertical lines and surface buoys to recover gear from the seafloor. Upon acoustic release command the SMELTS underwater lifting engine opens the valve and fills a lift-bag which brings gear back to surface for recovery. SMELTS is developing surface and seafloor marking technologies for On-Demand Ropeless Fishing with industry partners and has installed the first permanent system in a commercial fishing vessel. SMELTS working with NOAA, fishers and industry partners have made significant advances in On-Demand Ropeless fishing and technology. SMELTS will present advancements made and intent of new work to be performed.

Making “Ropeless” Real in the South Atlantic black sea bass pot fishery

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The importance of input from fishers in fishing gear conservation engineering is well-understood in global marine capture fisheries. The emergence of innovative gear techniques and technologies, which remove end lines and buoys from the vertical water column, often raises concerns and questions from industry members regarding reliability, affordability, safety, and implementation. True collaborative efforts that acknowledge these challenges are necessary. "Ropeless" (pop-up, on-demand) fishing styles or gears require adaptation and refinement to work with individual fishing schemes, both operationally (aboard the vessel) and strategically (within a fisher's total fishing portfolio). Many fishers also volunteer their limited time to participate in various advisory panels, boards, and councils so the voices of fellow industry members are represented during the management process, while others work within their communities to bring about change.

Through trust-built collaborations between research partners, protected resources organizations, and state, regional, and federal fisheries management, the group of fishers represented here have contributed significantly to the understanding of ropeless fishing gear and its adoption. Their collection of aggregate data includes deployments of nearly every available ropeless gear created worldwide, as well as those in research and development. These fishers are authorized to test ropeless gear year-round within an approximately 15,000 square nautical mile time-area closure under the fourth iteration of a South Atlantic Fishery Management Council-supported, National Marine Fisheries Service exempted fishing permit. Communities interested in implementation of the same or similar systems in other regions will benefit from lessons learned and feedback from stakeholders during the first four years of this fisher-funded work.

The results of this collaborative work could be used to advocate for changes to the management of the pot component of the fishery, specifically elimination of current time/area closures. This would benefit both the fishing communities and impacted marine mammals.

Subsea gear location development, ropeless gear risk assessment, and feasibility modeling: a summary of ongoing and upcoming research related to ropeless fishing in the Gulf of Maine

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The rapid decline in the population of North Atlantic right whales has brought about an increasing amount of work to accelerate the transition away from traditional fishing gear with persistent rope in the water column. This transition requires testing diverse approaches in parallel to identify those that reduce risk to right and other large whales while addressing the needs and economic viability of fixed gear fisheries. The Maine Department of Marine Resources (DMR) is using internal and external funding sources to explore subsea gear marking technology in a way that is scalable to fisheries and integrates within existing fishing practices. SubSonus acoustic marking technology is being integrated with various chart plotting software already employed by fishermen. This research explores the performance of subsea ranging technology relative to traditional surface buoys and surface-marking of ropeless or on-demand gear. Additionally, DMR will field test alternative gear retrieval systems, including commercially available timed release systems, within differing fishing operations across different seasons for their viability among fixed gear fisheries and to quantify the realized risk reduction achieved compared to traditional systems. Data collected will inform models created by SUNY-Stony Brook to estimate risk thresholds in the Gulf of Maine for the tested gear systems accounting for seasonal and

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oceanographic variation across the Gulf of Maine region. SUNY Stony Brook will also estimate the impacts of anticipated fishing gear density on implementing these alternative fishing systems. This presentation will summarize the SubSonus and Olex chart software integration that has already begun on a pilot scale, preview the gear testing that will broaden into the commercial sector during the 2023 fishing year, and outline SUNY-Stony Brook modeling approaches to risk calculations and impacts from adoption.

From Experimental to Commercial Rope-on-demand/Ropeless Fishing in Atlantic Canada

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Ropeless, or rope-on-demand fishing practices, are supported by Fisheries and Oceans Canada (DFO) under its management measures to prevent entanglements of large whales in commercial non-tended, fixed gear fisheries, including lobster and crab. Beginning in 2018, a variety of acoustic releases and ropeless systems have been explored in selected Atlantic trap fisheries. Ropeless commercial fishing of snow crab has been tested for three years (2020-2022) in the southern Gulf of St. Lawrence, which permitted experimental license holders to become familiar with the gear and sell their catches. Snow crab trawls, as opposed to single traps, are currently being piloted to allow for an increase in the number of deployed traps per acoustic release, thereby reducing a harvester's financial investment in this technology. Significant federal funding has been provided to support Canadian manufacturing of ropeless systems, which are being tested and refined in a number of fisheries. Canadian Fisheries Officers participated in educational workshops regarding the functionality of rope-on-demand fishing systems including training in gear location tracking. The deployment of rope-on-demand fishing systems in combination with access to fishing grounds inhabited by North Atlantic right whales is a key motivator to industry participation and future expansion of this whalesafe fishing practice. The federal government announced a new Whalesafe Gear Adoption Fund to

support the adoption of requirements that are being phased in for whalesafe fishing gear.

CanFISH: A gear lending program providing access and training to the commercial fishing industry to facilitate on-demand fishing in Atlantic Canada

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In Canada, large areas are being closed to traditional fishing to protect North Atlantic right whales (NARW). On-demand (ropeless, buoyless) gear is being permitted on a limited basis for fisheries to operate in these closed areas. There are, however, several obstacles to fisheries incorporating on-demand gear into their operations including accessibility, financial considerations, licensing, and inexperience with the gear. In addition, individual fish harvesters must select an appropriate system for their fishery, obtain the gear, and learn how to operate it. To help overcome these challenges, we developed the CanFISH Gear Lending Program funded by the Government of Canada's Whalesafe Gear Adoption Fund. The purpose of CanFish is to make on-demand gear accessible to any fish harvester in Atlantic Canada who wants to fish in NARW closures. Through the program, an on-demand system is recommended to each harvester based on their individual fishing operations, environmental conditions and results obtained from our existing gear trial program. The gear is delivered to the harvester along with an experimental fishing permit, and they are trained at-sea to use the gear and to record its performance. Once the harvester is done using the gear it is returned to CanFish, inspected, and serviced before re-entering the program's inventory. Since the program's launch in early 2022, 10 fish harvesters have used the program to successfully fish snow crab in a fisheries closure, removing more than 800 buoylines from the fishery. The program successfully removes the financial risk of investing in a new technology, increases knowledge of the gear and its use among stakeholders, and provides a connection between the fishing industry and technology developers to help improve future gear designs. It also addresses potential discrepancies in access

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among harvesters by providing gear at no cost to the borrower.

Status update of Ropeless RISER: A ropeless fishing system with automated gear location and integral chart plotter display and control

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The Ropeless RISER™ is an acoustically-actuated, airbag retrieval system. This highly configurable system can be attached to existing traps or act as standalone “anchors” for trawls. Airbags are the preferred retrieval mechanism due to lift capacity and simplicity of operation; providing the most lifting force in the smallest possible volume and weight on deck. Aside from the handling of buoys and lines, trawl recovery and deck operations remain essentially the same as they are now. In fact, the Ropeless RISER™ system can make the gear setting and retrieval process safer and more efficient. Unlike other ropeless solutions, the Ropeless RISER™ system provides real-time, seafloor location of traps with a technique called Single Ping Positioning™. This patent pending technology consists of acoustic transponders on each of the submerged systems and a hull-mounted transceiver on each vessel which allows “virtual buoys” to be seen on a chart plotter without special ship maneuvers or any actions on the part of the vessel operator. Each seafloor transponder has a unique ID that allows the chart plotter to distinguish and display ownership, as well as identify single traps and multi-trap trawls allowing only vessels in close proximity to “see” the locations of the seafloor gear. In this way, setting gear remains much like it is done now, in which visual observations and radar displays are used to locate gear and prevent conflicts. Because this method resolves gear conflict, it can remove the last remaining impediment to making ropeless a reality, and it does so in an automated manner - without tablets, phones, apps, cell or satellite services, or the need for central reporting and management of gear positions. The presentation will include a summary of US and Canadian gear testing in 2021 and 2022, and images of real-time, gear location chart plotter displays.

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| Lauren | Saez | OAI/NMFS/WCR |
| Kate | Sampson | GARFO |
| Phillip | Sanchez | Sustainable Fisheries Partnership |
| Kim | Sawicki | University of Massachusetts-Dartmouth |
| Christopher | Schillaci | NOAA- GARFO |
| Alicia | Schuler | NOAA Fisheries |
| Sarah | Seaberg | IFAW |

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| Geoffrey | Shester | Oceana |
| Liese | Siemann | Siemann |
| Kirsten | Silva | University of Maryland CBL |
| Julia | Singer | Oceana |
| Nick | Sisson | NOAA Fisheries/GARFO |
| Sahra | Skripsky | Canadian Wildlife Federation |
| Ainsley | Smith | NOAA Fisheries |
| Maxime | Smith | Groupe MDMP |
| Charlie | Snow | Worcester Polytechnic Institute |
| Laura | Solinger | NOAA NEFSC |
| Trevor | Spradlin | NMFS OPR |
| Dawn | Stancavish | MASSA |
| Kevin | Staples | Maine Department of Marine Resources |
| Peter | Stein | Scientific Solutions Inc |
| Ashley | Stokes | Seacoast Science Center |
| Megan | Stolen | Blue World Research Institute |
| Taylor | Stoni | MA Division of Marine Fisheries |
| Allyn | Sullivan | Attentive Energy / TotalEnergies |
| Erin | Summers | Maine Department of Marine Resources |
| Wendy | Szaniszlo | Canadian Wildlife Federation |
| Jamie | Testa | Chesapeake Biological Laboratory |
| Guy | Thibault | DEPARTMENT OF FISHERIES AND OCEANS |
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| Kim | Tilas | MET |
| Kathryn | Townsend | Maritime Aboriginal Peoples Council |
| Marisa | Trego | NOAA Fisheries |
| Edward | Trippel | Fisheries and Oceans Canada |
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| Krystyna | Urbancic | Canadian Wildlife Federation |
| Shelby | Vance | Anderson Cabot Center for Ocean Life at the New England Aquarium |
| Hanna | Vatcher | Canadian Wildlife Federation |
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| Elizabeth | Vézina | Canadian Wildlife Federation |
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| Connie | Vincent | Fisheries and Oceans Canada |
| Harold | Vincent | Ropeless Systems, Inc. |
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2022 Ropeless Consortium Participants

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| Gavin | Willoughby | Applied Acoustics |
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