Expansion Project to Modernize Pot Fishing for the Southeast Commercial Black Sea Bass (BSB) Pot Portion of the Snapper-Grouper Fishery Using Subsea Buoy Retrieval Systems[1]

Date of Application: 11/23/2021

Extent of Time EFP needed: February 1, 2022 – August 31, 2024

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Identification of Problem:

Acoustic Subsea Buoy Retrieval Systems (ASBRS) are an example of innovative gears which store buoys and their retrieval devices at depth. These systems exist in the water column for minutes instead of hours or days as they are activated via acoustic releases only when fishers are present. Currently vertical end lines and buoys, such as those utilized in the Black Sea Bass (BSB) pot portion of the snapper-grouper fishery, present an entanglement risk to the critically endangered North Atlantic right whale (NARW), a species which migrates through the SA BSB pot fishing grounds and calves off the coast of Georgia and Florida in winter months. Adaptation of ASBRS or "ropeless" systems for this style of pot fishing could remove nearly all risk to these whales and other marine animals that suffer entanglements. These systems have been utilized in other fisheries and in many other marine applications worldwide for over twenty years and are currently being tested nationwide in a multitude of locations that suffer fishery closures due to the presence of endangered cetaceans (by this PI and others). For fisheries management to determine if these devices could be relied upon in an area currently closed to pot fishing when NARW mothers and calves are present, a detailed performance analysis is required that examines the refinement and successful use of ASBRS in this pot fishery.

[1] Subsea Buoy Retrieval Systems are also known as "ropeless", "lineless", "pop-up", and "on-demand" fishing systems. For the purpose of the application, the all-inclusive term SBRS will be used for all devices.

Our first fisher-funded pilot project conducted under a NMFS Exempted Fishing Permit showed the eight units of ropeless gear we tested to be 100% reliable when properly trained, experienced researchers and fishermen were operating the devices. Additionally, our independent review of past trials have since shown a greater than 99.99% success rate when gear is handled by properly trained, experienced personnel, and further, highlight the importance of fisher input and expertise in making the gear more adaptable (and profitable) for those wishing to fish an ASBRS or a SBRS.

During our **reliability** testing in the initial pilot, we were not testing how good fishermen or researchers were at *learning* or *using* the gear, but merely how reliable the gear was at returning the pots to the vessels. During our pilot project, four researchers worked directly with ten different fishers and 14 units of eight different ropeless devices on three different vessels and completed several hundred deployments of various gear configurations. To assess issues of safety, reliability of devices, efficiency, fishability and researcher and fisher learning curve, we collected trap interior and exterior recordings, active and passive deck and dockside operations recordings, and aerial video of retrievals and repacking/stowing activities on deck. At the conclusion of our first trial fishing season, (fishing single pots), we recorded a total of 799 successful SBRS releases (out of 804 attempts) which occurred over the season and showed 99.4% success rate of the devices. Fishermen report < 1% occurrence of human error when setting control gear (Buff & Ogg, pers comm), which meant our ropeless gear needed to be more than 99% reliable. Ignoring operational error (human-caused) the devices themselves were 100% reliable. Factoring human error in, the releases themselves were 99.4% reliable (799 successes out of 804 attempts). All operational failures caused the line and buoys to be retained in their containment devices, so no gear was "accidentally released" or "unexpectedly" triggered at any time. These systems have to date, been extremely reliable (>99%) in tests done internationally. (Shester, 2018; Terhune *et al.*, 2018; Baker and Specialist, 2019; Flagg, 2019; Morris and MacEachern, 2019; Stevenson, 2019)(*See Appendix 2*)

Research Objectives & Methodology:

This project includes two detailed research components. The first component evaluates ASBRS and SBRS devices, while the second component evaluates the economics of ASBRS/SBRS gear. It is our intent that this work will,

(1) Allow for expansion of our initial pilot to the Georgia black sea bass pot fishery (funded by a current GA Sea Grant award) ***during the closure*** to examine basic functionality, reliability, & feasibility of ropeless fishing gear & alternative rigging configurations,
(2) Expand our alternative gear project to additional fishers in North Carolina, South Carolina, and Florida ***during the closure*** to examine basic functionality, reliability, & feasibility of ropeless fishing gear & alternative rigging configurations for the BSB pot fishery,
(3) Collect data regarding upfront, implementation, & maintenance costs for gear types,
(4) Survey past and current Snapper-Grouper permit holders,

(5) Conduct an economic analysis of ropeless black sea bass pot fishing using empirical data from these trials and our pilot trial; and
(6) Supply "whale-safe" BSB products to wholesale & retail partners to gather relevant data about expected revenues for this niche product.

During Years One, Two, and Three, gear efficiency data will be collected during regional field-testing by the applicants. Various ropeless gear & pot configurations will be tested on a combination of vessels, during which time "experimental" gear & configurations will be tested against controls for set-up, soak, haul times, fisher-learning curves, & catchability. Catch will be wholesaled & retailed according to our wholesale partner's marketing schemes, with values reported at the conclusion of the project.

If funded, in **Year Two,** we will examine a critical variable cost in the development of a commercial ropeless fishery; ***the cost to enter the market***, which requires the purchase of technologies that incorporate 1) a galvanic time release (GTR), 2) a time-date system, and/or 3) an acoustic release system; paired with an air bag lift or rope management system. While some systems bear significant upfront financial costs to the user, some carry more moderate costs that will likely be commensurate with existing gear & seasonal maintenance expenditures, which will likely decrease over time and as market demand increases. We have developed an analytical tool to allow comparisons of the projected costs of acquiring & operating ten ropeless gear solutions in development or commercially available. Stakeholders can use this framework to evaluate the economic feasibility of (& multiple scenarios for) an industry-wide transition & can be adapted to accommodate any present-day pot fishery's needs.

If funded, **the second year** will also focus on performing outreach to Snapper-Grouper permit holders. We will collect BSB fishery-relevant information for inclusion in the economic analysis through review, field research, outreach, & surveys. The surveys will gather information on decision-making schemes concerning offshore winter pot fishing, focus shifts to other species, & archival, current & future costs of status quo winter fishing efforts.

Finally, we will calculate the net present value of net revenues for adopting each system over 1-, 5-, 10-, & 20-year cycles, & include the cost of annual expendables & replacements for worn or end-of-life units. Further, we will assign a scoring schema to deal with perceived social benefits with non-monetary values that fishers indicate are important during the survey process. We will return scenarios to management & fishers that they can use to make informed decisions about maintaining or changing The project will provide critical information for all partners and will yield lessons for other fisheries facing similar conflicts and resultant economic difficulties, such as the New England lobster fishery, and the West Coast dungeness crab fishery.

We are collaborating with other stakeholders in a meaningful fashion; Marine Extension and GA Sea Grant (GASG) for outreach and education to consumers and fishers, Southeast Regional Office Protected Species Branch for considering measures to mitigate impacts to NARW, and the South Atlantic Fishery Management Council.

Data will be collected from February 2022 until August 31, 2024 with ropeless devices (if issued an EFP) in the BSB pot fishery through an ongoing and collaborative effort of several BSB pot endorsement holders, multiple ASBRS/SBRS manufacturers, our wholesale and retail partners, the Georgia Conservancy, the University of Georgia's Marine Extension and Georgia Sea Grant.

Objectives and Fishing Methods

The research described in this EFP application specifically seeks this exempted fishing permit to determine:

- If the ASBRS/SBRS gear will show a greater than >99% successful deployment and retrieval rate,
- If ASBRS/SBRS gear significantly increases time or expense for retrieval and recovery versus the current fishing method such that it might affect profitability,
- If ASBRS/SBRS gear significantly increases time or expense for repacking of gear for redeployment versus the current fishing method such that it might affect profitability,
- If bycatch rates for a modified BSB pot design ("4BY") are greater than the traditional single pots,
- If the harvest of BSB in the preferred inshore areas currently closed, will still yield enough catch to offset the cost of ASBRS/SBRS fishing gear and modifications.

The first phase of our work will be to familiarize the fishers with ASBRS gear, using mock-up traps (with no entrances for fish) as allowable by law, during a knowledge exchange in Townsend, GA. We have arranged this event with long-standing members of the BSB pot fishing community to ensure that our fishers are utilizing the similar fishing methods across all ropeless fishing efforts, as well as to introduce crew members to the ASBRS and train them at one time. We intend to use our "Learning-Teaching-Mastery" plan during our fisher dockside training and fishing trials to quantify and understand learning curves for the various devices. This information is essential for future research, development, and regional adoption plans for SBRS gear. Our learning exchange will also test and refine our "Six Rights for Ropeless" quick start and troubleshooting guide.

This will yield basic data about the ease of adaptation to the experimental buoy designs and success of acoustic deployments and retrievals, and to gain valuable fisher-provided feedback on our virtual gear marking software, as well as those products that accompany the various ASBRS. These initial test traps will be tested with safety lines stored at depth using timers and/or GTRs in place as back-up releases. These configurations have been used successfully in other regions of the United States and Canada. Camera and film recordings of fish, trap, ASBRS, and participant behavior will be utilized to ensure safety of both intended target catch and sub-legal species as well as nearby marine animals and participants.

We proposed to fish with each identified fisher applicant for up to 10 days each year in supervised field trials. Fishers will then perform unsupervised, but data recorded fishing trials aboard

permitted commercial vessels during periods allowable in the EFP to evaluate the performance of ASBRS and SBRS with both the experimental and standard BSB pot configurations.

BSB pots will be fished as singles and 4BYS in inshore areas; this will be done in during the closure periods to compare against control pots previously fished to yield data relative to the time expended to retrieve and rebait traditional traps per current regulations. These experimental gears and configurations of BSB pots will be fished on live bottom with ropeless gear and without ***persistent*** vertical endlines and buoys and recorded with virtual GPS gear marking applications and software. Virtual gear marking (marking of gear deployment location with chartplotters, GPS, and manufacturer-provided software) will be utilized and evaluated, with analysis of the interoperability of systems being shared with fishery management partners.

The selected styles of ASBRS/SBRS gear and pot configurations can be seen in Figures 2-12 and are detailed later in the EFP. Timed releases will be used as primary releases when soak times are <90 minutes and fishers are within line of sight of their gear. GTRs will be used as back-up releases to ensure that gear is not lost due to catastrophic failure of the SBRS and ASBRS gear.

Any gear modifications or alterations in rigging will be made through consultation with regional & federal management agencies and in collaboration with individual fishers and industry partners. Fishers participating in this initiative are assumed to be receiving grant funding and/or self-funding the work. To ensure coverage under the MMPA by the Marine Mammal Authorization Program, they will keep and sell all legal catch so that it meets the definition of a commercial fishery. We will consult with NOAA Fisheries to ensure our research design and fishing activities are in congruence with NARW conservation measures currently in place.

An overview of each product's gear type, working method, and development status is presented in Table 1.

Table 1 Summary of current ropeless systems available

Manufacturer	Line Storage Method	Release Method	Status	Field-tested	Web site
Desert Star Systems	Multi or Bag	AC	Mature design 20+ yr. product	Yes	http://www.desertstar.com
EdgeTech	Cage	AC	Mature design since 1965	Yes	https://www.edgetech.com
Fiomarine	Spool	AC TD	Mature design 20+ yr. product	Yes	http://fiomarine.com
International Fishing Devices	Multi	GTR	Mature Design	Yes	https://www.undersearelease.com
Lobster Lift	Air	AC TD	Solid Prototype	Yes	https://www.lobsterlift.com
Longsoaker	Mesh	GTR	Solid Prototype	Yes	http://longsoaker.com

Puget Buoy	Line Cannister	TD	Prototype	Yes	https://pugetbuoy.com
Ropeless Riser	Air	AC	Solid Prototype	Yes	https://www.Ropeless Riser.org
Sub Sea Sonics	Multi	AC TD	Mature Design & Solid Prototype	Yes	https://www.subseasonics.com

Type and size of gear to be used:

We will fish traditional black sea bass pots, with a uniform mesh size of >2.0 inches as described by Rudershausen, et al. to reduce potential bycatch of unintended species as well as undersized conspecifics. (Rudershausen *et al.*, 2016). We will also be fishing four BSB pots of regulation size with the same mesh size, connected with hog rings to reduce the number of ASBRS devices needed to haul gear in winter in the inshore area (to reduce gear setting and resetting time and to investigate improving return on investment for ASBRS gear).

Black Sea Bass Pot Modifications

BSB pot fishers are limited to 35 traps per endorsement, and they must return to the dock at the end of each fishing trip. Many pot fisheries utilize trawls (traps connected by a ground line) to increase their fishing efficiency and reduce the number of vertical buoy lines needed for hauling. Because trawls are not allowed in this region during parts of the season, we collaborated with endorsement holders to conceive a method that connects four regulation-sized pots for our pilot project. This was done with wire connecting clips (hog rings) and required only one SBRS gear device to retrieve the four pots. Our experimental design ensured that all sides of the pots and configurations of pots used a mesh size of >2.00" to allow maximum opportunity for the release of unintended species and sub-legal conspecifics (Rudershausen *et al.*, 2016). This experimental design also reduced the total entrances from eight to four (Figures 5 and 6).

This same gear will be trialed with some fishers in this project to 1) reduce the number of SBRS devices needed to haul gear to reduce expense for gear and 2) test the feasibility of targeting a large group of BSB at one time, improving the efficiency of gear while reducing the amount of time required by fishers in winter to set and haul and, 3) reduce the number of

Figure 2 4BY Experimental Trap Design

Figure 1 4BY Experimental Trap with FioBuoy AC100

individual gear deployments during the closure. Traditionally, fishing 32 pots would require 32 deployments; our method requires only eight deployments to achieve this same number of pots fished. It is important to note that the interior dimensions of these configurations ***are the same as required by law***. This modification aims to examine ways to reduce procurement and implementation costs associated with SBRSs while ensuring catch rates that are similar or greater than those in single-pot configurations.

Amount of gear to be used: 35 total pots per vessel
Number of gear hauls: <2000
Average soak time: 90 minutes for timed releases, 90 min- overnight for acoustic releases.
Sampling months/time of year: November 15 – April 30
Sampling locations (including depth):

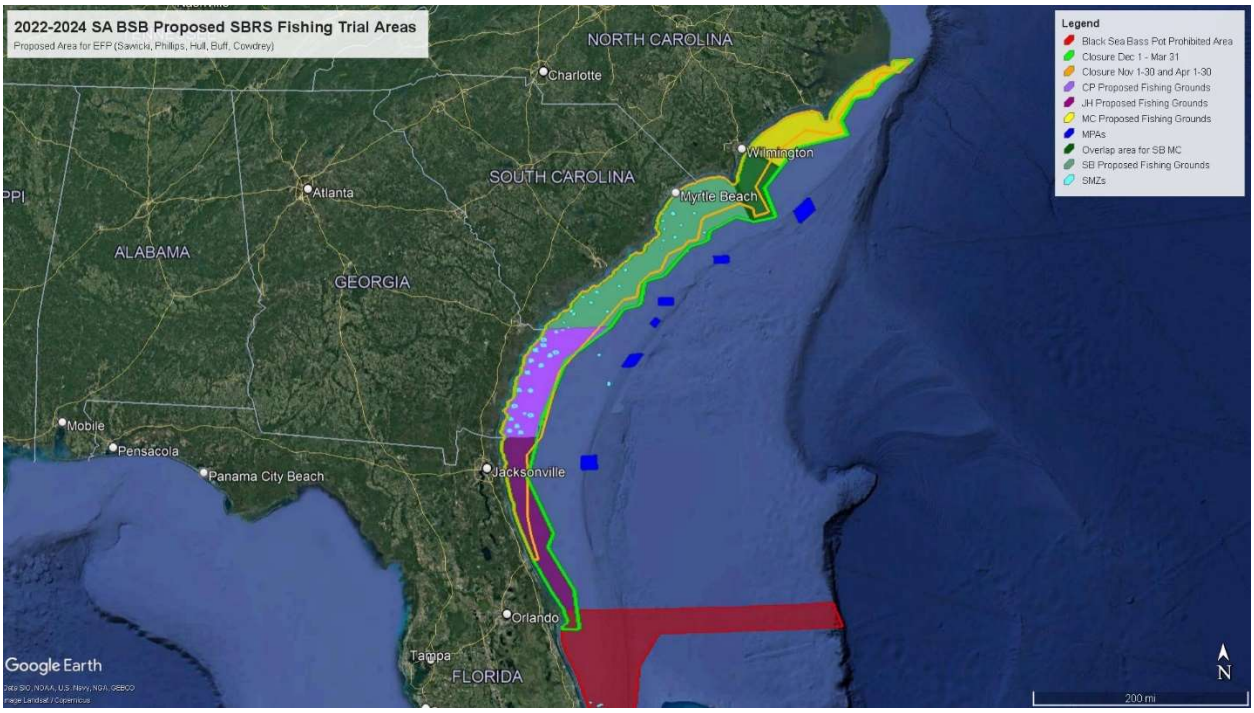

Figure 3 Proposed Fishing Areas for SA BSB ropeless pot fishery 2022-2024

Inshore, in waters between 20 and 65 meters per the map above (Figure 3). The area indicated in yellow would be the primary area for fishing by Captain M. Cowdrey. The area indicated in dark green would be a combined opportunity region for both Captain Cowdrey as well as Captain Scott Buff and crew. The area indicated in light green would be the primary fishing grounds utilized by Captain Buff and crew, but outreach is underway to recruit additional trial participants off the South Carolina Coast. The area highlighted in purple will be those grounds available for gear trials to Captain C. Phillips and crew, and lastly, the area indicated in maroon will be the area utilized by Captain J. Hull. Outreach is ongoing to recruit an additional fisher for the northern opportunity area in Florida.

We will not fish in Special Management Zones (SMZs) or the North Atlantic Right Whale Critical Habitat Area or those areas listed in CRF 50 §622.182 Gear-restricted areas ((a)(1)(i) through (ii).

Detailed Sampling Areas and coordinates are listed on page 25.

To accurately address our research questions, our research group will require exemptions from the following regulations:

Regulations Project requires exemptions from

I. 50 CFR 622.183(a)(1)(ii)

For the purpose of paragraph (a)(1)(i) of this section, transit means direct, non-stop progression through the MPA. Fishing gear appropriately stowed means -

a. 50 CFR 622.183(a)(1)(ii) (E)

A crustacean trap, golden crab trap, or sea bass pot cannot be baited. All buoys must be disconnected from the gear; however, buoys may remain on deck.

We require exemption from this rule because ASBRS/SBRS gear (inclusive of buoys or lift bags) may not always be easy or possible to disconnect from traps, particularly those that are fixed or spliced into the bridle system of singles or 4BYs. No pots will be baited during transit through MPAs.

II. 50 CFR 622.183(a)(2)(vii)

For the purpose of paragraph (a)(2)(i) of this section, transit means direct, non-stop progression through the spawning SMZ. Fishing gear appropriately stowed means:

a. 50 CFR 622.183(a)(2)(vii)(E)

A crustacean trap, golden crab trap, or sea bass pot cannot be baited. All buoys must be disconnected from the gear; however, buoys may remain on deck.

We require exemption from this rule because ASBRS/SBRS gear (inclusive of buoys or lift bags) may not always be easy or possible to disconnect from traps, particularly those that are fixed or spliced into the bridle system of singles or 4BYs. No pots will be baited during transit through SMZs.

III. 50 CFR 622.183(b)(6)

Seasonal closure of the commercial black sea bass pot component of the snapper-grouper fishery.

The closed area is that area and time period described in paragraphs (b)(6)(i) and (b)(6)(ii) of this section, respectively. During the applicable closure, no person may harvest or possess black sea bass in or from the closed area within the South Atlantic EEZ either with sea bass pots or from a vessel with sea bass pots on board, except that a vessel with a valid commercial permit for snapper-grouper with a sea bass pot endorsement that is in transit and with black sea bass pot gear appropriately stowed as described in paragraph (b)(6)(iii) of this section may possess black sea bass. In addition, sea bass pots must be removed from the water in the applicable closed area within the South Atlantic EEZ before the applicable time period and may not be on board a vessel in the closed area within the South Atlantic EEZ during the applicable closure, except for such sea bass pot gear appropriately stowed on board a vessel in transit through the closed area. See paragraph (b)(6)(iii) of this section for black sea bass pot transit and gear stowage requirements through the closed areas.

a. 50 CFR 622.183(b)(6)(i)

(i) From November 1 through November 30 and from April 1 through April 30, no person may harvest or possess black sea bass in or from the closed area within the South Atlantic EEZ either with sea bass pots or from a vessel with sea bass pots on board in the South Atlantic EEZ inshore of the rhumb lines connecting, in order, the following points:

Point	North lat.	West long.
1	35°15′	State/EEZ boundary.
2	35°15′	75°09′.
3	35°06′	75°22′.
4	35°06′	75°39′.
5	35°01′	75°47′.
6	34°54′	75°46′.
7	34°52′	76°04′.
8	34°33′	76°22′.
9	34°23′	76°18′.
10	34°21′	76°27′.
11	34°25′	76°51′.
12	34°09′	77°19′.
13	33°44′	77°38′.
14	33°25′	77°27′.
15	33°22′	77°40′.
16	33°28′	77°41′.
17	33°32′	77°53′.
18	33°22′	78°26′.
19	33°06′	78°31′.
20	33°05′	78°40′.
21	33°01′	78°43′.
22	32°56′	78°57′.
23	32°44′	79°04′.
24	32°42′	79°13′.
25	32°34′	79°23′.
26	32°25′	79°25′.
27	32°23′	79°37′.
28	31°53′	80°09′.
29	31°31′	80°33′.
30	30°43′	80°49′.
31	30°30′	81°01′.
32	29°45′	81°01′.
33	29°31′	80°58′.
34	29°13′	80°52′.
35	29°13′	State/EEZ boundary.

Our work requires exemption from this rule as it would not be possible to fish ABSRS/SBRS gear in any other area and return pertinent data on the economic viability of this gear for this fishery without access to the resource, which is in greatest abundance, is most valuable, and easiest to access in the winter closure area and closure period. We have already tested the experimental gear, as well as the control gear for reliability in a previous pilot project. We will take all available safety precautions necessary including turning off the permitted fishing vessels to look and listen for whales in the area for 15 minutes prior to triggering release of the devices. We will take all available safety precautions necessary including turning off the permitted fishing vessels to look and listen for whales in the area for 15 minutes prior to triggering release of the devices. Further, before leaving the dock for all fishing activities, we will suggest that fishermen check the Whale Alert App or consult this sightings map: https://apps-nefsc.fisheries.noaa.gov/psb/surveys/MapperiframeWithText.html.

For areas off NC and SC, we will advise our participant vessels to transit 10 knots or less within a 5 nautical mile radius of a right whale sighting for 3 days post the initial sighting. For areas off GA and FL, we will advise our participant vessels to transit 10 knots or less within a 5 nautical mile radius of a right whale sighting for 14 days post that sighting.

b. 50 CFR 622.183(b)(6)(ii)

(ii) From December 1 through March 31, no person may harvest or possess black sea bass in or from the closed area within the South Atlantic EEZ either with sea bass pots or from a vessel with sea bass pots on board in the South Atlantic EEZ inshore of the rhumb lines connecting, in order, the following points:

Point	North lat.	West long.
1	35°15′	State/EEZ boundary.
2	35°15′	75°08′.
3	34°58′	75°41′.
4	34°49′	75°50′.
5	34°47′	76°05′.
6	34°31′	76°18′.
7	34°20′	76°13′.
8	34°12′	77°00′.
9	33°43′	77°30′.
10	33°21′	77°21′.
11	33°18′	77°41′.
12	33°22′	77°56′.
13	33°12′	78°20′.
14	33°05′	78°22′.
15	33°01′	78°38′.
16	32°40′	79°01′.
17	32°36′	79°18′.
18	32°19′	79°22′.
19	32°16′	79°37′.
20	32°03′	79°48′.
21	31°39′	80°27′.
22	30°58′	80°47′.
23	30°13′	81°01′.
24	29°32′	80°39′.
25	29°22′	80°44′.
26	28°50′	80°22′.
27	28°21′	80°18′.
28	28°21′	State/EEZ boundary.

Our work requires exemption from this rule as it would not be possible to fish ABSRS/SBRS gear in any other area and return pertinent data on the economic viability of this gear for this fishery without access to the resource, which is in greatest abundance, is most valuable, and easiest to access in the winter closure area and closure period. We have already tested the experimental gear, as well as the control gear for reliability in a previous pilot project. We will take all available safety precautions necessary including turning off the permitted fishing vessels to look and listen for whales in the area for 15 minutes prior to triggering release of the devices. We will take all available safety precautions necessary including turning off the permitted fishing vessels to look and listen for whales in the area for 15 minutes prior to triggering release of the devices. Further, before leaving the dock for all fishing activities, we will suggest that fishermen check the Whale Alert App or consult this sightings map: https://apps-nefsc.fisheries.noaa.gov/psb/surveys/MapperiframeWithText.html.

For areas off NC and SC, we will advise our participant vessels to transit 10 knots or less within a 5 nautical mile radius of a right whale sighting for 3 days post the initial sighting. For areas off GA and FL, we will advise our participant vessels to transit 10 knots or less within a 5 nautical mile radius of a right whale sighting for 14 days post that sighting.

c. 50 CFR 622.183(b)(6)(iii)

(iii) For the purpose of paragraph (b)(6) of this section, transit means non-stop progression through the area; fishing gear appropriately stowed means all black sea bass pot gear must be out of the water and on board the deck of the vessel. All buoys must either be disconnected from the gear or stowed within the sea bass pot. Disconnected buoys may remain on deck.

We require exemption from this rule because ASBRS/SBRS gear (inclusive of buoys or lift bags) may not always be easy or possible to disconnect from traps, particularly those that are fixed or spliced into the bridle system of singles or 4BYs. No pots will be baited during transit.

IV. 50 CFR § 622.189 (b)

Configuration restriction

In the South Atlantic EEZ, sea bass pots may not be used or possessed in multiple configurations, that is, two or more pots may not be attached one to another so that their overall dimensions exceed those allowed for an individual sea bass pot. This does not preclude connecting individual pots to a line, such as a "trawl" or trot line.

Our work requires exemption from this rule because it would not be possible to test our 4BY trap configurations with the fishers who elect to try them. These trap configurations would make transition to ASBRS/SBRS gear more affordable and is a critical element of our research.

V. 50 CFR § 622.189(e)(1)

Requirements for pot removal.

A sea bass pot must be removed from the water in the South Atlantic EEZ and the vessel must be returned to a dock, berth, beach, seawall, or ramp at the conclusion of each trip. Sea bass pots may remain on the vessel at the conclusion of each trip.

Our work requires exemption from this rule because it would not be possible to test traditional soak times and approaches by some fishers who have historically used these methods. These trap configurations would make transition to ASBRS/SBRS gear more affordable for those wishing to use the pots as a passive fishing approach and is a critical element of our research.

VI. 50 CFR § 622.189 (g)

Sea bass pot buoy line marking requirement.

In addition to the gear marking requirements specified in 50 CFR 229.32(b), from November 15 through April 15, each year, in the Southeast U.S. Restricted Area North as described in 50 CFR 229.32 (f) and from September 1 through May 31, each year in the Offshore Trap/Pot Waters Area and the Southern Nearshore Trap/Pot Waters Area, as described in 50 CFR 229.32(c)(6) and (9), respectively, the buoy line must be marked with a purple color band. The colored band must be clearly visible when the gear is hauled or removed from the water, including if the color of the rope is the same as, or similar, to the colored band. The purple band must be marked directly onto the line and adjacent to the buoy line markings specified in 50 CFR 229.32(b), that is, at the top, middle, and bottom of each buoy line deployed by, or on board, the vessel. Each of the three purple bands must be a 12-inch (30.5 cm) color mark. In marking or affixing the purple band, the line may be dyed, painted, or marked with thin colored whipping line, thin colored plastic, or heat-shrink tubing, or other material.

Our work requires exemption from this rule and requests a different color for our line marking so that our experimental fishing is discernible from other fisheries and gear types.

VII. 50 CFR § 229.32 (C) (1) (i)

Buoy line floating at the surface

No buoy line floating at the surface. No person or vessel may fish with trap/pot gear that has any portion of the buoy line floating at the surface at any time when the buoy line is directly connected to the gear at the ocean bottom. If more than one buoy is attached to a single buoy

line or if a high flyer and a buoy are used together on a single buoy line, floating line may be used between these objects.

Seven of the devices require floating line to return the buoy or buoys to the surface for retrieval. Currently, the average time for appearance of buoys at greater than 100ft is approximately three minutes. Retrieval generally takes less than 120 seconds, which means that floating rope would be at the surface for less than five minutes total, during which time the vessel would be within 20-30 feet of the line at all times.

Two of the devices do not incorporate line longer than ten feet in the design, and one uses a harness that clips to the trap. The remaining devices will use less than 150' of rope which will be stowed inside either a trap (See Figure 4 Edgetech 5112), a bag (Desert Star), or on a spool (FioBuoy, Puget Buoy).

VIII. 50 CFR § 229.32 (C) (vi) (D & E)

Buoy line free of objects

> *(D) The entire buoy line must be free of objects (e.g., weights, floats, etc.) except where it attaches to the buoy and trap/pot*
>
> *(E) The buoy line is made of sinking line.*

Seven of the ASBRS/SBRS device configurations require floating line to return the buoy or buoys to the surface for retrieval. Currently, the average time for appearance of buoys at greater than 100ft is approximately 3 minutes. Retrieval generally takes less than 120 seconds, which means that floating rope would be at the surface for less than five minutes total, during which time the vessel would be within 20-30 feet of the line at all times. Sinking line cannot be used for this application as it will create a negatively buoyant strain on the buoys and not allow for their return to the surface.

All of the gears with a rope storage system will need to be attached between the trap and the buoy. Several of the gears might require a small anchor or weight to be attached between the trap and rope-storage device or buoy in areas with higher current to keep them from fouling in the trap, as well as to ensure they are not dragged from their deployment area. We are requesting the use of these devices only if necessary. For lift bag and buoy systems, the actual systems will be secured between the trap and the buoy/bag. Please see figure 4.

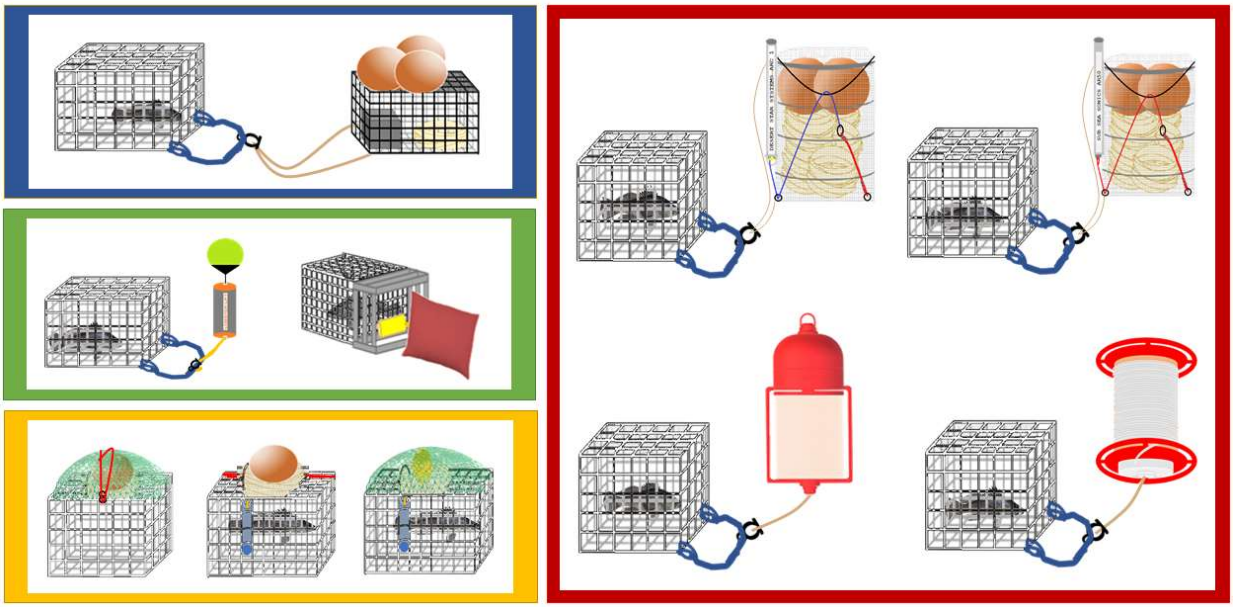

Figure 4 ASBRS/SBRS Gears to Be Tested (from L to R, top to bottom: EdgeTech 5112, Sub Sea Sonics AR 50, Desert Star Systems ARC-1XD, LobsterLift , Ropeless RISER, Puget Buoy, Fiomarine-FioBuoy, Longsoaker Guardian - GTR, Sub Sea Sonics - TR4RT, Longsoaker Guardian & Sub Sea Sonics TR4RT hybrid. Sawicki &Toth, 2021

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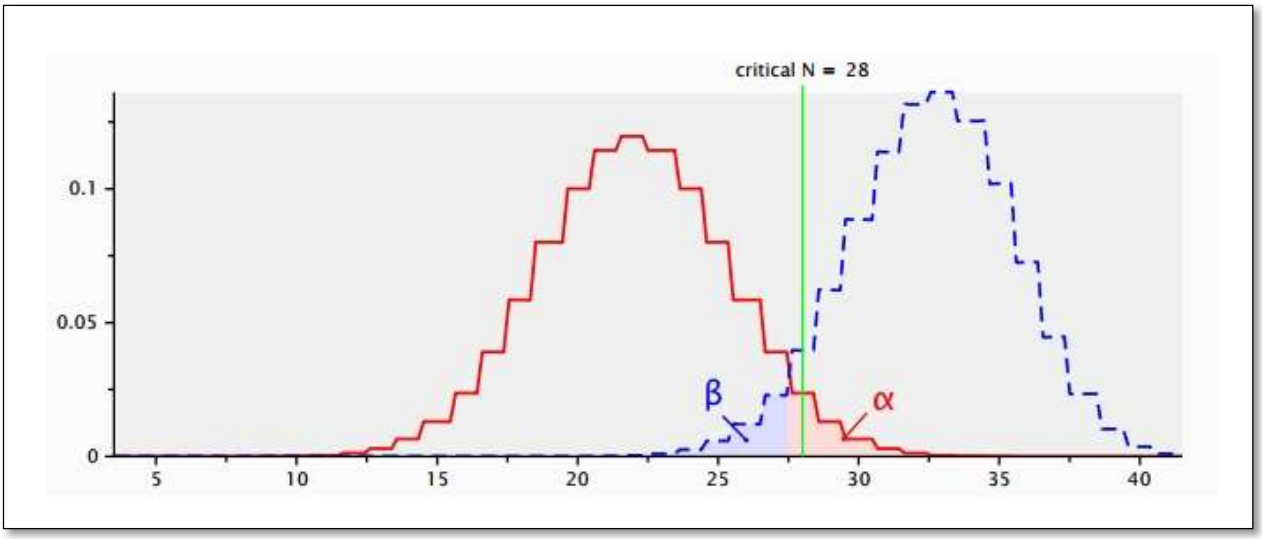
Appendix 1. Power Analysis for ASBRS Fishing Sample Size

[1] -- *Friday, July 19, 2019 -- 21:52:40*

Exact –	Proportion: Sign test (binomial test)		
Analysis:	A priori: Compute required sample size		
Input:	Tail(s)	=	One
	Effect size g	=	0.24
	α err prob	=	0.05
	Power (1–β err prob)	=	0.95
Output:	Lower critical N	=	28.0000000
	Upper critical N	=	28.0000000
	Total sample size	=	44
	Actual power	=	0.9550476
	Actual α	=	0.0480709

Exact –	Proportion: Sign test (binomial test)		
Analysis:	A priori: Compute required sample size		
Input:	Tail(s)	=	One
	Effect size g	=	0.24
	α err prob	=	0.01
	Power (1–β err prob)	=	0.99
Output:	Lower critical N	=	55.0000000
	Upper critical N	=	55.0000000
	Total sample size	=	87
	Actual power	=	0.9903537
	Actual α	=	0.008913776



Appendix 2

Testing of Ropeless Fishing Gear= In the past 20 years, more than 30 research projects have tested ropeless concepts and ropeless retrieval systems, with more planned and ongoing.

Testing of Ropeless Fishing Gear= In the past 20 years, more than 30 research projects have tested ropeless concepts and ropeless retrieval systems, with more planned and ongoing.

In 1998, the U.S. National Marine Fisheries Service (NMFS) issued a federally funded contract to "design, develop, and evaluate ... a cost-effective prototype acoustic release system for the buoy endline of offshore lobster trap gear." Since this first initiative, a considerable amount of testing of ropeless retrieval systems has taken place. A comprehensive overview of all the research to date indicates a total of 32 ropeless technology projects. Overall, this testing has served to drive the evolution from a technical concept to a working prototype to an operational system and finally to an established product with commercial viability.

Testing of Ropeless Concepts

Since 1998, at least 11 research projects that funded conceptualization of ropeless gear were developed in the U.S. Six of these were based on acoustic release technology, the innovation at the heart of many ropeless retrieval systems. Table 1 outlines the full scope of conceptual research over the last twenty years in the U.S., which led to the creation of fully operational ropeless systems. The table describes the gear style, sample size (when available), location, funding source, and type of project. The types of projects are very diverse, including the creation of a ropeless prototype, lab testing of ropeless gear, demonstrations of gear, and using gear for fishing (Table 2).

Testing and Use of Ropeless Systems

Results and ideas generated from the conceptual projects detailed above led to the development of full-blown operational systems available for further testing and daily use. These tests have produced iterative improvements to gear and brought several systems to commercial viability. Equally important, testing has generated helpful data on how well ropeless systems work.

Table 2 gives an overview of 21 testing projects (or demonstrated use) of ropeless retrieval systems, several in "at-sea" conditions. For these tests, testers deployed the gear, virtually marked its location, virtually relocated it, and then retrieved it. It describes gear style, sample size, type of testing, and location of testing for each project. Tests of ropeless gear have been conducted all around the world, including in Australia, Canada, New South Wales, Scotland, and Massachusetts.

Table 2 Research on ropeless concepts in the United States since 1998

Year	Project author and citation	Type of project	Location	Sample size (n)	Gear style and name	Funding source
1999	(DeAlteris, 1999)	Prototype and Testing	RI	10	Acoustic releases (Benthos 875, EdgeTech AMD)	NOAA
1999	(Turner *et al.*, 1999)	Concept, Built, and Lab Tested	NH	N/A	Acoustic release Buoyless Lobster Trap	NH Sea Grant
2013	(Partan and Ball, 2016)	Research and concept	MA	N/A	ORE (EdgeTech) line canister, Desert Star, FioBuoy, WHOI concept	NOAA
2007	(Allen and DeAlteris, 2007)	Prototype and Test	RI	129	Acoustic	NFWF
Before2010	NOTUS (ALWTRT, 2010)	Built	NJ	NA	Notus Acoustic Release	NMFS
2012	(PFC, 2012)	Test and used for Fishing	ME	386	GPS and Grapple (not recommended)	NMFS
2012	Gwinn Grapple	Test and used for Fishing	MD	30	GPS and Grapple (not recommended)	NMFS
2014	(Hopkins *et al.*, 2014)	Concept, Built, and Lab Tested	NH	UNK	Acoustic release	NH Sea Grant
2015	(Basque *et al.*, 2015)	Concept, Built, and Lab Tested	NH	N/A	Acoustic release buoyless trap	NH Sea Grant
2018	(Biedron, 2018)	Trial	MA	N/A	Desert Star	IFAW
2018	(Shester, 2018)	Demonstration	CA	8	FioBuoy, Desert Star	Oceana

Table 3 Testing of ropeless gear systems from 1996 – November 2021

Year	Project author and citation	Type of testing	Location	Sample size (n)	Gear style and name
1996-2019	FioBuoy, FioMarine (pers. comm.)	Internal Test	AUS	206	FioBuoy
2000-2019	Multiple Customers (pers. comm. Ridd *et al.* multiple dates & McCrindell)	Active Use	AUS	N/A	FioBuoy Line spool, timer or acoustic release
1999	(DeAlteris, 1999)	Prototype Test	RI	50	Acoustic release
2005	(Hopkins and Hoggard, 2005)	Prototype Test	MS	N/A	Subsea Sonics AR 50
2007	(Allen and DeAlteris, 2007)	Prototype Test	RI	129	Acoustic
2011	FRDC, (Liggins, 2012)	Test used for fishing	NSW AUS	>100	Acoustic release line storage bag
2018	CWLA, (Terhune *et al.*, 2018)	Used for fishing	CAN	94	Desert Star ARC-1
2018	Acadian Crabbers Assn (DFO, 2018; Gies, 2018)	Used for fishing	CAN	UNK	Desert Star ARC-1
2019	(CWLA, 2019)	Tested	CAN	ongoing	Ashored MOBI
2011	(Porter, 2018) for MLA	Used for fishing	NSW	active use	Desert Star
2018	SMELTS & NOAA (Milliken, 2018; Riels, 2018)	Test	MA	50	SMELTS
2018	WHOI/NOAA(Milliken, 2018; Ball, *et al*., 2018)	Test	MA	50	WHOI Spool
2019	Acadian Crabbers Assn (DFO, 2018)	Used for fishing	CAN	ongoing	Ashored MOBI Edgetech5112 SMELTS
2019	Lobster Lift (C. McCarthy pers. comm.)	Internal Test	MA	>50	Lobster Lift Prototype
2019	EdgeTech/NOAA (E. Matzen pers. comm.)	Used for fishing	MA	>12	EdgeTech 5112
2019	SMELTS/ NOAA (pers. comm.)	Used for fishing	MA	>12	SMELTS Lobster Raft
2016-2019	(Partan and Ball, 2016, 2018; Ball *et al.*, 2018)	Test	NE AL	42 proposed	Line spool, acoustic release
2017-2019	SMELTS (Riels, 2018)	Internal Test	PNW, NE AL	608	SMELTS
2018-2019	Ashored (M. Poole, pers. comm.0029	Internal Test	CAN	>100	Ashored MOBI
2018-2019	EdgeTech (R. Morris, pers. comm.)	Internal Test	MA	>100	EdgeTech 5112
2019-2021	(Sawicki, ongoing)	Test, Used for fishing	Scotland, UK	>100	Desert Star ARC-1 Fiobuoy
2020-2021	(Sawicki, ongoing)	Test, Used for fishing	USA	>1500	All listed in this application

Appendix 3 Fishing Areas and Permitted Vessel and Operator Information

Detailed Sampling Areas

All areas bounded by the following approximate coordinates, and recognized as the inshore time area closure under 50 CFR 622.183(b)(6)(i) and (ii)

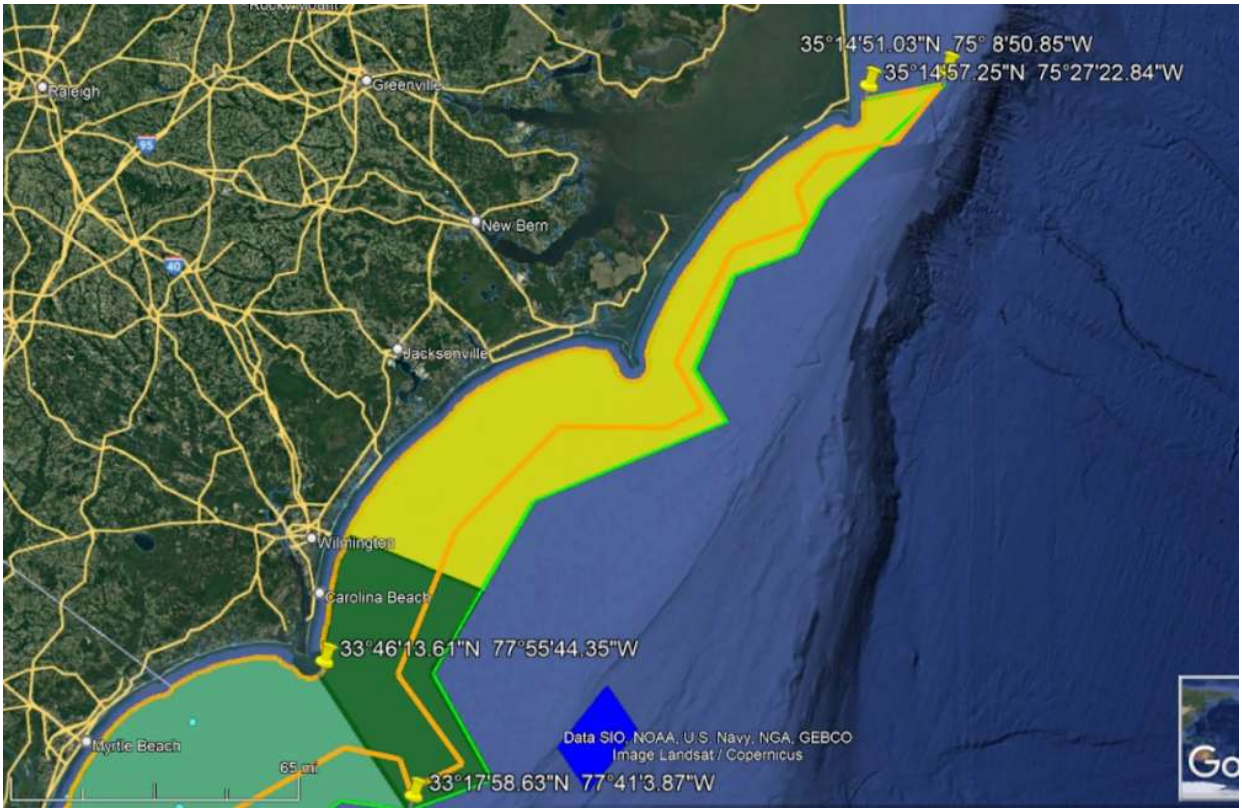
Yellow: Captain Michael Cowdrey
NW 35°14'57.25"N 75°27'22.84"W
NE 35°14'51.03"N 75° 8'50.85"W
SW 33°46'13.61"N 77°55'44.35"W
SE 33°17'58.63"N 77°41'3.87"W

Dark Green: Captain Michael Cowdrey and Captain Scott Buff and Crew
NW 34°11'59.18"N 77°43'38.80"W
NE 33°57'14.55"N 77°15'30.84"W
SW 33°46'13.61"N 77°55'44.35"W
SE 33°17'58.63"N 77°41'3.87"W

Light Green: Captain Scott Buff and Crew
NW 34°11'59.18"N 77°43'38.80"W
NE 33°57'14.55"N 77°15'30.84"W
SW 32° 2'10.98"N 80°44'43.14"W
SE 32° 3'6.68"N 79°48'4.17"W

Purple: Captain Charlie Phillips and Crew
NW 32° 2'10.98"N 80°44'43.14"W
NE 32° 3'6.68"N 79°48'4.17"W
SW 30°42'22.90"N 81°20'39.32"W
SE 30°42'25.28"N 80°49'31.98"W

Maroon: Captain Jimmy Hull and Crew
NW 30°42'22.90"N 81°20'39.32"W
NE 30°42'25.28"N 80°49'31.98"W
SW 28°34'53.31"N 80°30'24.21"
SE 28°35'0.64"N 80°20'34.58"W



Yellow: Captain Michael Cowdrey
All areas bounded by the following approximate coordinates, and recognized as the inshore time area closure under 50 CFR 622.183(b)(6)(i) and (ii)

NW 35°14'57.25"N 75°27'22.84"W
NE 35°14'51.03"N 75° 8'50.85"W
SW 33°46'13.61"N 77°55'44.35"W
SE 33°17'58.63"N 77°41'3.87"W

Dark Green: Captain Michael Cowdrey
All areas bounded by the following approximate coordinates, and recognized as the inshore time area closure under 50 CFR 622.183(b)(6)(i) and (ii)

NW 34°11'59.18"N 77°43'38.80"W
NE 33°57'14.55"N 77°15'30.84"W
SW 33°46'13.61"N 77°55'44.35"W
SE 33°17'58.63"N 77°41'3.87"W
We will not fish in Special Management Zones (SMZs) Marine Protected Areas (MPAs) or the North Atlantic Right Whale Critical Habitat Area or those areas listed in CRF 50 §622.182 Gear-restricted areas (a)(1)(i) through (ii).

Information for vessels to be used for the EFP as soon as the information is available and before operations begin under the EFP:

F/V Lady Kay (SBPE-9) VID: 587674
Sneads Ferry, North Carolina

Vessel owner information:

Michael Cowdrey
PO Box 598
Sneads Ferry, NC 28460-0598
(910) 340-9801
michaeldcowdrey@gmail.com

Vessel captain information and primary project participants –

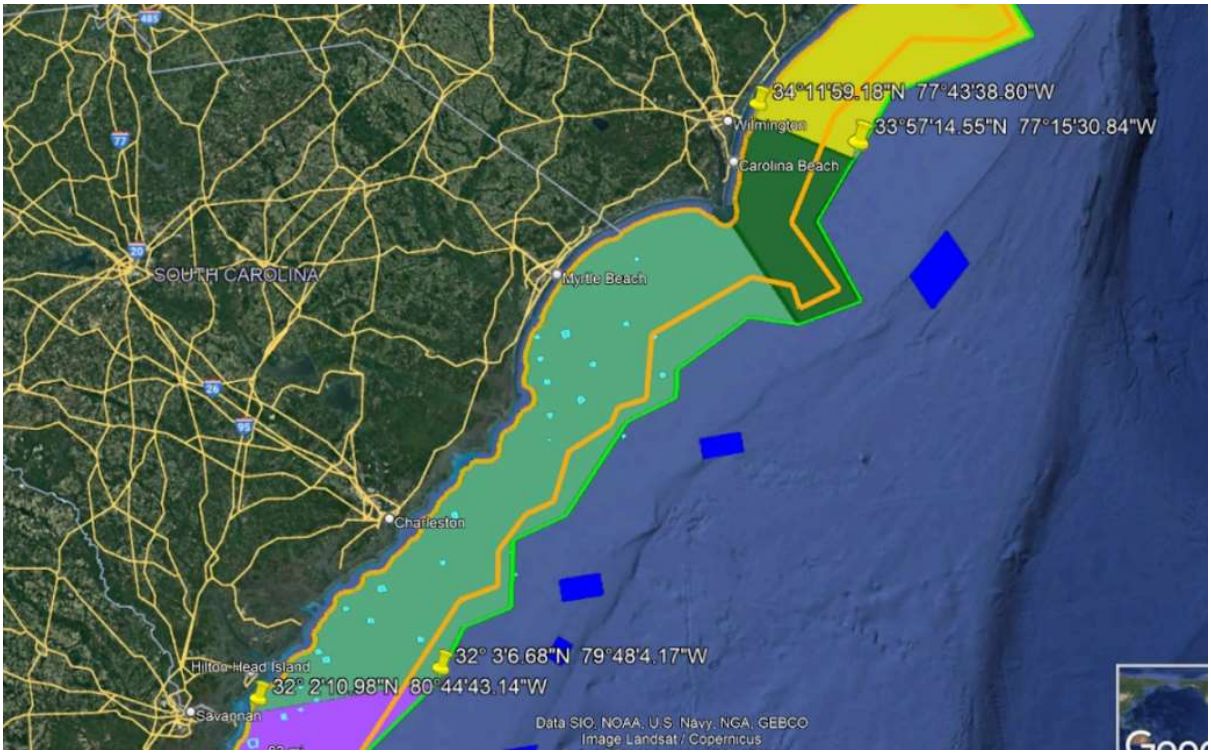
Captain Michael Cowdrey
Researchers: Kim Sawicki, Bryan Fluech, Charles McMillan, Chris Rillahan, Dr. Pingguo He, Captain Tom Burgess

SST Staff: Lucy McGinnis, Rohan Burne

Signature of applicant.

_____

Kim Sawicki
President, Sustainable Seas Technology



Dark Green: Captain Scott Buff and Crew
All areas bounded by the following approximate coordinates, and recognized as the inshore time area closure under 50 CFR 622.183(b)(6)(i) and (ii)

NW 34°11'59.18"N 77°43'38.80"W
NE 33°57'14.55"N 77°15'30.84"W
SW 33°46'13.61"N 77°55'44.35"W
SE 33°17'58.63"N 77°41'3.87"W

Light Green: Captain Scott Buff and Crew
All areas bounded by the following approximate coordinates, and recognized as the inshore time area closure under 50 CFR 622.183(b)(6)(i) and (ii)

NW 34°11'59.18"N 77°43'38.80"W
NE 33°57'14.55"N 77°15'30.84"W
SW 32° 2'10.98"N 80°44'43.14"W
SE 32° 3'6.68"N 79°48'4.17"W
We will not fish in Special Management Zones (SMZs) Marine Protected Areas (MPAs) or the North Atlantic Right Whale Critical Habitat Area or those areas listed in CRF 50 §622.182 Gear-restricted areas (a)(1)(i) through (ii).
Information for vessels to be used for the EFP as soon as the information is available and before operations begin under the EFP:

F/V Reel-M-N (SBPE-4) VID: NC6637DS
Southport, NC

F/V Wire Nut (SBPE-31) VID: NC7908DC
Oak Island, NC

Vessel owner information:

Brian Scott Buff
4888 Coastal Dr Se
Southport, NC 28461-8722
(910) 294-1463
scott@buffbuilders.com

Vessel captain information and primary project participants –

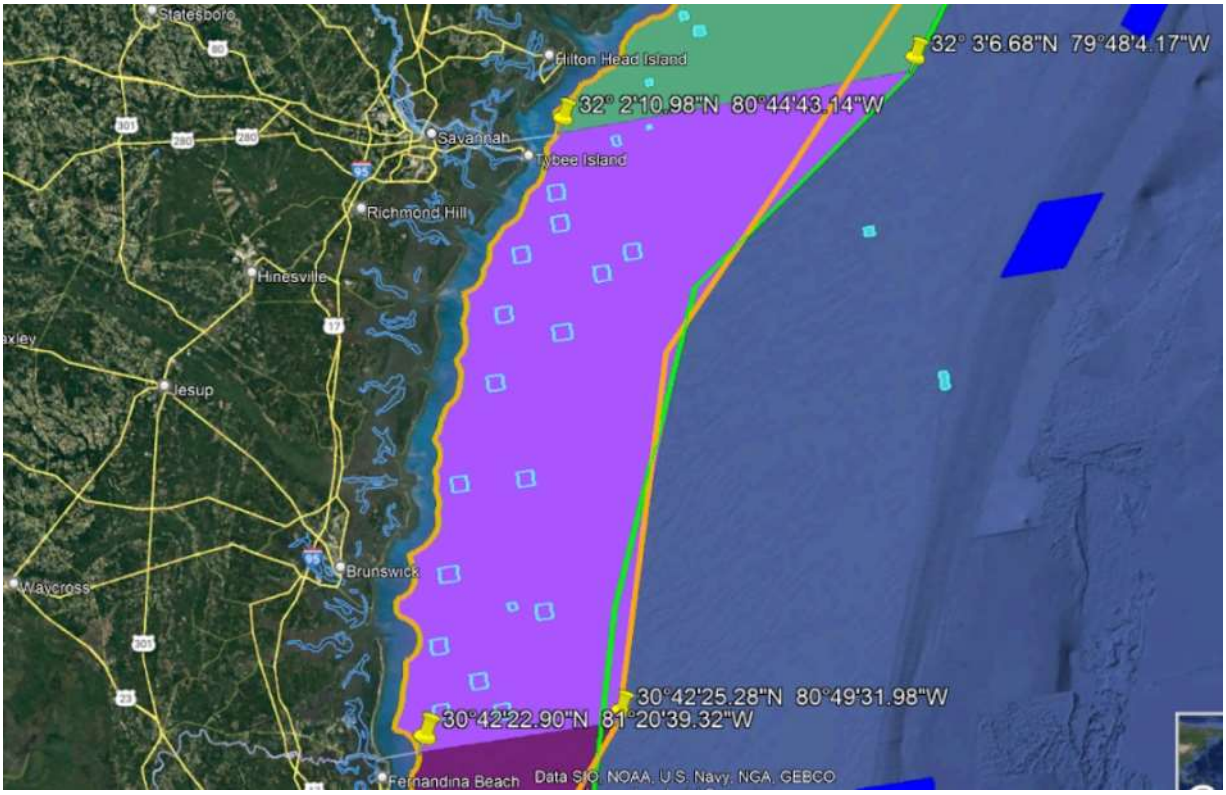
Captain Scott Buff and designated crew (Captains: Al Dosher, Chris Jenkins, and John Porter)
Researchers: Kim Sawicki, Bryan Fluech, Charles McMillan, Chris Rillahan, Dr. Pingguo He
SST Staff: Lucy McGinnis, Rohan Burne

Signature of applicant.

_____

Kim Sawicki
President, Sustainable Seas Technology

Purple: Captain Charlie Phillips and Crew



All areas bounded by the following approximate coordinates, and recognized as the inshore time area closure under 50 CFR 622.183(b)(6)(i) and (ii)

NW 32° 2'10.98"N 80°44'43.14"W
NE 32° 3'6.68"N 79°48'4.17"W
SW 30°42'22.90"N 81°20'39.32"W
SE 30°42'25.28"N 80°49'31.98"W
We will not fish in Special Management Zones (SMZs) Marine Protected Areas (MPAs) or the North Atlantic Right Whale Critical Habitat Area or those areas listed in CRF 50 §622.182 Gear-restricted areas (a)(1)(i) through (ii).

Information for vessels to be used for the EFP as soon as the information is available and before operations begin under the EFP:

F/V Fish Hound (SBPE-18) VID: 693851
Townsend, Georgia

F/V Captain Lynn (SBPE-20) VID: 542775
Townsend, Georgia

Vessel owner information:

Charles Phillips
1418 Sapelo Avenue NE
Townsend, GA 31331
(912) 832-4423

GA_Capt@yahoo.com

Vessel captain information and primary project participants –

Captain Charlie Phillips and designated crew

During Outreach Fishing Events:

Captain Jimmy Hull
Captain Scott Buff and designated crew
Captain Michael Cowdrey
Captain Tom Burgess
Captain Oscar Navarrete
Captain Eric Meagley

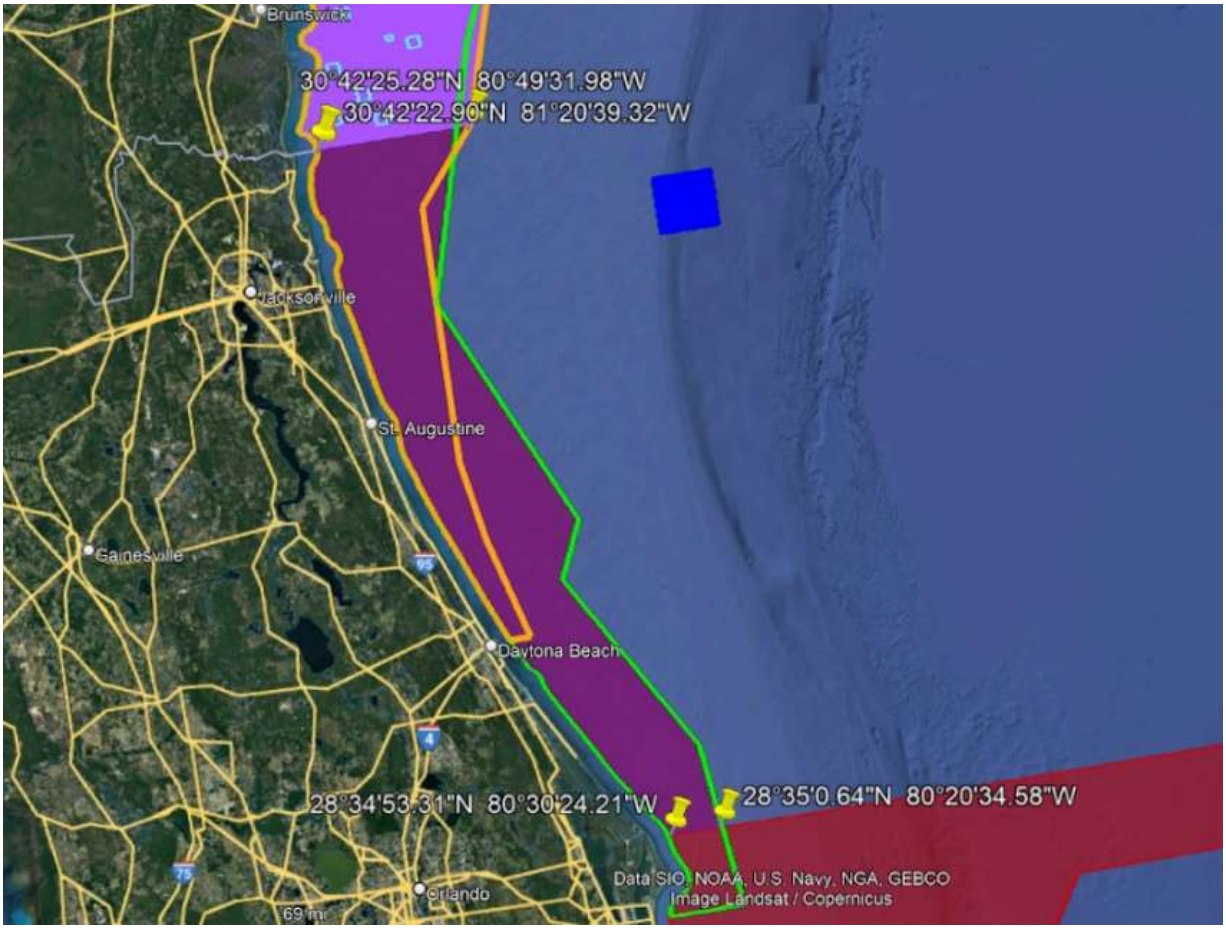
Researchers: Kim Sawicki, Bryan Fluech, Charles McMillan, Chris Rillahan, Dr. Pingguo He

SST Staff: Lucy McGinnis, Rohan Burne

Signature of applicant.

_____

Kim Sawicki
President, Sustainable Seas Technology



Maroon: Captain Jimmy Hull and Crew
NW 30°42'22.90"N 81°20'39.32"W
NE 30°42'25.28"N 80°49'31.98"W
SW 28°34'53.31"N 80°30'24.21"
SE 28°35'0.64"N 80°20'34.58"W

All areas bounded by the following approximate coordinates, and recognized as the inshore time area closure under 50 CFR 622.183(b)(6)(i) and (ii)

We will not fish in Special Management Zones (SMZs) Marine Protected Areas (MPAs) or the North Atlantic Right Whale Critical Habitat Area or those areas listed in CRF 50 §622.182 Gear-restricted areas (a)(1)(i) through (ii).

Information for vessels to be used for the EFP as soon as the information is available and before operations begin under the EFP:

F/V Work-a-Hull-ic (SBPE-7) VID: 1094408
Ormond Beach, FL

Vessel owner information:
Jimmy Hull
Southport Angler Inc

111 W Granada Blvd
Ormond Beach, FL 32174-6303
(386) 547-1254
hullsseasfood@aol.com

Vessel captain information and primary project participants –

Captain Jimmy Hull and Captain Wayne Hardy
Researchers: Kim Sawicki, Bryan Fluech, Charles McMillan, Chris Rillahan, Dr. Pingguo He
SST Staff: Lucy McGinnis, Rohan Burne

Signature of applicant.

_____

Kim Sawicki
President, Sustainable Seas Technology

Product Name:
Desert Star ARC-1XD
Manufacturer:
Desert Star Systems
Release Type:
Acoustic Release
Line Management Style:
Rope Release Bag
Field Tested: Yes
Available for Purchase: Yes
Website:
http://www.desertstar.com
Video Demonstration:
Desert Star Systems

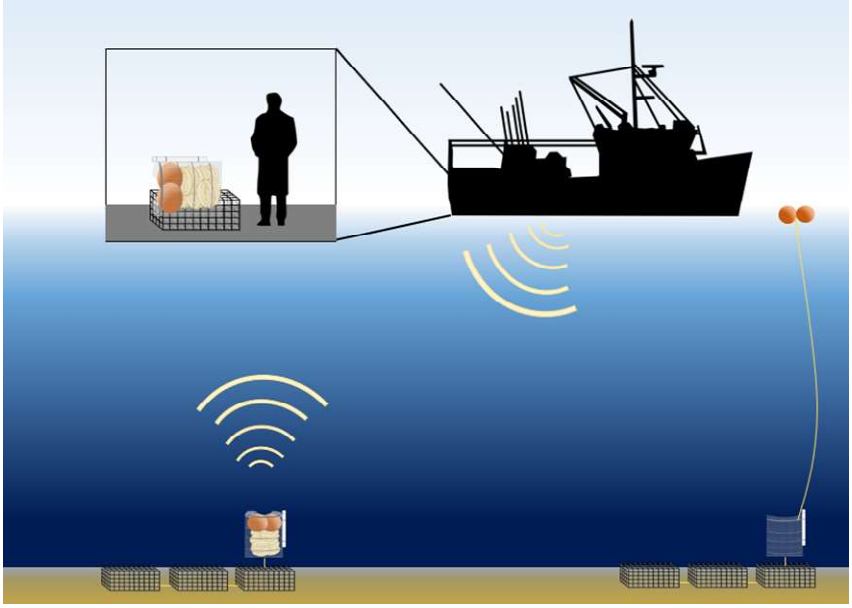


Figure 5 ARC-1XD with Rope Release Bag © 2019 Annika Toth

The Desert Star ARC-1 is a modular acoustic release system produced by Desert Star Systems that can be paired with any rope management systems (Figure 5). As seen in Figure 5, the buoys and rope are contained in a mesh bag with an acoustically triggered release mechanism attached to the side, which is placed with the rest of a fisherman's regular gear. The release mechanism is a small magnesium wire that disintegrates when it receives an acoustic command. Once released, the buoys and line ascend out of the bag and are available for retrieval at the surface. The gear is then hauled as normal, and the line is repacked for another deployment. The rope storage method can and has been customized to fishermen's needs according to their geographic regions. This release system has existed and been in use by fishermen in New South Wales (Australia) for many years and is available for purchase on Desert Star Systems' website. This device will require weight to be added to the trap to fully submerge the bag.

This system has been successfully tested and used by fishers in Australia, New South Wales, South Africa, New Zealand, Scotland, Canada, California, Maine, Massachusetts, Georgia, and North Carolina for use in fishing applications and had a reliability of 100% during our pilot project.

Product Name:
EdgeTech 5112
Manufacturer:
EdgeTech
Release Type:
Acoustic Release
Line Management Style:
Cage System
Field Tested: Yes
Available for Purchase: Yes
Website:
https://www.edgetech.com
Video Demonstration:
Cage System

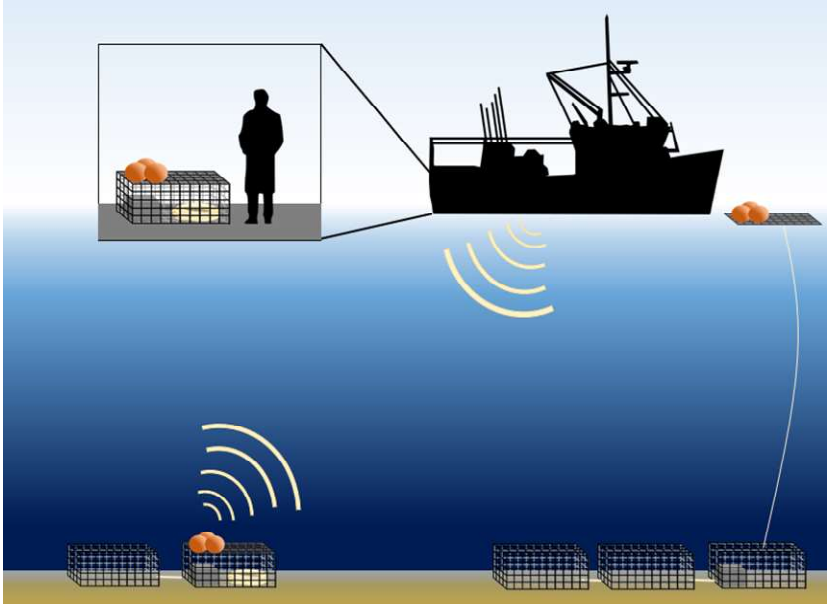


Figure 6 EdgeTech 5112 © 2019 Annika Toth

The EdgeTech 5112 system is an acoustic command and control system developed by EdgeTech. The system consists of a modified lobster trap, which comes in a variety of sizes and rugged acoustic release (Figure 6). The release cage has two sections and a top cover with flotation. One section holds up to 650 feet of ⅜ line, and the other section contains the acoustic release. The top cover includes the floatation that detaches and floats to surface when the acoustic release is actuated. It is deployed like any other lobster trap but without the need for surface rope and buoy. The unit can be deployed in water depths down to 500 meters and handle a load of 500 pounds (release load 250 pounds) while enduring underwater for up to one year (two years on lithium batteries). The acoustic release is constructed of nickel aluminum bronze alloy that protects against corrosion. When communicating with one of the 5112 deck boxes, the system will provide shipboard operators information such as battery life status, tilt information, and release information and confirmation. This system was designed from the ground up with the input of lobster fishermen and is available for purchase on EdgeTech's website. This device will not require weight to be added to the trap.

This system has been successfully tested by fishers in Canada, California, Maine, Massachusetts, Georgia, and North Carolina for use in fishing applications and had a reliability of 100% during our pilot project.

Product Name:
(Fiobuoy® AC100)
Manufacturer:
Fiomarine
Release Type:
Acoustic Release
Line Management Style:
Spool Design
Field Tested: Yes
Available for Purchase: Yes
Website:
http://fiomarine.com
Video Demonstration:
Spool design

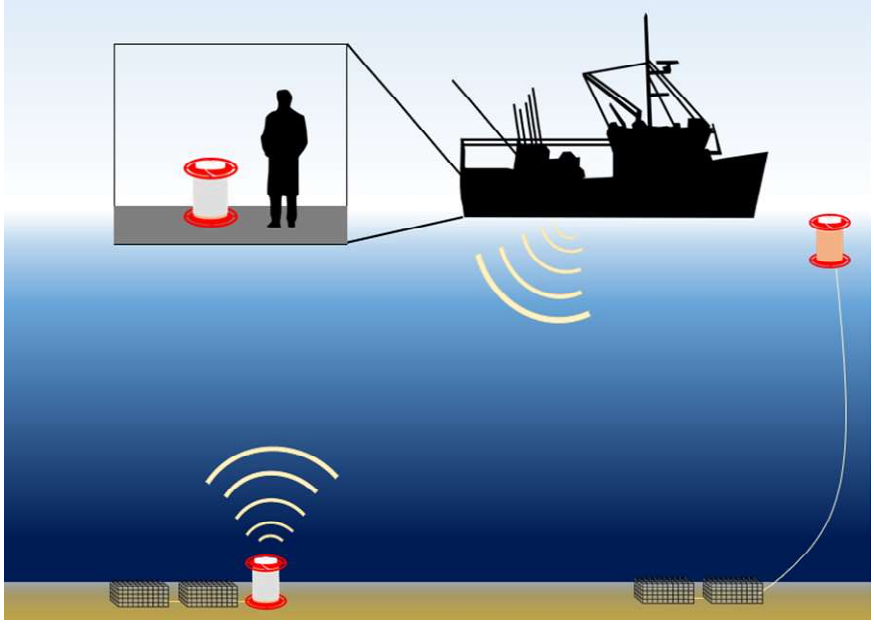


Figure 7 Fiobuoy © 2019 Annika Toth

The Fiobuoy® is an integrated smart buoy system comprised of a spool of rope, acoustic modem, floatation, and release mechanism affixed to a subsea object (Figure 4). Each unit has a unique identification code to allow security to the fleet and provide an integrated system management capability for enhanced fisheries operations and oversight. The code management capability can be configured to allow only the buoy to operate in areas open for fishing. If there were an attempt to launch the system within a closed zone, the release jaws would not close on the surface. This system capability prevents the deployment of the system when configured for this functionality. The Fiobuoy mechanical release is activated upon receiving an acoustic command from the surface vessel, a master code for enforcement personnel is also designed into the system. There are also two failsafe release backups in the Fiobuoy; a time/date trigger and a low battery trigger. Once the mechanical jaws are released, the Fiobuoy floats to the surface as the line unspools. Recovery operations remain the same as traditionally marked surface float fixed gear traps. This configuration removes the surface float and the vertical line in the water column until a release is triggered. This device will not require weight to be added to the trap unless fast moving currents are present.

This system has been successfully tested by fishers in Australia, New Zealand, Scotland, California, Maine, Massachusetts, Georgia, and North Carolina for use in fishing applications and had a reliability of 100% during our pilot project.

Product Name: Galvanic Timed Release
Manufacturer:
International Fishing Devices
Longsoaker Fishing Systems
Gear Type: GTR
Field Tested: Yes
Available for Purchase: Yes
Website: http://neptunemarineproducts.com
Product Page: **GTRs**


Figure 8 Close up view of GTR back up

Galvanic Timed-Releases (GTR) are a low-cost option in widespread use in the marine industry and in multiple pot fisheries globally. (Figure 11) (Salvador *et al*., 2006). A GTR device uses two dissimilar metals that corrode at a predictable rate. The corrosion releases the link, which then allows a float and line to rise to the surface for recovery. GTR's must be used in saltwater. Their corrosion rate depends on the water's salinity and temperature at the depth being used.

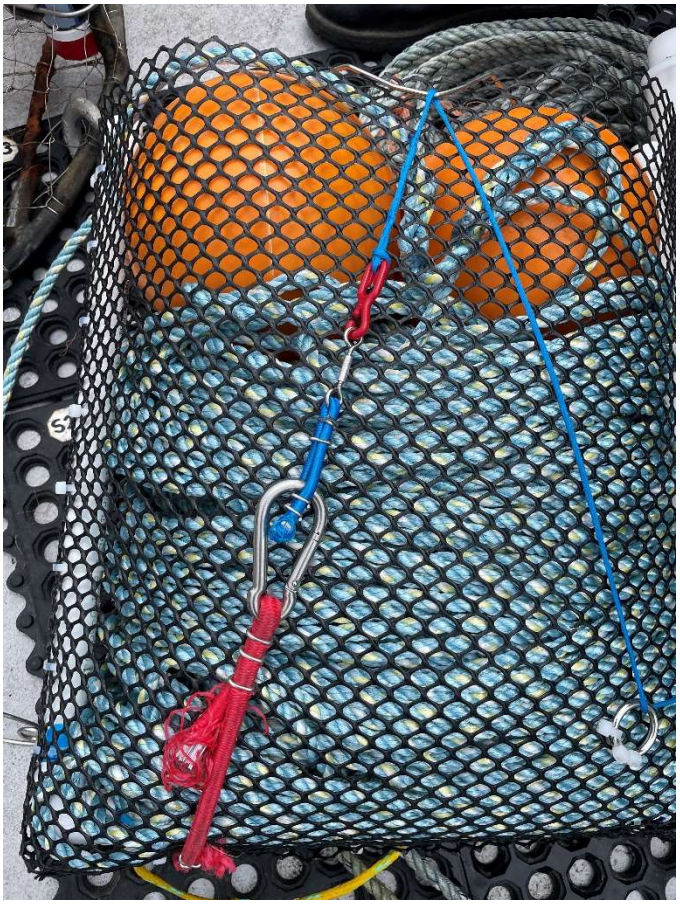


Figure 9 GTR installed on Rosskelly Bag with DSS ARC1XD, California

GTR releases offer approximate release timing, which varies with water temperature, salinity, current speed, and fouling. Thus, GTR-equipped ropeless systems will still leave the rope in the water column some percentage of the time.

The primary purpose of these releases in this trial is to ensure a "back-up" method of retrieval for the ASBRS/SBRS systems in case of catastrophic failure of the acoustic systems or timers. This is the method required by California Dungeness Crab Risk Assessment Mitigation Program (RAMP) Gear Authorizations. We are utilizing this back up system in other fishing projects as well, in California, Scotland, Canada, and Maine.

Product Name:
LobsterLift
Manufacturer:
Lobster Lift
Release Type:
Acoustic Release
Line Management Style:
Lift Buoy
Field Tested: Yes
Available for Purchase: No – solid prototype
Website:
https://www.lobsterlift.com
Video Demonstration:

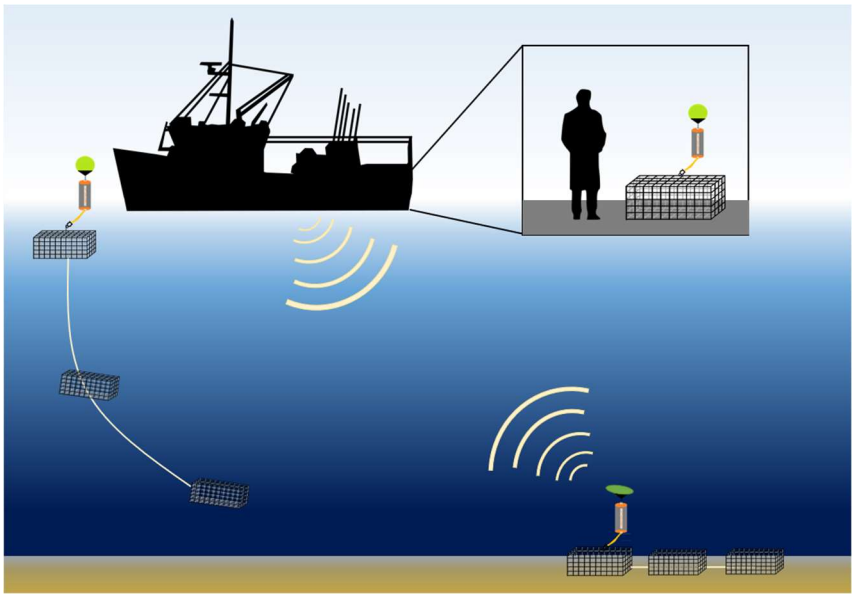


Figure 10 Lobster Lift © 2021 Sawicki & Toth

LobsterLift is a lineless, self-surfacing modular lobster trap retrieval system. Traps utilizing LobsterLift technology sit on the seafloor and are raised when needed, either through acoustic signal or through GTR (Figure 7). To retrieve a trawl, a fisherman sends an acoustic signal from the boat to a module attached to the trawl. Alternatively, the unit can be fitted with a GTR, which would allow the release of nitrogen from a tank to inflate an attached buoy. The buoy increases in size until it can float the trap to just below the surface (4-8 ft. below the waterline). The buoy is then hauled, the traps are retrieved, removed of their catch, and re-baited. This method uses no vertical endline but does use rope between traps and would require slight modification to work with GTR to protect catch, animals, and gear. This device will not require weight to be added to the trap.

This prototype has been successfully tested by fishers in Maine, Massachusetts, Georgia, and North Carolina for use in fishing applications and had a reliability of 100% during our pilot project.

Product Name:
Guardian
Manufacturer:
Longsoaker Fishing Systems
Release Type:
Time/Date Hybrid or GTR Release
Line Management Style:
Net
Field Tested: Yes
Available for Purchase: Yes
Website:
https://longsoaker.com/
Video Demonstration:
Longsoaker Guardian

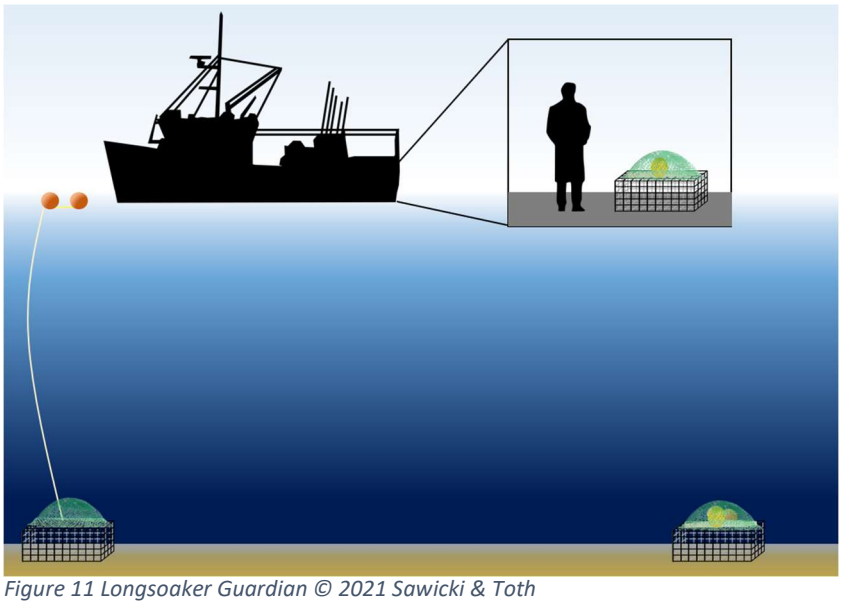


Figure 11 Longsoaker Guardian © 2021 Sawicki & Toth

The Longsoaker Guardian is a fishing trap retrieval system. Traps utilizing the Guardian technology sit on the seafloor and are raised when a timer is set (Such as the SSS TR4RT) or appropriately timed GTR is selected. The Longsoaker gear generally consists of a net and a GTR device which, once dissolved, allows the release of a coiled line and buoy from the top of a standard pot or trap. A standard hard buoy is used and is submerged for most of the soak time (Figure 11). It is not visible on the surface until the selected galvanic release dissolves and releases the buoy and line. The buoy is then hauled, the traps are retrieved, removed of their catch, and re-baited.

Retrieval time is the same as with regular gear, as long as the regular operational line was coiled and stored in a reasonably orderly manner. Line coilers with industry-standard hard-lay lines are recommended. Most fishermen will be able to use their existing buoy lines and deck gear. This gear can be easily modified to meet specific fishing requirements for different locations and regulations. When not in use, the retrofit is out of the way and does not require de-rigging, removal, or storage.

This system has been successfully tested by SST staff in the presence of California Fish and Wildlife Division personnel for use in fishing applications and had a reliability of 100% during our most recent outreach work.

Product Name:
Puget Buoy
Manufacturer:
Puget Buoy
Release Type:
Time Date Release
Line Management Style:
Line Cannister
Field Tested: Yes
Available for Purchase: No – solid prototype
Website:
https://pugetbuoy.com
Video Demonstration:
Puget Buoy

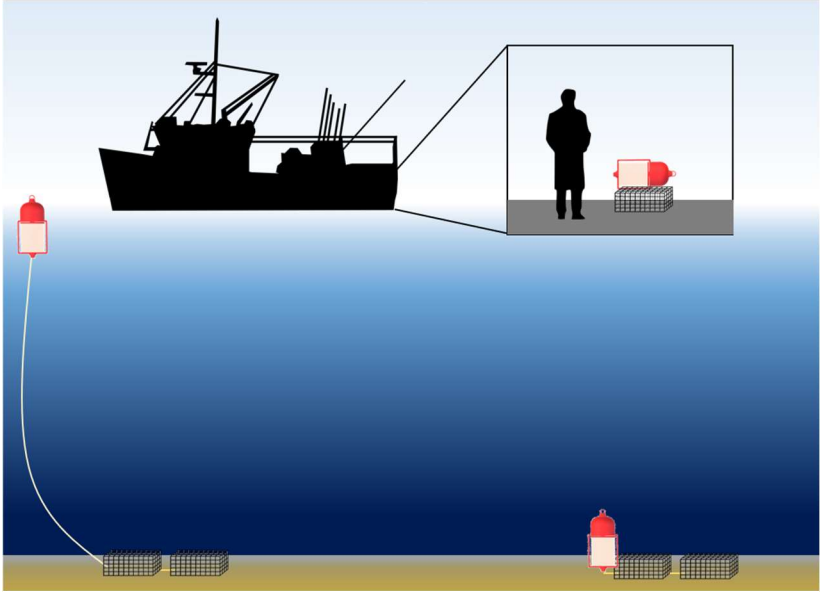


Figure 12 Puget Buoy © 2021 Sawicki & Toth

Puget Buoy is a self-surfacing modular pop-up buoy retrieval system compatible with most pots used for crab and lobster. Traps utilizing Puget Buoy technology sit on the seafloor and release to the surface through an onboard pre-programmed digital timer. (Figure 1).Before dropping the pots to soak, the captain uses an existing smartphone or tablet to interface wirelessly with the Puget Buoy and set a scheduled release time for the Puget Buoy to surface at a later time. When soaking, the Puget Buoy stays connected to the trap floating just above the seafloor. When the pre-programmed time is reached, the buoy and line are automatically released to the surface where it is visible by the fisherman. The buoy is then hauled, the trap is retrieved, removed from their catch, and re-baited. This device will not require weight to be added to the trap. However, depending on the fishery and the trap you are using, the buoy-to-trap buoyancy ratio would need to be adjusted by selecting a Puget Buoy with the proper floats.

This prototype has been successfully tested by the Puget Buoy team in Washington State for use in fishing applications and had a reliability of 100% during our pilot tests. As we continue to expand testing in North America, we will be updating the reliability estimates to be more comprehensive.

Manufacturer:
Ropeless Systems
Product Name: Ropeless Riser
Release Type:
Acoustic Release
Line Management Style:
Inflatable Lift Bag
Field Tested: Yes
Available for Purchase: No – solid prototype
Website: www.ropeless.us
Video Demonstration:
Ropeless Systems Ropeless Riser

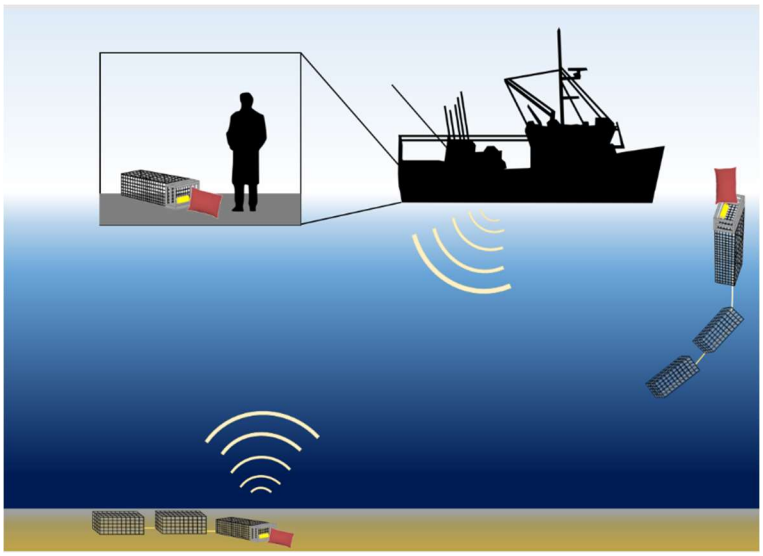


Figure 13 Ropeless Riser © 2021 Sawicki & Toth

Ropeless Systems (Ropeless Riser) is located in Maine and has developed a lift bag retrieval system that is operated remotely using an acoustic modem. The Ropeless Riser lift bag does not employ any vertical line; instead, an acoustic modem, release electronics, and a compressed air cylinder are contained in an aluminum frame mounted to a fishing trap. (Figure 7). When the release system receives an acoustic signal, the compressed air cylinder fills the lift bag on top of the trap with air to bring the traps to the surface. The system is negatively buoyant which offers the best protection from gear loss or movement during storms. No buoyancy is generated until recovery is required and then various amounts of buoyancy (tens to hundreds of pounds) can be generated. The lift bags utilized are rugged and are often used to lift vehicles and airplanes on land and are the same used for ocean science and military applications. The Ropeless Riser lift bag system has been tested in engineering and fishing trials in Narragansett, Massachusetts, Scotland, Maine, and Canada. This device will not require weight to be added to the trap.

Product Name:
TR4RT
Manufacturer:
Sub Sea Sonics
Release Type:
Timed Release
Line Management Style:
Multi
Field Tested: Yes
Available for Purchase: Yes
Website:
https://www.lobsterlift.com
Video Demonstration:
Sub Sea Sonics TR4RT

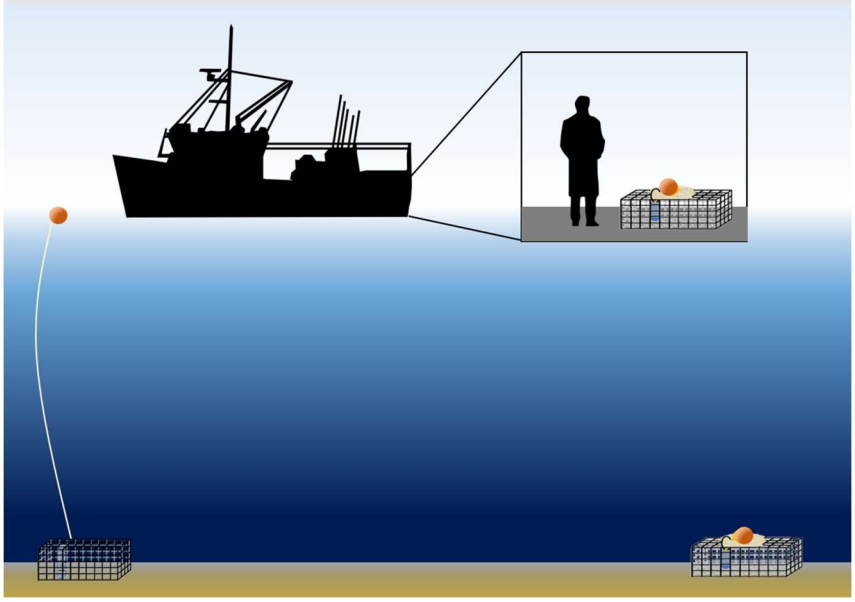


Figure 14 Sub Sea Sonics TR4RT © 2021 Sawicki & Toth

The TR4RT system is a programmable timed-release developed by Sub Sea Sonics. The system was developed primarily for use with fishing traps but can be used in any suitable application. The system consists of an underwater housing, a rotating release and programming cam, and a release line retainer. The system works on the principal of "Time Until Release" (TUR). Using the cam, the user programs the unit with a specified TUR. The user then arms the system and deploys the equipment. After the specified TUR duration has elapsed, the cam rotates 180 degrees and to activate the release. For most systems, this releases a coil of line and float that are secured to the trap, and the float comes to the surface and the equipment can then be retrieved. The line handling system works by securing the normal trap line (in a coil) and float to the top of the trap with a three-point tie-down system that consists of a bungee and release loop that is secured to a cam on the timer. The unit is constructed from Delrin (cam) and PVC (housing) and has a clear window for the programming display. The TR4RT is generally attached to the wire mesh of the trap using off-the-shelf, corrosion-resistant plastic or stainless-steel clamps. The cam is capable of supporting release line tensions up to about 15 kg. The operating depth is 0 to 150 meters, and the battery life is approximately 6 months assuming the release is activated every three days during that period. For short deployments, biofouling can be quickly removed with a soft-bristle brush, while for longer deployments, the unit can be easily protected from biofouling using a wrap of standard packaging tape that can be removed and discarded at the end of the deployment.

This release system was designed with fishermen on the West Coast using a BREP grant (2018) has been successfully tested by NOAA for use in fishing applications and had a reliability of 100% during our pilot project.

Product Name:
AR50
Manufacturer:
Sub Sea Sonics
Release Type:
Acoustic Release
Line Management Style:
Multi
Field Tested: Yes
Available for Purchase: Yes
Website:
https://www.lobsterlift.com
Video Demonstration:

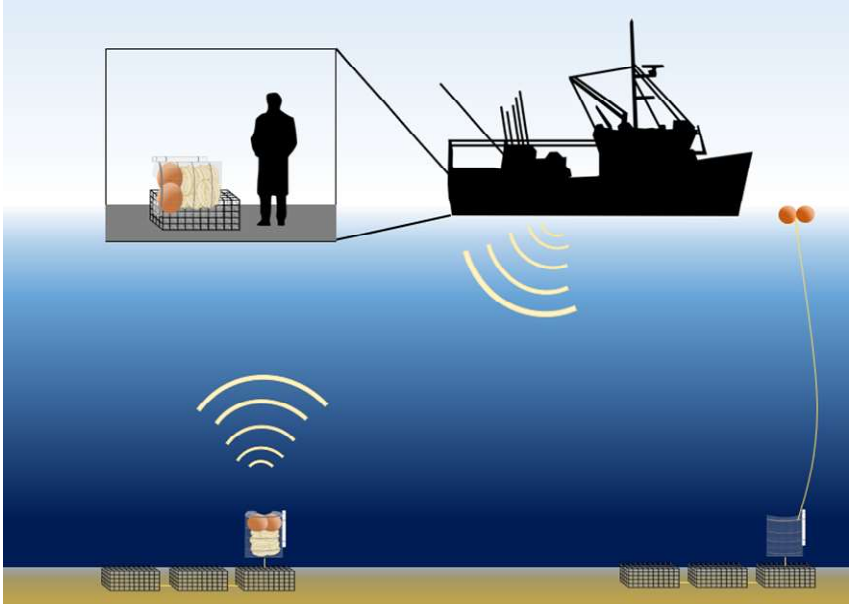


Figure 15 SSS AR50 with Rope Release Bag © 2019 Annika Toth

The Sub Sea Sonics AR50 is a modular acoustic release system produced by Sub Sea Sonics that can be paired with any rope management system. As seen in Figure 12, the buoys and rope are contained in a mesh bag with an acoustically triggered release mechanism attached to the side, which is placed with the rest of a fisherman's regular gear. This release unit is deployed underwater and contains the receiver plus a microcomputer and batteries and holds a release link with a screw-on retainer cap for link replacement. It turns on automatically when it is placed in the ocean by means of water contact to the link and the coil contacts. It has a unique 4-digit identification number that has been assigned to it by the factory. This identification number is entered into the topside acoustic release interrogator (ARI-50) when a command is sent. When the release command is received the unit applies its full battery voltage to the link (pos) and the 'coil' (neg) for 15 minutes. This causes the small hoop of metal to erode, effecting the release. There is a checkout command that can be sent to cause the unit to switch on the erosion voltage for only 10 seconds which is useful for checkout. (Note: This release works in ocean water and typical bay water. It will not work in fresh water since the electrolytic erosion will not occur at a fast enough rate)

Once released, the buoys and line ascend out of the bag and are available for retrieval at the surface. The gear is then hauled as normal, and the line is repacked for another deployment. The rope storage method can and has been customized to fishermen's needs according to their geographic regions. This release system has existed since the 1990's and has been successfully tested by NOAA for use in fishing applications and had a reliability of 100% during our pilot project. This device will require weight to be added to the trap to fully submerge the bag.

Kim Sawicki
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860.287.7221

Professional Preparation:

- 2018 B.S., University of Connecticut. Pathobiology and Veterinary Science. Emphasis-Virology
- 2018 B.S., University of Connecticut. Allied Health Science. Emphasis-Epidemiology

Current Appointment:

2020-Present Research Associate*, PhD Student*,
University of Massachusetts-Dartmouth School for Marine Science and Technology

2018- Present President, Sustainable Seas Technology, INC. Ocala, Florida
Middle Haddam, CT

Past Appointments:

2020	Fulbright-Schuman Student	Marine Institute, Galway, Ireland
2019	Fulbright-Schuman Student	St. Andrew's University, Scotland

Professional Affiliations:

- American Fisheries Society
- American Society of Ichthyologists and Herpetologists

Awards and Honors:

2021 Marine Mammal Commission

Design for an International Virtual Fishing Gear Marking System to Reduce Whale Entanglements

2021 Intercampus Marine Science Symposium Fisheries Lightning Talk-
Winner University of Massachusetts

2021 Intercampus Marine Science Symposium Marine Science Photo Contest-
First Place University of Massachusetts

2019-2020 Fulbright-Schuman Independent Research Award

Professional Service:

2020 Small Business Innovation Research Grant External Reviewer

Invited Lectures

2021	Advances in Pot Fishing	Scripps Oceanographic Institute
2020	Ropeless Fishing Gear	New Bedford Science Café
2020	Fishermen Helping to Save Whales	Marine Resources Council
2020	Ropeless Fishing	Sea Turtle Preservation Society

Consultations and Technical Assistance

2021 National Marine Sanctuary Foundation- Dungeness Crab Pop-Up Research
2019-2020 International Fund for Animal Welfare
2019 Mercy for Animals

Grant Proposals Funded

2021 Name Withheld as not yet Announced $500,000 *Primary Investigator*
"Adoption of Ropeless Fishing Gear to Reduce Whale Entanglements Through Fisher-Led Adaptation"

2021 Georgia Sea Grant $150,000 *Primary Investigator*
"Enhancing the South Atlantic Black Sea Bass Pot Fishery with Acoustic Subsea Buoy Retrieval Systems"

2021 Marine Mammal Commission $35,000 *Primary Investigator*
"Design for an International Virtual Fishing Gear Marking System to Reduce Whale Entanglements"

2021 The Lukis Family Foundation $230,000 *Primary Investigator*
Ropeless Fishing Gear Outreach for Underserved Fishing Communities

2019-2020 Fulbright-Schuman Grant $25,000 *Primary Investigator*
Successful EU Policy Adaptation Supporting Advanced Fishing Technologies to Reduce Bycatch and Entanglements

Publications

Cui J, O'Connell CM, Costa A, Pan Y, Smyth JA, et al. (2019) A PRRSV GP5-Mosaic vaccine: Protection of Pigs from Challenge and ex vivo Detection of IFNγ Responses Against Several Genotype 2 Strains. PLOS ONE *14* (2). *Acknowledgements:* **Sawicki, Kim**

Cui, J.; O'Connell, C.M.; Hagen, C.; Sawicki, K.; Smyth, J.A.; Verardi, P.H.; Van Kruiningen, H.J.; Garmendia, A.E. Broad Protection of Pigs against Heterologous PRRSV Strains by a GP5-Mosaic DNA Vaccine Prime/GP5-Mosaic rVaccinia (VACV) Vaccine Boost. (2020) Vaccines *8* (106).

Technical Reports

Sawicki, K Authors: Fiotakis, J.; Flagg, M.; Hondros-MacCarthy, C.; McFarlane, J.A.R.; Morris, M. Shegog, M.; Toth, A.; Wolf, J.; Zhu, T. (2020) Ropeless is Real.

Presentations/Posters Presented at Professional Meetings

Sawicki, Kim; He, Pingguo. 2021. Global Initiatives to Explore Subsea Buoy Retrieval Systems for Pot Fisheries. ICES-FAO Working Group on Fishing Technology and Fish Behaviour.

Sawicki, Kim 2021. Subsea Buoy Retrieval Systems for Pot and Trap Fisheries. University of Massachusetts Intercampus Marine Science Symposium. New Bedford, MA.

Thomas, Peter; Heinemann, Dennis; Werner, Timothy; Eliminating risk of entanglement in fishing pot lines for large whales: Update on efforts to develop and test "ropeless" gear. *Acknowledgement:* **Sawicki, Kim**

Professional Development
Courses/Trainings/Certifications

2021	Licensed Paramedic (2005-Present)	State of Connecticut
2021	Human Research Social & Behavioral Research	CITI Program-UMASSD
2020	Healthcare Provider CPR/AED Recertification	APES, Norwich, Connecticut
2016	Human Research Social & Behavioral Research	CITI Program-UCONN

Professional Conferences/Meetings Attended

2021	University of Massachusetts Marine Science Symposium	New Bedford, MA USA
2020	West Coast Entanglement Science Workshop	California, USA
2019	World Marine Mammal Conference	Barcelona, Spain

Synergistic Activities

- *Coordinator for the Ropeless Fishing Gear Manufacturers Workgroup* Organizes meetings, agendas, proposals, research and collaborative proposals for worldwide community of ropeless fishing gear manufacturers. Responsible for identifying and pursuing opportunities on behalf of the group and group members, and liaison for relationship building and maintenance between all parties and other stakeholders.
- *Coordinator for the Irish Entanglement Alliance* Organization and scheduling of meetings, agendas, proposals, research and collaborative proposals for stakeholders from the Irish Whale and Dolphin Group, ORC Ireland, the Irish Seal Sanctuary, the Marine Institute, Killybegs Fishermen's Organisation, and others. Responsible for identifying and pursuing opportunities on behalf of the group and group members, and liaison for relationship building and maintenance between all parties and other stakeholders.

Relevant Expertise

Kim Sawicki is a Ph.D. student studying conservation engineering at UMASS-Dartmouth's School of Marine Science and Technology. As the founder and the president and founder of Sustainable Seas Technology 501 (c) (3), she is dedicated to working with innovative technology, fishers, and engineers to save marine mammals from unnecessary human-induced deaths, and to preserve coastal fishing communities as they are. She is recognized as a leading expert of subsea buoy retrieval systems for fishing applications and has extensive experience working one on one with fishers wishing to adopt on-demand fishing technologies. She was a funded Fulbright-Schuman Program Alumni affiliated with the University of Connecticut, the University of St. Andrews, Scotland, and the Marine Institute in the Republic of Ireland to conduct research on marine policy

relating to fisheries management, entanglement, gear technology, and fishing innovations. Her nine-month independent research project in 2018–19 required travel along the coasts of both countries, working closely with entanglement experts, pathologists, engineers, policy makers, and fishing communities. In addition to her ongoing research, the author fosters informed discussion of coastal community and cetacean conservation through innovation on her website, Sustainable Seas. Since November 2018, she has served as a liaison between eight underwater technology companies and entrepreneurs that have mature products or are actively developing ropeless technologies. She is a volunteer for the Scottish Marine Animal Stranding Scheme, the Irish Whale and Dolphin Group, and the State of Connecticut's Region 4 Incident Management Team (since 2010). She is one of the founding members of the Irish Entanglement Alliance, and with the guidance of the gear manufacturers consortium, she advised the New England Fishery Management Council's (NEFMC) gear research group on the standardization of research methodologies for ropeless. Currently, she is involved in ongoing research in Georgia, Ireland, and the UK on the implementation of ropeless fishing technologies and recently completed a pilot study with Scottish creel fishers. She is a proven project manager who has overseen large nationwide implementations of technological innovations and has conducted extensive field research and outreach with ropeless fishing gear internationally. She is the author of the technical report, "Ropeless is Real," and a ropeless fishing blog, "Sustainable Oceans & Seas," which houses a historical compendium of ropeless technology projects and coordinates and consults with stakeholders involved in other ropeless fishing projects. She is currently the principal investigator on a pilot SBRS project for the black sea bass pot fishery in the South Atlantic.