National Marine Sanctuary Foundation

August 29, 2025

CDFW Marine Region
Attn: EFP Coordinator
20 Lower Ragsdale Drive, Suite 100
Monterey, CA 93940

Subject: Experimental Fishing Permit ( ) Amendment Request

Dear Owen Mulvey-McFerron:

I would like to request the following amendments to Experimental Fishing Permit and its associated terms and conditions, held by the National Marine Sanctuary Foundation.

1) **Expand the Geographic Area for Gear Deployment**
   Under the issued EFP and Special Condition 15 (Allowable Fishing Area and Time of Year), traps may be deployed between the California/Oregon border (42° N. latitude) and Lopez Point (36° 00' N. latitude). We request to expand the southern boundary to Point Conception (34° 27 N. latitude) to allow interested vessels in fishing zone 5 to participate in the EFP.
2) **Expand Testing Opportunities in the Spot Prawn Fishery**
   Under current regulations, participants in the spot prawn fishery may use pop-up gear, provided that one end of each string of traps is marked with a surface buoy. Participants will initially trial gear using a hybrid configuration – retaining a buoy line on one end of the string while testing pop-up gear on the other end – followed by trials without any vertical buoy lines. This request is based on: (1) interest from fishery participants to trial the gear to address marine life entanglement risk; (2) the need to allow trials without surface buoys, as the gear is designed to be deployed to reduce entanglement risk; and (3) the value of testing gear in deep-water fisheries to inform gear development for deep-water applications.
3) **Authorize Testing of Additional Gear Types with Flexibility for Future Versions**
   Under the current EFP, participating vessels may trial several pop-up fishing systems from multiple manufacturers (i.e., Ashored Innovations, Desert Star Systems, EdgeTech, Fiomarine, Guardian Ropeless System, Sub Sea Sonics). We request adding the following systems as approved options.
   - **Desert Star Systems ARC-2** – A coastal version of Desert Star's Ropeless Fisher system optimized for the requirements and economics typical of inshore trap fisheries.
   - **Devocean Ropeless Systems** – Submersible on-demand buoys equipped with spooled rope to prevent tangling, available in both deep- and shallow-water configurations to support use across diverse fishing environments.

- **Ropeless Fishing Systems Ropeless RISER** – Configurable airbag-based retrieval system, including the RISER AT (Acoustic Timer) and RISER MTA (Multi-code Transponder Actuator) models.
- **SMELTS Lift-Rafts** – Acoustically-triggered lift-bag system with a range of models designed to perform in different depths, lift capacities, and conditions.

Detailed summary descriptions of these systems, their components, and gear marking systems are attached for reference.

We also request flexibility to test new versions or models of gear that are substantially similar to the systems already authorized under the EFP, to enable testing to keep pace with advancing technology and fishery needs, while remaining focused on effective, practical solutions.

We understand that these changes constitute a major amendment, and the associated fee has already been paid. Please let me know if you have any questions or if additional information would be helpful. We appreciate your consideration.

Sincerely,

Greg Wells
Gear Innovations Manager
National Marine Sanctuary Foundation

Ropeless Fisher "Coastal" System

SA Sensational Seafood octopus fishing vessel with ARC-2 equipped release bags departing Cape Town for a day of 'ropeless' longline fishing

Photo Credit: Michael Daniel

1. System Overview

The "Coastal" version of Desert Star's Ropeless Fisher system is optimized for the requirements and economics typical of coastal (inshore) pot & trap fisheries:

- Use in shallower waters up to about 50 fathoms.
- Smaller vessels often with an open cockpit, where operation of acoustic releases with a computer interface may not be practical.
- Single operator or with one crew, where equipment operation needs to be hands-free to the maximum extent possible.

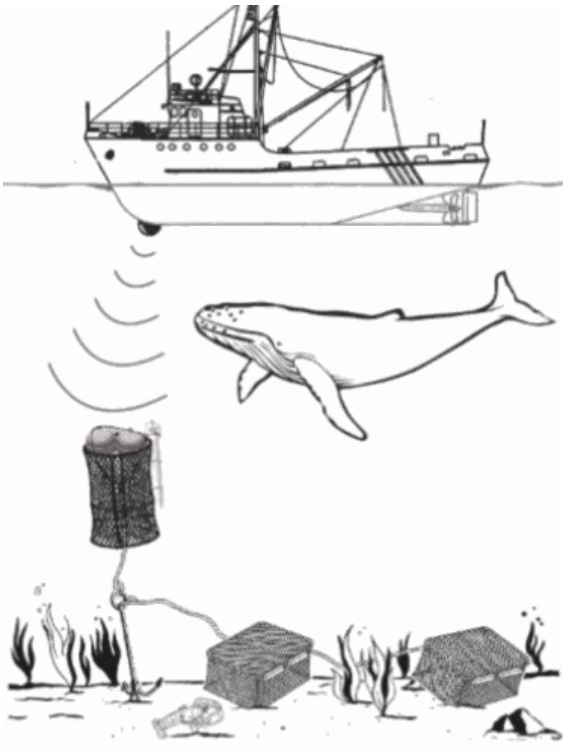


Figure 1: General configuration of Desert Star's Ropeless Fisher "Coastal" system.

1.1. General system configuration

1. A release bag is attached by a short tether to the end(s) of a trawl or a single trap. Buoyed by hard floats, the bag floats above the trap, thereby keeping it clear of terrain that might block acoustic communications and providing a grappling target in case of a snag (pop-up fail).
2. The release bag is filled with a sufficient amount of rope to release the hard floats to the surface, plus enough scope to keep them at the surface for a sufficient time for buoy recover when fishing in strong currents.
3. A model ARC-2 (coastal version) broadcast triggered acoustic release is attached to the bag. It is rigged in such a way that upon remote trigger, it will open the bag to release the floats trailing the haul rope.
4. The fishing vessel is outfitted with a simple switch operated deck box, which repeatedly broadcasts a fisher specific code. This automatically triggers acoustic releases as the vessel approaches.
5. Provided with a hull-mounted directional transducer and an over-the side transducer (omnidirectional). The hull mounted transducer allows release system operation while the vessel is under way. The over-the-side transducer serves as a back-up.
6. An Android tablet for virtual gear marking.
7. The Ropeless Fisher (RF) virtual gear marking app for the Android tablet.

1.2 General operating method

1. **Trap (trawl) setting & virtual gear marking.** To mark a single trap, the skipper enters a trap identifying number and presses the DEPLOY button on RF when the trap goes over the side. For trawls, the DEPLOY button is pressed twice, at the beginning and the end of the trawl. Gear marks are shared with other fishers via an internet link such as cell phone or satellite modem. The system operates without on-line access, and in this case gear marks are automatically synchronized once a

fisher is back in internet range. For privacy reasons, the gear marks are subject to a 'visibility radius' set by the owning fisher. Such marks appear to other fishers only if they are within the visibility radius.

2. **Trap (trawl) release action.** Prior to pulling traps or trawls, the fisher switches the STM-4 deck box on. The box now starts transmitting a fisher specific code repeatedly, about once every five seconds. Traps or trawls are generally approached sailing up-current, using the virtual gear marks displayed on the Ropeless Fisher app for guidance. The hull mounted transducer is best mounted with some forward dead-rise angle to better 'illuminate' releases ahead. Once a release is within the beam and effective range of the approaching vessel (up to 450m observed), the release mechanism triggers, the bag opens, and the buoy rises to the surface trailing the haul line.
3. **Trap hauling and release bag re-filling and arming.** Once the buoy is on board, the haul rope is connected to the block (winch). A bag holder is rigged to fit under the block. A rubber flap is used to guide the rope from the block directly into a waiting empty bag. The buoys and trap are rigged for fast disconnect and re-connect. This is necessary because the top and the bottom end of the rope is reversed during bag filling.

These videos illustrate commercial operation and sea trials of the Ropeless Fisher "Coastal" system.

- Ropeless Fisher Coastal Demonstration by Kim Sawicki (Sustainable Seas Technologies), Loch Broom, Scotland)
- Rigging and preparation for fishing during MLA sea trials at Cape Cod Bay
- Release bag triggering (underwater footage, credit Sustainable Sea Technology)

1.3. Pop-up fail (snag) recovery

Pop-up fails are a part of ropeless fishing, and most of them are caused by rope and buoy snags. The pop-up fail rate depends on how experienced a fisher is, and how aggressive the fishing operations are as we explored during our 2020 Ropeless Consortium presentation. New and sea trial users have observed initial pop-up fail rates over 20% of hauls, while experienced users operate as low as 3% long-term average. In

any case, even the lowest pop-up fail rate would not be tolerable if it translated to gear loss. For this reason, Ropeless Fisher Coastal integrates several recovery supporting mechanisms:

1. Release bags can be identified and localized via a fishing vessel's **depth sounder**. The hollow hard floats make for a strong SONAR target, which is distinct from seafloor features because the release bag floats several to tens of feet above the seafloor as determined by tether length selection.
2. The release bag location above the sea floor provides a good **grappling target**.

Grappling Techniques:

Once located, the grappling method for single traps involves laying a weighted line with grappling hook in a half-circle around the up-current side of the known trap / release bag location and then hauling the grappling line. This typically snares the release bag floating on its tether. For trawls, the release bag at the second end of the trawl is triggered if pop-up of the first end fails. If this fails as well, the ground line may be used as the grappling target.

Overall, the recovery support mechanisms of Ropeless Fisher have kept annual gear losses of commercial fishers consistently in the 0% - 4% range, and in general much lower than the fishers experienced with static buoy fishing.

2. Sea Trials and Commercial Fishing Use History

Ropeless Fisher Coastal is a recent configuration developed to enable practical ropeless fishing on smaller boats. This configuration was first used during the MLA sea trial in 2018, aboard the vessel Margaret M operated by skipper Dave Casoni.

In 2020, SA Sensational Seafood (previously Cape Town Octopus) became the first commercial fishing operation to use the Ropeless Fisher "Coastal" system.

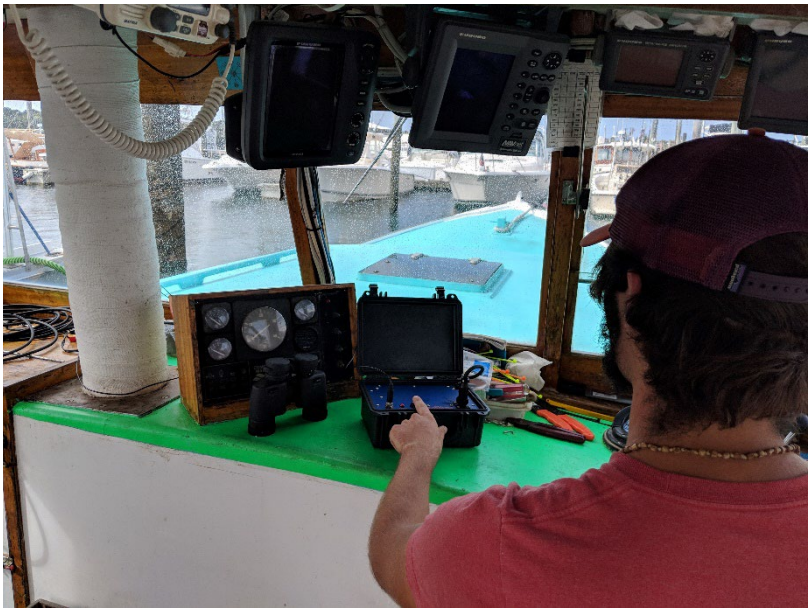
The system has also been demonstrated and sea trialed in various locations and fisheries by researcher Kim Sawicki of Sustainable Seas Technology. Recent work includes commercial fishing for black seabass under an EFP along the southern U.S. Atlantic coast.

Publications about the South African octopus fishery experience with the "Coastal' system

- 2019: Closing of octopus fishery and consequences
- 2020: Fishery re-opens using Desert Star Ropeless gear (Coastal version)
- 2022: Study finds Ropeless fishing effective to reduce whale entanglements

3. System Component Description & Specifications

3.1. Deck System (CLIN X001)



The deck system consists of the hard case mounted STM-4 controller unit, which is supplied including an over-the-side sonar transducer, and a hull mountable transducer (CLIN X003). The STM-4 is a simple, switch operated device. The skipper typically switches the STM-4 on and leaves it running throughout the fishing day. As ARC-2 releases pick up the signal, they trigger and buoys pop-up ahead of the approaching boat. The ARC-2 observes a programmable post-release blackout period such as 1 hour or 12 hours. As traps or trawls are re-baited and re-deployed, the blackout period prevents inadvertent

re-trigger until the fishing vessel has left the grounds. The STM-4 can be powered by 12V DC boat power, or via a supplied power brick by 95-250 VAC.

3.2. Underwater Acoustic Release System (CLINX002)

ARC-2 on the side of a bag custom designed by SA Sensational Seafood (South Africa) for hauling heavy trawls in the shallow (~10-20 fathom) but rough waters near Cape Town. The ARC-2 shown here has experienced approx. 18 months of near continuous service.

The underwater acoustic release system consists of the ARC-2 broadcast release, which is secured to the side of a release bag. It is rigged to open the bag upon reception of the broadcast release command. The ARC-2 uses a patented fusible link mechanism that operates by fusing (instantly melting) a short length of nickel chromium resistor wire. The wire which is suspended between two titanium posts constrains a loosely hinged lever, the single moving part of the mechanism. The opening lever frees one end of a tensioned release cord, which in turn opens the bag. The freed hard float(s) now rise to the surface rapidly, at a nominal speed of 1 fathom / second, trailing the haul rope. The simplicity of this mechanism translates to reliability, resistance to marine fouling, small size and weight (approx. 3.5 lbs) and low cost compared to motor actuated releases. After now ten years of ongoing fishing use in Australia, the gear inventory of that fishery (several hundred units) remains in good shape! The ARC-2 release is powered by a rechargeable lithium-ion battery. Excepting areas of high ambient noise, this battery supports about 300 release cycles and a 1-year

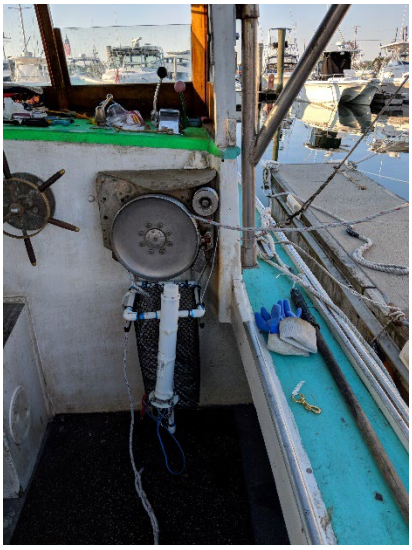
deployment duration between charges. However, if high ambient noise is present, such as when very shallow water fishing in surgy and rough seas, the ARC-2 may not enter sleep mode. In the worst-case scenario, battery endurance between charging is then reduced to 2.5 months including 60 release cycles.

3.3. Release Bags (CLIN X002)

Release bags are boat specific and are generally manufactured and optimized by the fisher for their needs. This is also the most economical option. Desert Star supports this by providing tutorial videos and instructions for specific bag designs.

Desert Star currently manufactures four bag designs with a commercial fishing or sea trial use history, and we are proposing to provide a selection of bags with an order. These can serve as starting points for sea trial participants. For the "Coastal" version of the system, we are proposing the order is split between the two larger bag designs:

- **BAG-35** is a small bag for shallow water fishing in small vessels. It was designed for the Cape Cod Bay sea trials aboard Margaret M, in collaboration with the Massachusetts Lobstermen's Association (MLA) skipper Dave Casoni. Dave wanted a bag that could be clipped under the block of his winch for automatic bag filling while hauling and end line. This bag holds about 35 fathoms of 1/4" polysteel rope and weighs approx. 17 lbs including the attached ARC-2. Flotation is provided by two 8" diameter floats. A rigid PVC pipe top frame facilitates clipping the bag into a holder.



•**BAG-80** is a compact bag developed for the California Dungeness Crab fishery, at depths up to 50 fathoms. It has seen extensive sea trial and equipment demonstration use, in particular by the projects of researchers Kim Sawicki (Sustainable Seas Technology). This bag holds 80 fathoms of 3/8” polysteel rope and weighs approx. 28 lbs including the attached ARC-2.

3.5. Over-the-side and Hull Mounted Sonar Transducers (CLIN X003)

The STM-4 deck box (CLIN X001) is shipped with two sonar transducers.

- The cabled over-the-side transducer (left) generally is used as a backup by offshore fishers. It is also useful when the location of an acoustic release is uncertain despite virtual gear marking, such as for example when it may have moved. In this case the omnidirectional beam pattern is of advantage. This transducer generally requires the vessel to come to a standstill or very slow speed before it is dunked.
- The hull mounted transducer (CLIN X003, right) has a flashlight like directional beam pattern with a full beam width of 60 degrees at the -3 dB (half power) points, and 90 degrees at the -10 dB (10% power) points. The transducer may be mounted pointing straight down, or with a deadrise angle of between 30 degrees (for deep water) and 60 degrees (for shallow water) in order to 'illuminate' and connect with acoustic releases ahead of the vessel. It can be used at any vessel speed. There are several mounting options, including through-hull with a fairing block for pointing, transom mount bracket and mounting on stabilizer wings.

3.6. System Control Tablet (CLIN X004)

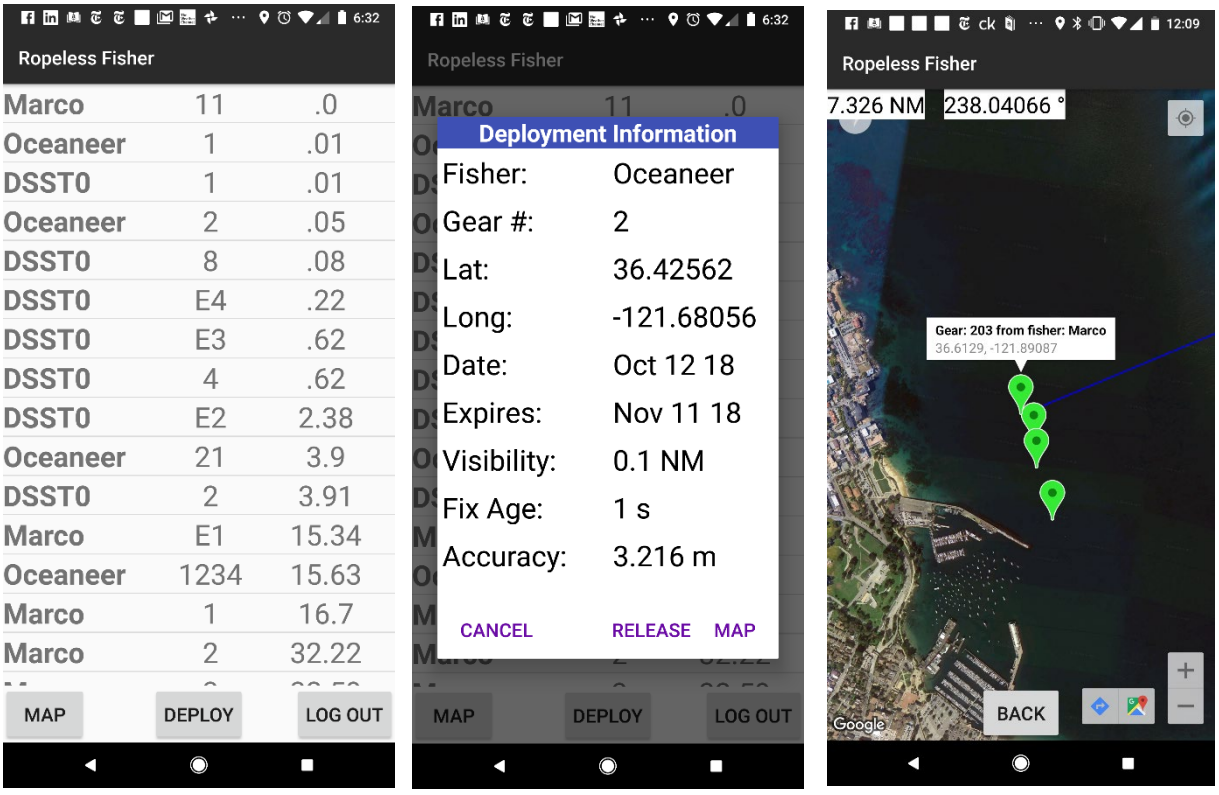
The Ropeless Fisher Coastal system is supplied with a compact Android tablet, model Samsung Galaxy Tab A7. Unlike with the "Offshore" version of the system, ARC-2 releases are not controlled via this tablet. This is instead done simply by switching the STM-4 deck box on (hands-free operation). Instead, the tablet is used for virtual gear marking only (see next section)

3.7. Ropeless Fisher Software (CLIN X005)

The Ropeless Fisher software, which is also available free of charge on the Google Playstore, is used for virtual gear marking. A demonstration of is provided in [this video of the CLA sea trials](#).

The software operates both on-line via a cell or satellite modem, and off-line. When off-line, gear marks are automatically synchronized with the cloud (shared) when an internet connection is re-gained.

Through integration with the Ropeless Manufacturers Working Group backend (RMW HUB) Ropeless Fisher supports display of virtual gear marks from other manufacturers systems and ensures Desert Star gear marks are accessible to users of other brands or other cloud platforms, including EarthRanger.



Ropeless Fisher Virtual Gear Marking & Sharing App

Devocean Ropeless System (DRS 3)

The DRS 3 technology, developed by Devocean Inc., eliminates the need for a constant rope connection between surface buoys and bottom fishing gear, while maintaining maximum operational efficiency.

The system includes three main components:

1. ***The submersible buoy**, which attaches to the fishing trap like a traditional buoy but is deployed to the seafloor along with the fishing gear. It houses a centrally locked spool containing the rope required for resurfacing.*
2. ***The Devocean application**, an interactive map-based tool for laptops and tablets, used to operate and locate the submersible buoys.*
3. ***The automatic rewinder***, installed on the vessel's deck, allows for fast and efficient buoy rearming without additional crew. It also houses the communication system that links the client application to the buoy—using Bluetooth when the buoy is on deck, and acoustic signals (via a transducer) when the buoy is submerged.*

   **The system can also operate without the rewinder. In this case, a standalone waterproof communication unit is provided to maintain the Bluetooth and acoustic link with the buoy. A coupling is also included to connect a standard handheld electric drill, which the user must operate to rewind the rope onto the internal spool. The operator is responsible for manually guiding the rope to ensure an even and tight winding pattern, which is essential to avoid tangling or jamming during the resurfacing sequence.*

DRS 3 buoys are primarily used in the snow crab fishery in Eastern Canada (Quebec, New Brunswick, Nova Scotia, and Newfoundland).

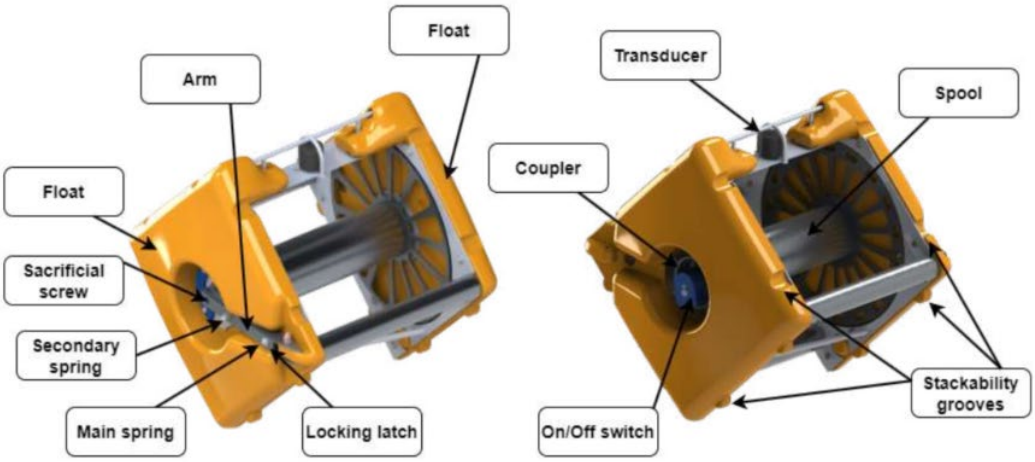


Image 1: 3D render of Devocean's DRS 3 buoy

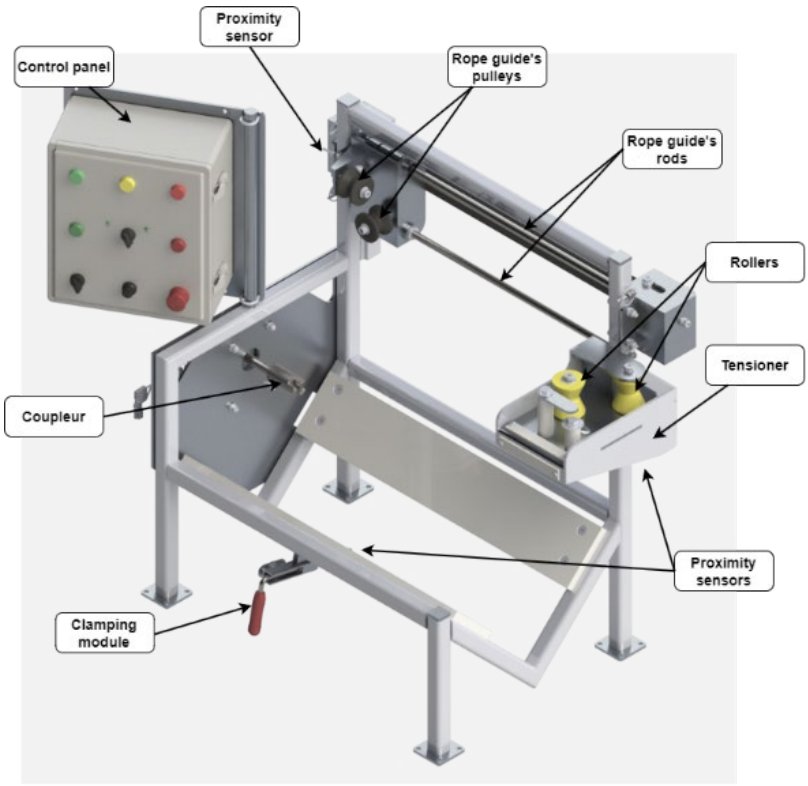


Image 2: 3D render of Devocean's DRS rewinder

1. Menu: Access Different Pages
2. Buoy Connection: BLE Connection Status with a Buoy
3. Rewinder Connection: Wired Connection Status with the Rewinder
4. Map Actions: Zoom Level, Orientation, and Boat Location
5. Action Buttons: Launch, Trigger, and Retrieve
6. Indicators: Boat Position, Location of Submerged Buoys
7. Legend: Scale and Coordinates

Image 3: Representation of Devocean's client application

Image 4: 3D render of a submerged DRS 3 buoy with a snow crab trap

Release Mechanism and Line Handling

The acoustic release is fully integrated into the buoy. Once the rope is wound, a press on the spring-loaded locking arm secures it, allowing submersion with the fishing gear.

To retrieve it, the user sends a unique acoustic key via the client app and transducer, when within ~1 km of the buoy. On receipt, the buoy unlocks and resurfaces as the rope unwinds, then is brought aboard.

During gear retrieval, the buoy is placed on the automatic rewinder, which safely rewinds the rope while the crew handles the catch. A single press re-engages the locking arm for redeployment.

The buoy withstands depths up to 250 m and holds 650 ft of 5/8" rope, 984 ft of 1/2" rope or 2,750 ft of 3/8" rope. Dimensions: 18" × 18" × 22", weight: ~40 lbs (no rope).

The rewinder fits all standard rope sizes, with adjustable presets for consistent, tangle-free winding. Proximity sensors stop it if a jam occurs. Powered by 120V.

Two backup systems prevent loss: a programmable timer and a sacrificial release that corrodes after ~1 year underwater.

Deck Unit and Acoustic Transducer

Each DRS 3 buoy is managed individually via the Devocean client app, used on a laptop computer or a tablet, which is connected to the communication hub, located inside the rewinder or in a standalone waterproof case when used without the rewinder. Before deployment, the user chooses the buoy on a list and verifies readiness of the buoy (time stamp, communication, battery) via Bluetooth.

Once the submersion is confirmed, the buoy can be submerged, and its GPS location is logged after pressing save on the screen. The owner can choose to use the system in single pot or in trawl mode.

To retrieve it, the user must be within ~1 km. The acoustic release is triggered in the app by selecting the buoy on the map or in the list.

A beta version of two-way acoustic communication confirms that the buoy has received the release command.

Two transducer types are supported: a mobile omnidirectional unit (submerged for each use) or a fixed directional unit mounted through the hull.

Gear Location Marking

The Devocean app lets users log and share the locations of their submerged buoys. It is compatible with other systems through a partnership with Earth Ranger and requires an annual subscription.

Users see only their own buoys, but nearby on-demand systems (within 5 nautical miles) appear on the map without ownership details.

Regulatory authorities have secure access to the data for compliance purposes.

An internet connection is required on board for real-time location updates, but not for submerging or triggering a buoy.

- *The owner single trap will be identified on the map by a colored marker with the name or number of the buoy.*
- *The owner trawl line will be identified on the map by two colored markers, with name or number of the buoys, connected by a dotted line.*

** The user can customize the logo and colour of the marker, as well as the names of its buoys.*

- *Any other on-demand system nearby will be identified on the map by either one grey marker for a single trap or two grey markers connected by a grey dotted line for a trawl line.*

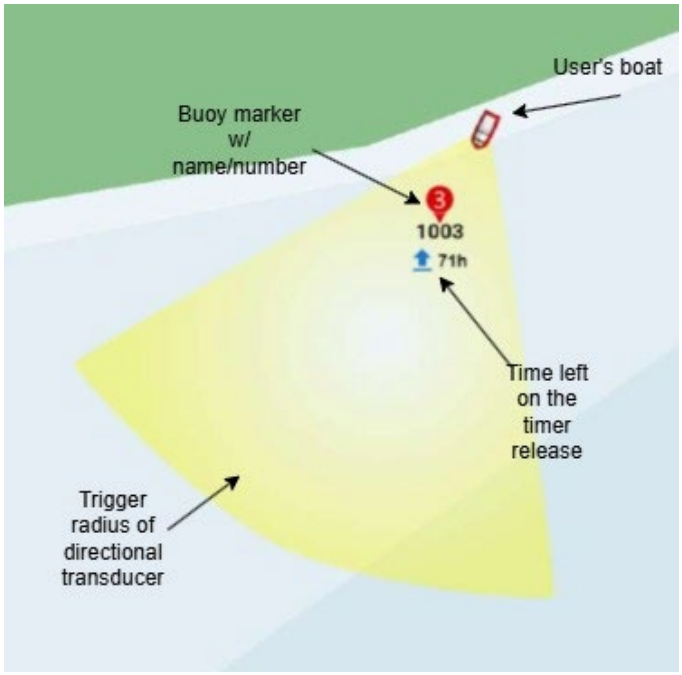


Image 5: Representation of a user's single trap marker

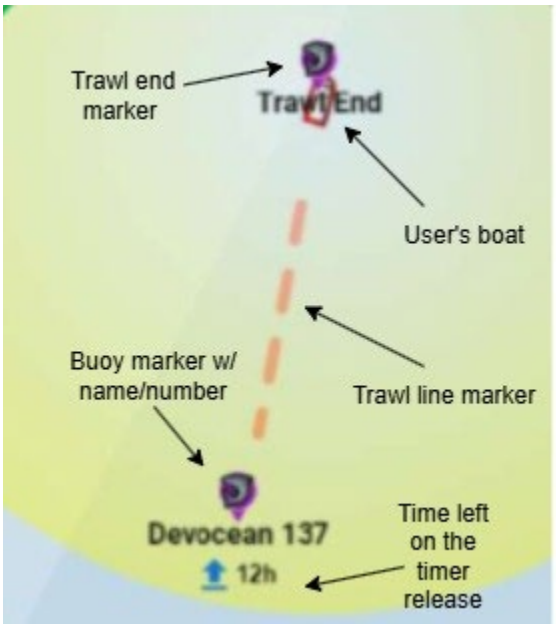


Image 6: Representation of a user's trawl line marker

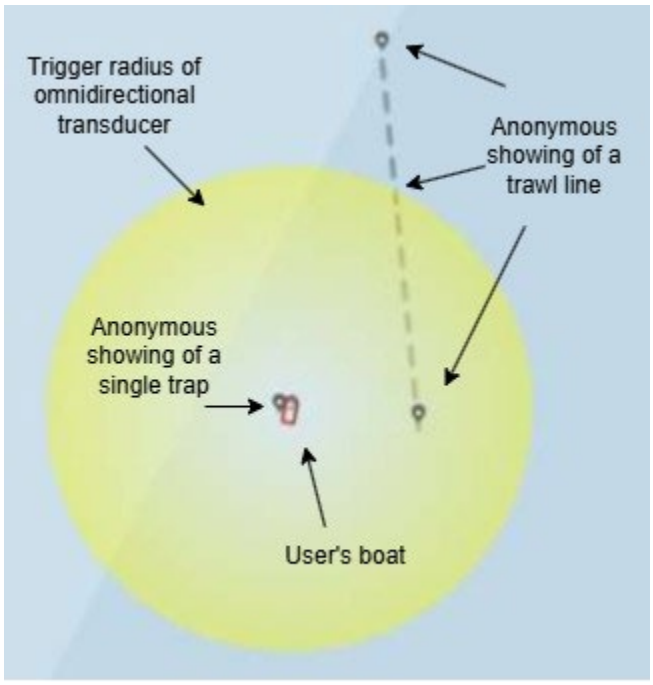


Image 7: Representation of someone else's trawl line and single trap

Image 8: DRS 3 buoy with a regular Quebec's snow crab trap

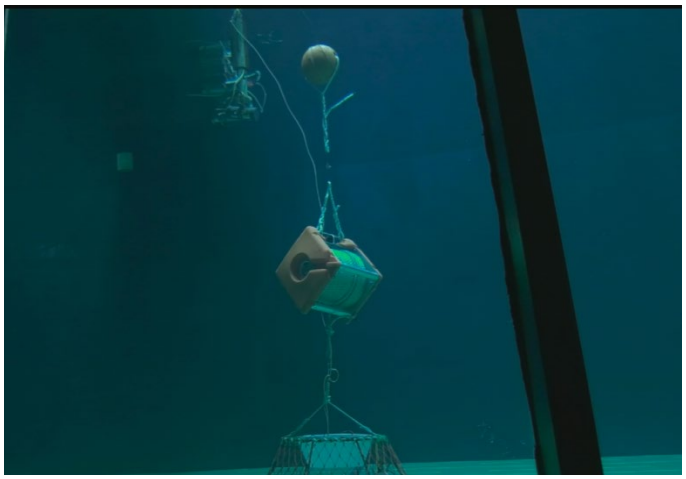


Image 9: Underwater view of DRS 3 buoy during flume tank testing at Marine Institute of Memorial University of Newfoundland

Image 10: Deckhand retrieving a DRS 3 buoy

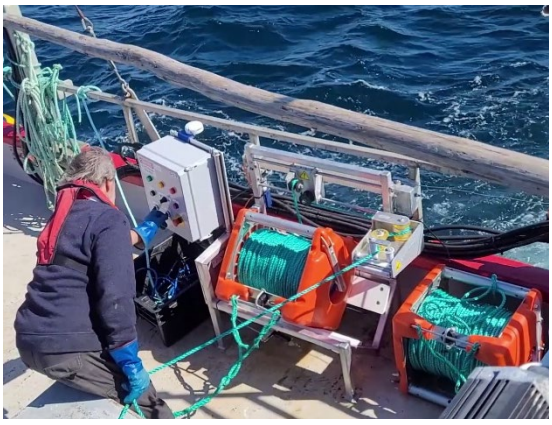


Image 11: Deckhand using the automatic rewinder to prepare DRS 3 buoy

***Devocean Ropeless Shallow Water System* (DRSWS)**

The shallow water on-demand buoy system is based on the same acoustic and embedded electronics technology as the DRS 3 but is specifically designed for coastal fisheries operating in shallower waters and from smaller vessels.

The system consists of three main components:

1. ***The submersible buoy**, which attaches to the fishing gear like a conventional buoy and is deployed to the seabed. It features two side floats connected by a central shaft, which houses the rope used for resurfacing. The central shaft also contains all electronic components, except for the transducer, which is mounted externally on the side of the buoy.*
2. ***The Devocean client application**, available on laptops and tablets, allows users to operate, monitor, and locate the buoys through an interactive map interface.*
3. ***The communication unit**, a standalone waterproof case that connects the buoy to the user device. It enables Bluetooth communication when the buoy is on deck and acoustic communication, with a transducer, when the buoy is submerged.*

The system is ideal for small-scale or nearshore fisheries and can be deployed without additional equipment.

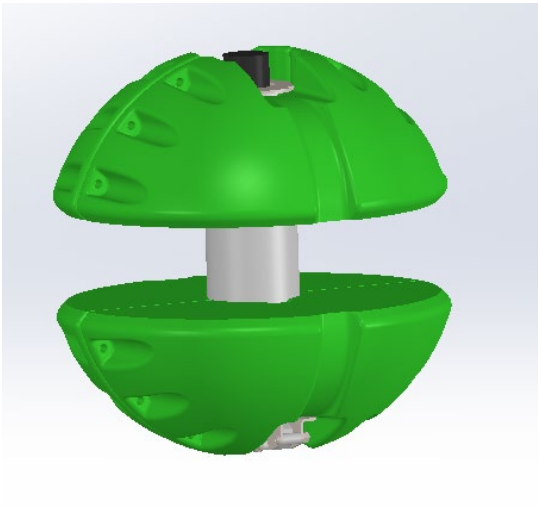


Image 1: 3D render of Devocean's DRSWS buoy

1. Menu: Access Different Pages
2. Buoy Connection: BLE Connection Status with a Buoy
3. Rewinder Connection: Wired Connection Status with the Rewinder
4. Map Actions: Zoom Level, Orientation, and Boat Location
5. Action Buttons: Launch, Trigger, and Retrieve
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Image 2: Representation of Devocean's client application

Release Mechanism and Line Handling

The acoustic release is fully integrated into the buoy. Once the rope is wound, a press on the spring-loaded locking arm secures it, allowing submersion with the fishing gear.

To retrieve it, the user sends a unique acoustic key via the client app and transducer. On receipt, the buoy unlocks and resurfaces as the rope unwinds, then is brought aboard.

To redeploy the buoy, a crew member must manually rewind the rope onto the buoy's central axel. A single press re-engages the locking arm for redeployment.

The buoy withstands depths up to 820 ft and holds 475 ft of 1/2" rope or 900 ft of 3/8" rope. Dimensions: 17" spherical design, weight: ~20lbs (no rope).

Two backup systems prevent loss: a programmable timer and a sacrificial release that corrodes after ~1 year underwater.

Deck Unit and Acoustic Transducer

Each DRSWS buoy is managed individually via the Devocean client app, used on a laptop computer or a tablet, which is connected to the communication hub, inside a standalone waterproof case. Before deployment, the user chooses the buoy on a list and verifies readiness of the buoy (time stamp, communication, battery) via Bluetooth.

Once the submersion is confirmed, the buoy can be submerged, and its GPS location is logged after pressing save on the screen. The owner can choose to use the system in single pot or in trawl mode.

To retrieve it, the user must be within ~1 km. The acoustic release is triggered in the app by selecting the buoy on the map or in the list.

A beta version of two-way acoustic communication confirms that the buoy has received the release command.

Two transducer types are supported: a mobile omnidirectional unit (submerged for each use) or a fixed directional unit mounted through the hull.

Gear Location Marking

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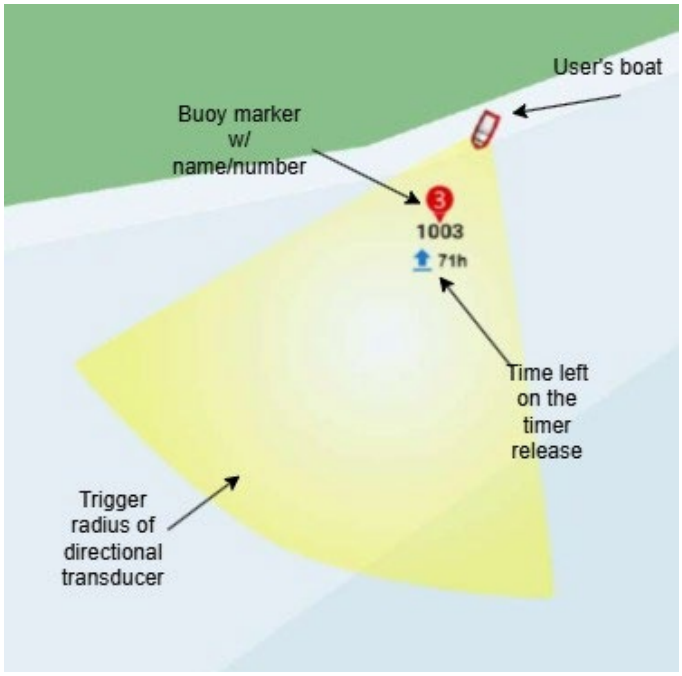


Image 3: Representation of a user's single trap marker

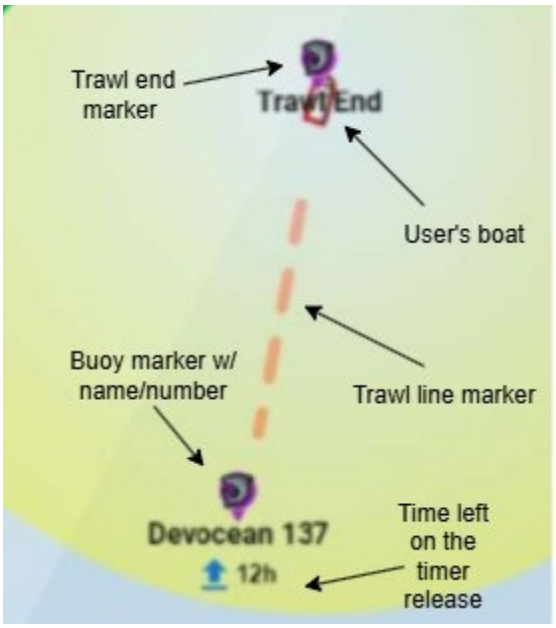


Image 4: Representation of a user's trawl line marker

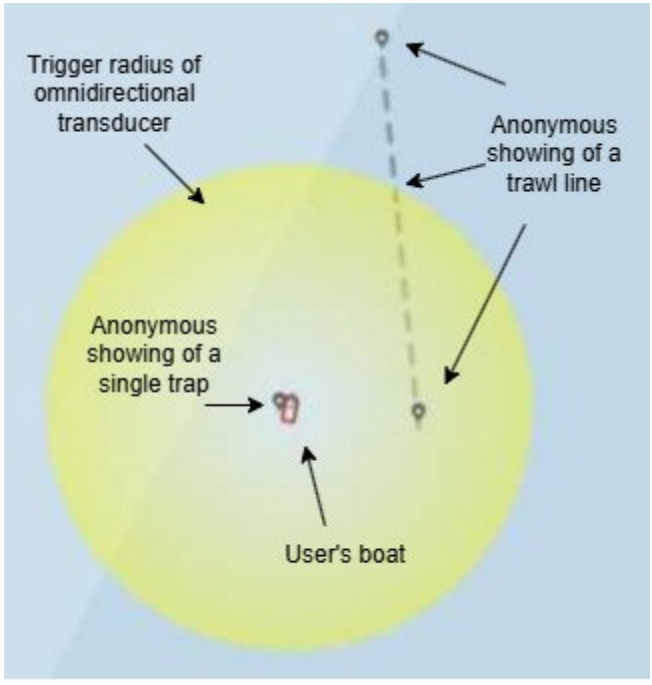


Image 5: Representation of someone else's trawl line and single trap

Images 6-7-8: DRSWS prototype buoy

RISER™ AT
Acoustic/Timer Actuator

Maximum Operating Depth: 400m

Communication Type: Receive-only, Surface Transmission

Communications Frequency: 12 kHz

Communications Range: 1 mile (varies depending on sea state conditions and depth)

Actuation Modes for Inflation: Multiple actuation modes are available, depending on the intended use-case:

- Acoustic: Receive-only communication.
- Timer: Count-down or Date/Time based actuation timer.
- Acoustic/Timer: Acoustic release and timer release

Battery: Rechargeable Lithium-ion Batteries

Deployment Battery Life: 50-days

Dimensions: 3.51" diameter X 13.42" long.

Actuator In-Air Weight: 4.82 lbs.

Actuator In-Water Weight: -1.01 lbs.

Features:

Fill timer for air conservation (configured via app)

Highly configurable submerged system

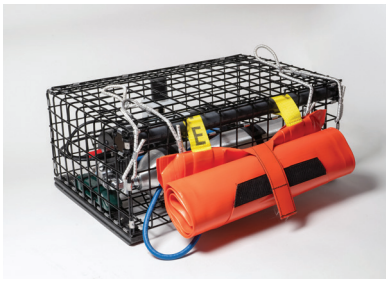
Enhanced trap visibility on the surface

Compact deck box and dipping transducer

Intuitive tablet interface for system actuation

RISER™ AT Submerged System:

The submerged system consists of several key components, a RISER™ AT actuator, a High-Pressure Solenoid Valve, a compressed air cylinder, and a lift bag. RISER™ AT features a receive only hydrophone for surface to seafloor communications. The system can be programmed to actuate upon acoustic command, or timer (count-down or date/time). The High-Pressure Solenoid Valve installs onto a compressed air cylinder and connects to RISER™ AT. When actuated, the valve opens, inflating the lift bag, and causing the system to ascend. To conserve air, the system can be programmed with a fill timer that closes the valve after a user determined amount of time. All components of the submerged system are housed inside a wire mesh frame, which comes in various sizes and lift capacities dependent on the needs of the fishermen.



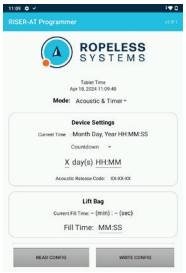
Submerged System

High-Pressure Solenoid Valve

RISER™ AT Surface Control System:

The surface control system includes the RISER™ AT Deck Box, at tablet with the RISER™ app, and a surface transducer. A release code is entered into the app which sends the unique acoustic signal through the surface transducer, which can be detected by RISER™ AT up to a mile away. The system is designed to be compact and portable. It features a battery powered deck box and does not need to rely on ship power.

Surface Control System



RISER™ App

Ropeless Systems RISER MTA™

The RISER™ MTA system is Ropeless Systems' most feature rich solution for ropeless on-demand fishing. It is an all-in-one solution for removing vertical line from the water column and providing automatic, hands-free gear marking using Ropeless Systems' real-time acoustic marking system. RISER™ MTA provides fishermen with real-time position information of their traps on the seafloor as well as the GPS location of other on-demand fishing traps to avoid gear conflict. Trap positions are clearly shown on a chart plotter, where all command-and-control operations are performed. When the fisherman wants to retrieve a trap, a command is sent to RISER™ MTA to inflate a lift bag which brings the ground line, or several traps to the surface. The inflated bag extends high out of the water to give better visibility than a traditional buoy, and once retrieved, the line is run through a hauler as usual.

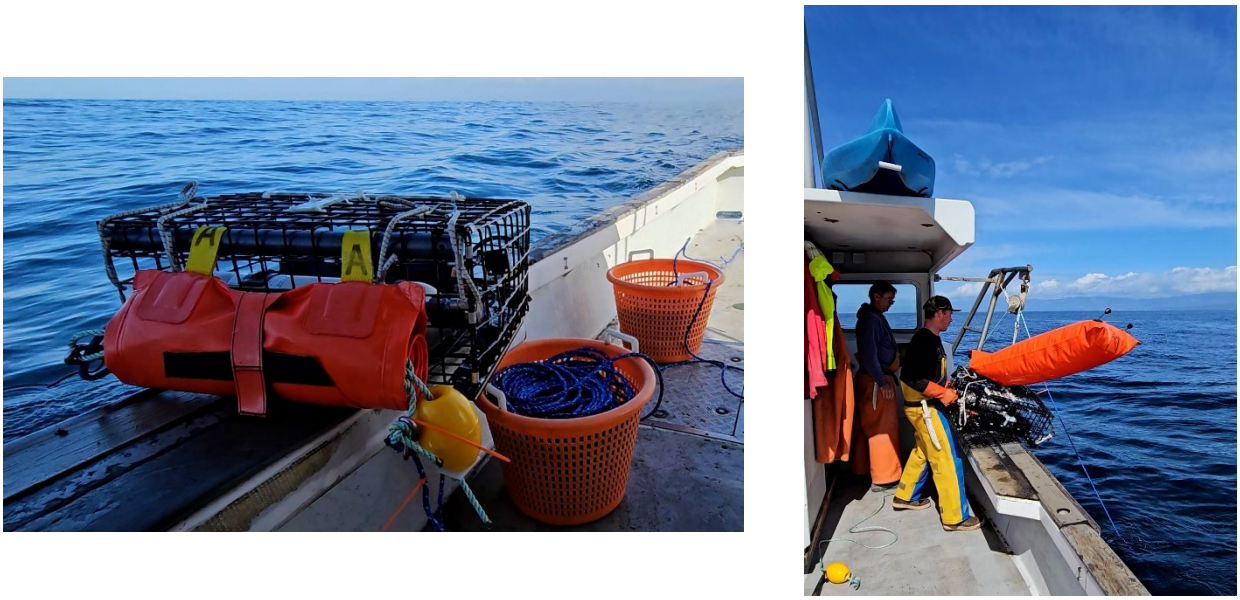


Figure 1 *RISER MTA seafloor recovery system ready for deployment (LEFT) and recovered at surface ready for hauling (RIGHT).*

Release Mechanism and Line Handling:

The submerged system for RISER MTA™ consists of several key components, the RISER™ MTA Transponder/Actuator unit, a high-pressure solenoid valve, a compressed air cylinder, a lift bag, and a remote mounted transducer. All components of the submerged system are housed inside a wire mesh frame, which comes in various sizes. The system's air supply and lift bag are configurable based on the fishermen's needs. The submerged system

comes in two standard sizes: the Ground Line Recovery Configuration offers up to 200 lbs. of lift, and the Anchor Configuration provides up to 500 lbs. of lift.

Figure 2 *RISER MTA seafloor recovery systems in two sizes (LEFT) and view of components inside mesh frame (RIGHT).*

The system is armed by plugging the cable from the high-pressure solenoid valve into the RISER-MTA™ Transponder/Actuator and opening the hand wheel on the air supply. A gauge built into the solenoid valve shows how much air is left in the tank. The submerged system can be attached via line to a single trap, or two submerged systems can be used at either end of a string of traps. When the systems are deployed, they will automatically acoustically check in with the transceiver and its location will be updated on the chart plotter. Paired systems in a string or trawl configuration will be connected by a line on the chart plotter.

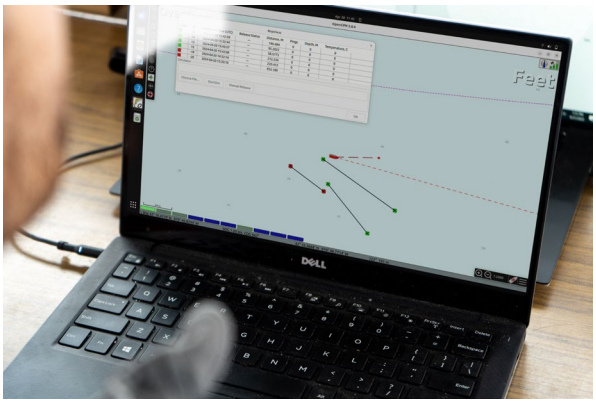


Figure 3 *Chartplotter display. Positions are added as gear is deployed without requiring operator action. Release is commanded from chartplotter for owned gear.*

When the owner of the system wants to retrieve their traps, they can do so by clicking on the trap on the chart plotter and commanding its release. An acoustic signal is then sent to the submerged system which in turn opens the high-pressure solenoid valve and inflates the lift bag, beginning its ascent. The system detects when it has left the seafloor and will automatically close the valve to conserve air. Once the system surfaces, it can be easily spotted, as the lift bag extends high out of the water. The fisherman can hook onto a tag line and run the line through a hauler as usual. Rearming the system is as simple as deflating and rolling the bag, checking for sufficient air supply, then redeploying.

Transceiver and Gear Location Marking:

The surface control system includes the Ropeless RISER™ Transceiver, a pole or hull-mounted transducer array, and a chart plotter running the Ropeless RISER™ Plugin. All interaction and communication with the submerged systems is done on the chart plotter.

Figure 4 *Vessel system. Transducers on a pole mount configuration (LEFT) cabled to the transceiver box (RIGHT). The transceiver box manages all communications between the chartplotter and seafloor gear and with any shoreside databases (RMWHub or EarthRanger).*

As soon as a RISER MTA™ system is deployed, it will automatically be in communication with the transceiver, and its location will be calculated and displayed on the chart plotter. The chart plotter will show location of the gear up to a mile away dependent on environmental conditions. Position information for RISER MTA™ is acoustically calculated in real-time and does not require an internet connection or manual recording of GPS locations. If an internet connection becomes available on the vessel (such as Starlink or

cellular) then the gear locations obtained by hands-free acoustic positioning can be uploaded to a designated shore database such as RMWHub or EarthRanger.

GPS positions of other on-demand fishing products which have been uploaded to an online database can be automatically downloaded and displayed in the chart plotter interface. For example, the positions can be obtained from the RMWHub or EarthRanger gear location databases. All seafloor units within range are displayed to avoid gear conflict, but ownership is differentiated, so only systems assigned to the fishermen can be fully identified and interacted with.

Figure 5 *RISER MTA surface transducer assembly for hull mount installation on fishing vessels (instead of the over the side pole mount configuration.*

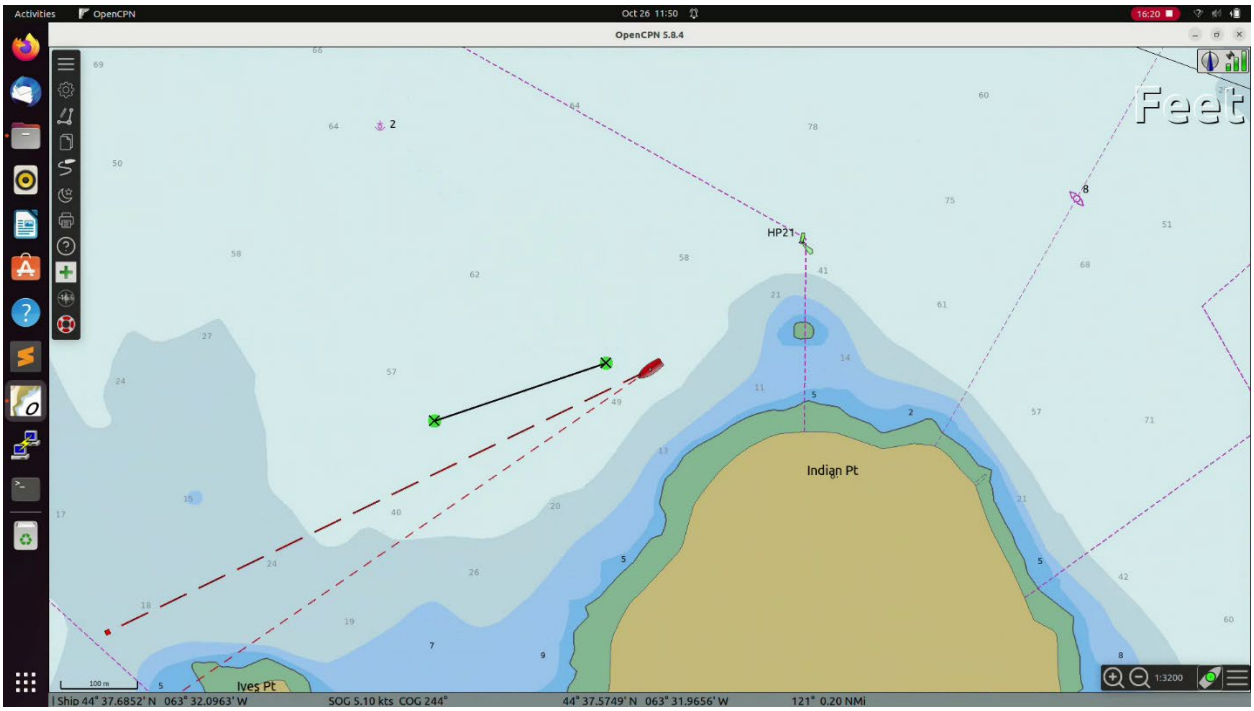


Figure 6 *Detail of chartplotter display showing a trawl (string of traps). The circles are fishing gear and green indicates ownership. The black "x" inside the green circle indicates a trawl end and the line between them shows they have been paired and can mark the extent and direction of the trawl on bottom.*

SMELTS Lift-Raft™ Gear Description

Sea Mammal Education Learning Technology Society

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Introduction

SMELTS has invented and builds acoustically controlled lineless/on-demand fishing gear for use in fisheries that are closed to persistent end lines and buoys due to whale conservation. Gear can also be used in a hybrid application that also maintains a persistent end line and buoy for training and familiarization purposes.

Theory of operation

SMELTS Lift-Rafts™ consist of a rugged steel cage with an internal chassis containing the valve, high pressure cylinders and an acoustic pressure vessel that houses the acoustic board, transducer and battery. When an acoustic signal is sent from a vessel at the sea surface to the sea floor, the SMELTS Lift-Raft™ wakes up and begins communications to the vessel. Primary communication commands are wakeup, hibernate, range, update status, pressure & temperature and release. To recover a SMELTS Lift-Raft™ a wakeup command is sent to the sea floor from a distance of < .5 nm, unit will respond back to the vessel and the unit is ready for further commands. To raise SMELTS Lift-Raft™ a release/trigger command is sent and the acoustic board opens the valve which is connected to high pressure cylinders on the inlet side and a commercial fisheries lift-bag on the exit side of the valve. When the valve is commanded to open, high-pressure air fills the lift-bag and ascends gear to the surface.

Release Mechanism

All SMELTS Lift-Raft™ models utilize an acoustically-triggered lift-bag system to raise gear to the surface. The lift-bag system has proven to be reliable, predictable, and extremely versatile for inshore and offshore commercial fishing applications, as well as gear retrieval for research, marine debris, salvage and other ocean applications. SMELTS lift-bags are inflated using compressed air, which enters the bag through an acoustically triggered valve (see figure 7 in the appendix). Upon retrieval, the air pressure can be released with the use of check valves on the bottom of the lift-bag, which allows the lift-bag to be deflated, folded, and stowed, ready for another set and haul. The high-pressure cylinders which come equipped on SMELTS Lift-Rafts™ are manufactured under strict standards, and the entire release mechanism is bonded to a sacrificial anode, which greatly increases the longevity of SMELTS Lift-Rafts™. Each

Lift-Raft™ model is capable of multiple recoveries when fully pressurized. The variable buoyancy of the lift-bag allows for a system that is safe, reliable, and easy to handle on deck while also providing an immense lifting force.

SMELTS pioneered the lift-bag system as a solution to unreliable & maintenance intensive stowed line systems. SMELTS lift-bags are variably buoyant - when gear is set, the lift-bag is in its deflated state, and provides no buoyant force. Upon receiving an acoustic release command, the lift-bag inflates, which brings the unit to the surface without the need for lines. SMELTS lift-bags are manufactured using a highly visible and heavy duty ballistic nylon material with check valves on bottom, which allows for quick gear recovery and long product life cycles (See figures 5 & 6 in the appendix).

Acoustics & Transducers

SMELTS packages multiple acoustic platforms for communication and recovery of underwater assets. SMELTS currently uses EdgeTech's 5112 acoustic board and Teledyne's Ultra Compact Modem (UCM) acoustic board for SMELTS Lift-Rafts™. SMELTS has developed EdgeTech Lift-Rafts™ to be highly reliable and robust; the EdgeTech acoustic board operates via tonal communication, and release commands can be sent to a deployed subsea unit via a transducer and deck box combo paired with the EdgeTech TrapTracker App. SMELTS Lift-Rafts™ equipped with EdgeTech acoustics use a tilt-dependent, model-specific ascent protocol, which uses set inflation intervals and a tilt sensor to provide fast and efficient lift-bag inflation. EdgeTech units are capable of reporting information such as unit tilt & water temperature back to the surface using status commands, making gear recovery more predictable.

Teledyne's UCM is the answer to advanced fisheries use and research applications enabling high-speed Ultra-Short Baseline (USBL) data communications with both users on board a vessel, as well as other Teledyne SMELTS Lift-Rafts™. The Teledyne UCM enables the retrieval of gear using the same release mechanism (valve) as the EdgeTech 5112, but uses a pressure & temperature (PT) sensor to allow for an adjustable, pressure-dependent inflation threshold for optimal efficiency and speed in all depths. The inclusion of the PT sensor allows for other advanced features, such as automatic depth-dependent gear marking & advanced controlled system applications for research purposes. Furthermore, Teledyne equipped SMELTS Lift-Rafts™ have an

adjustable release failsafe, which automatically resurfaces gear after a set timeframe, ensuring gear recovery.

Figure 1: Teledyne ReleaseIT (left) and EdgeTech Bluetooth Low Energy Acoustic Transceiver (BLEAT) Deck Box (Right) with their respective transducers.

Gear Marking with No Surface Buoys

Accurate gear marking is necessary for fishers to relocate on-demand gear on the seafloor with no persistent end lines. SMELTS offers different gear marking solutions depending on the acoustic package of the unit (EdgeTech or Teledyne). For EdgeTech Gear, the Trap Tracker App allows seamless gear marking under normal use conditions. When gear is set and hauled, the action is automatically uploaded to the chart to be marked and removed. Teledyne gear is marked using the Teledyne Universal Top-Side Deck Box (UTS), which sends gear locations to the SMELTS SeaCloud via satellite internet & a GPS locator. Each SMELTS Lift-Raft™ marked on the chart is recorded and stored in the SMELTS Sea Cloud, which was developed with the purpose of recording and marking gear on the ocean floor. The Sea Cloud integrates with EarthRanger & EdgeTech gear marking software to provide gear locations for users of EarthRanger ER Buoy APP or EdgeTech TrapTracker App.

SMELTS also offers full gear control and gear marking for both EdgeTech and Teledyne units via the On-Demand Fishing App on select Raymarine chartplotter models. This app has been developed in collaboration with Teledyne Benthos for use in commercial fishing applications, but provides benefits for all use cases. Through the use of a hull-mounted transducer, the Raymarine chartplotter can seamlessly deploy and release SMELTS Lift-Rafts™, automatically marking and removing gear from the chart. The On-Demand Fishing App is fully interoperable between EdgeTech and Teledyne acoustics and can set and haul SMELTS Lift-Rafts™ with either acoustic platform.

Figure 2: On-Demand Fishing app being used to set and deploy gear.

Product Lineup

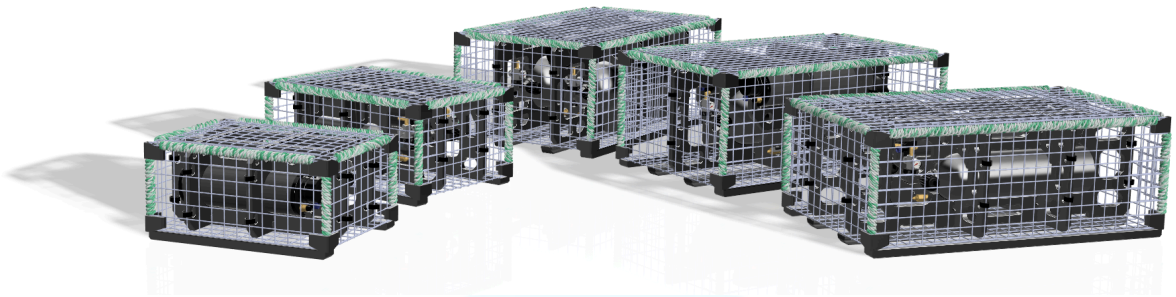


Figure 3: SMELTS Lifting Engine Lift-Raft™ Models.

SMELTS has developed a range of lineless solutions to perform reliably in different depths, lift capacities, and conditions. These models allow scalability and adaptability for fisheries and researchers, and share the same core release mechanism, deckbox, and interface. Each model is designed to be efficient in their respective depth ranges, maximizing the number of lifts and minimizing time to resurface.

The table below includes key specifications for each model.

Table 1: Comparison of SMELTS Lift-Raft™ Models

	LR-13	LR-26	LR-60	LR-80	LR-160
Tank Air Capacity, ft^3	13	26	60	80	160
Tank Configuration	Single	Dual	Dual	Single	Dual
Acoustic Vessel Size	14"	14"	17"	17 & 20"	17 & 20"
Acoustic Vessel Configuration	Single	Single	Single	Dual	Single
Buoyant Lift-bag Rating, lbs	80	185	185	250	500, 800, 1000
Recommended Deployment Depth, Fathoms (+/- 10)	25	50	150	200	300
Number of hauls on full tank in recommended depth	~4	~10	~12	~8	~12

Handling the system

One major benefit of the SMELTS Lift-Raft™ is its compact, durable, and serviceable design. The SMELTS team focused on creating a sustainable technology that is both reliable and repairable to make using & repairing the gear intuitive, aid in deployment and retrieval in crowded & moving decks, and to help fisheries & users more easily adapt to the capabilities of the system. Lift-Raft™ lineless gear consists of a durable, impact resistant High-Density Polyethylene (HDPE) core which is impervious to corrosion with low bioaccumulation and easy to clean. The lower part of the core supports the tanks & air lines, while the upper, removable section of the core houses the acoustic module.

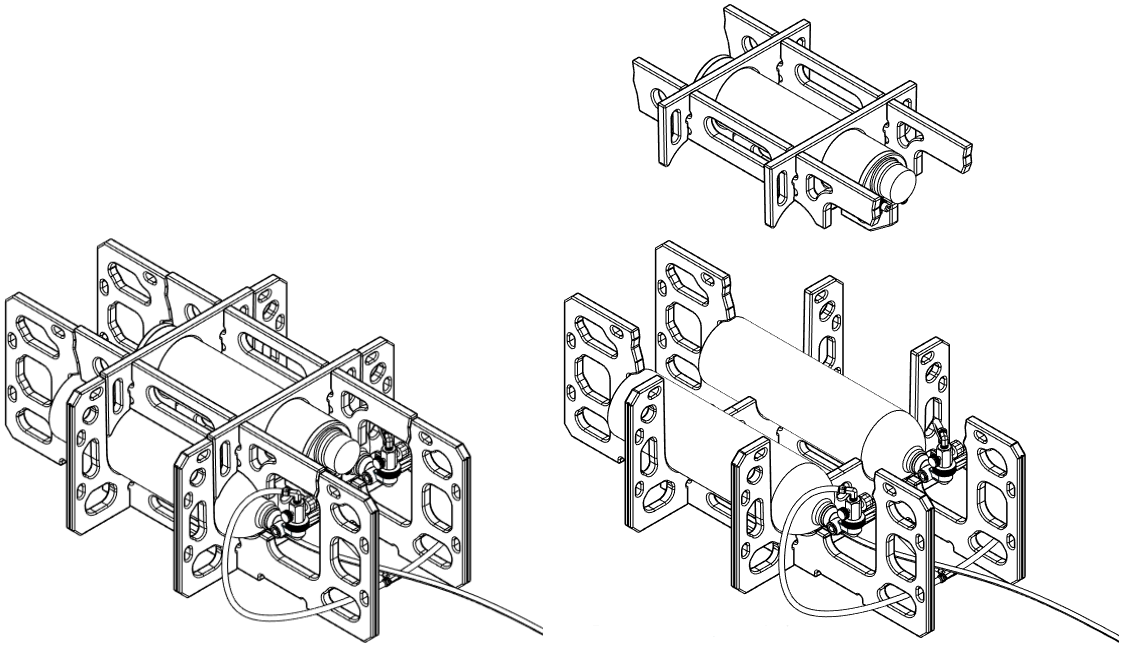
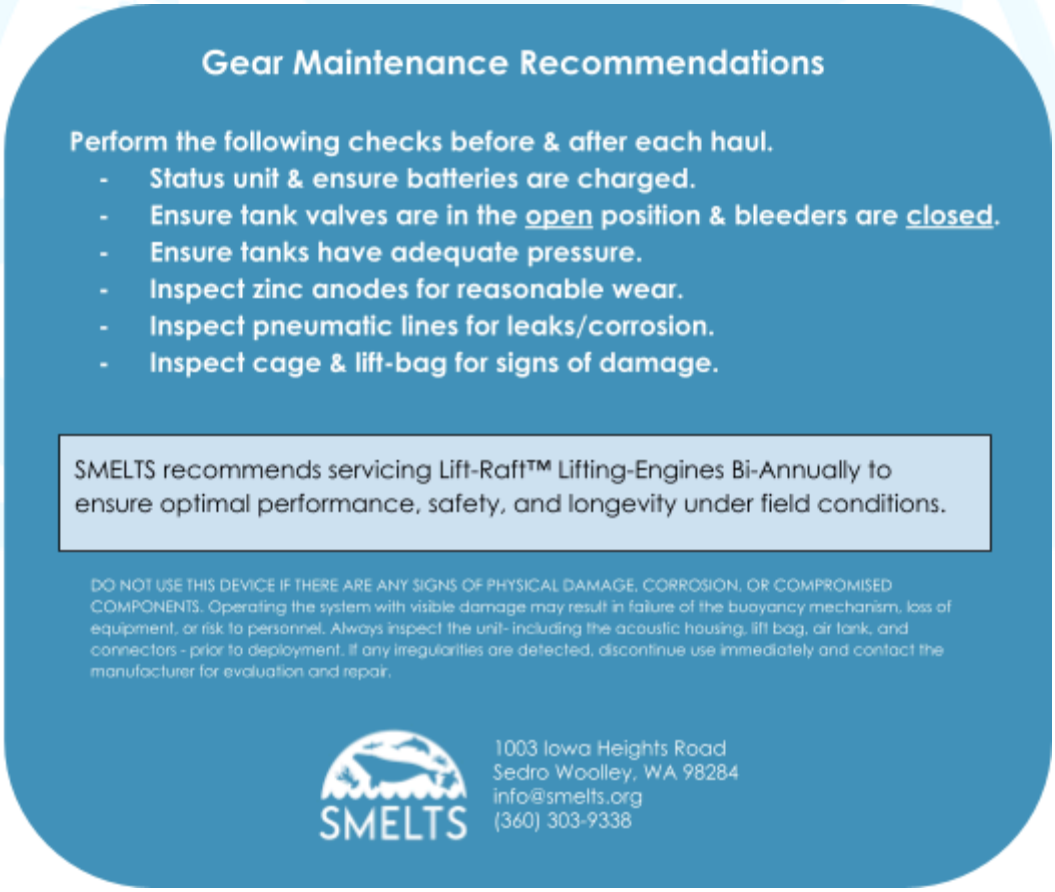


Figure 4: HDPE Core with tanks, acoustic module, and air lines, assembled (left) and separated in service position, allowing easy access to tanks & air lines (right)

The steel cage of a SMELTS Lift-Raft™ is composed of 10.5 Gauge Aquamesh, which is a PVC coated extruded wire mesh commonly used in the fishing industry. This material is highly durable with corrosion resistant properties, making it optimal for subsea applications. The steel cage is double-walled in impact prone locations with edges wrapped in abrasion-resistant line.

SMELTS Lift-Rafts™ are designed for long deployment periods, with components being exposed to the harshest ocean conditions. SMELTS has designed each model of Lift-Raft™ to be fully corrosion resistant through the use of zinc anodes & plastic materials. Components such as the wings, acoustic module, and cage are either composed entirely of plastic or have a strong plastic coating, making them highly corrosion resistant. Any metal components, such as the tank, valve, and air lines & fittings are electrically bonded to a sacrificial zinc anode, which will prevent the corrosion of the more noble metals. It is critical to monitor the condition of the anode to ensure the galvanic couple remains functional.

SMELTS recommends maintaining gear to ensure proper function & increase useful lifetime. The table below contains some critical maintenance items to keep in mind when servicing gear.



Appendix

Figure 5: 500 lb lift bag visible from deck of commercial fishing vessel

Figure 6: Left to Right - 80lb, 250lb, and 500 lb lift bag

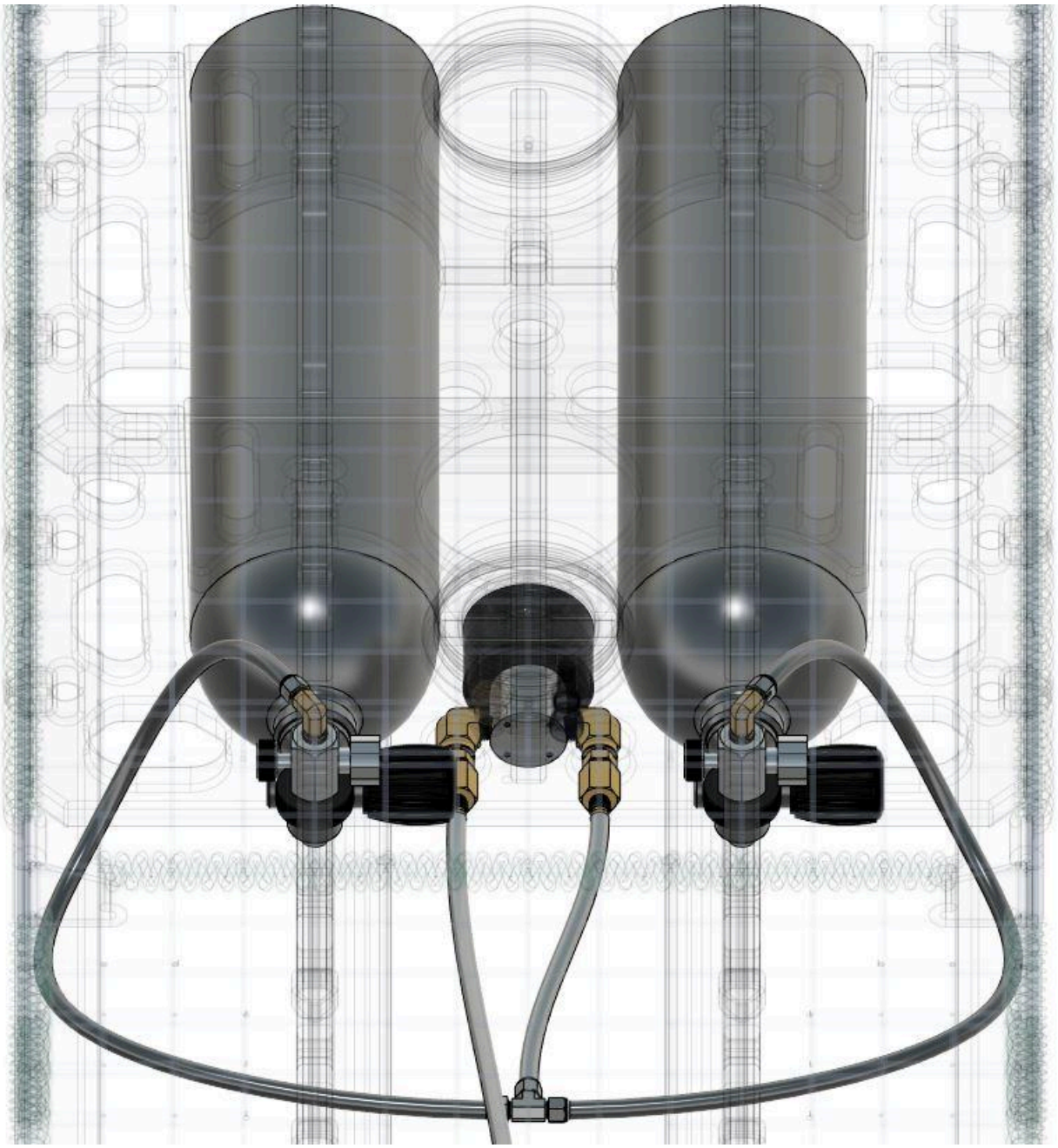


Figure 7: Diagram of lift-bag system, showing tanks, valve, and air lines for a LR-60 model.