

February 11, 2022

Mr. Charlton Bonham, Director  
California Department of Fish and Wildlife  
P.O. Box 944209, Sacramento, CA 94244-2090  
Submitted via email to [WhaleSafeFisheries@wildlife.ca.gov](mailto:WhaleSafeFisheries@wildlife.ca.gov)

**RE: Request for Alternative Gear Authorization for Use in the Commercial Dungeness Crab Fishery**

Dear Director Bonham:

We are enthusiastic to submit an alternative gear application requesting CDFW authorize the use of a timed-release pop-up (i.e., “ropeless”) gear system under the Risk Assessment and Mitigation Program regulations for use in fishing zone closures during the late part of the commercial Dungeness crab season beginning April 1, 2022. The goal of this application is to provide opportunities for fishermen to continue fishing during periods of elevated entanglement risk, extending their fishing season to provide fresh crab to Californians, and economic opportunities for fishermen to support their families and communities. Additional benefits of authorization include advancing the use and management of pop-up gear and identifying topics for future research, development, and testing.

Recent regulations to prevent whale and sea turtle entanglements have resulted in time-area closures that have shortened the commercial Dungeness crab fishing season. While this has reduced entanglements, it has impacted fishery participants that rely on a longer fishing season, particularly during the spring and early summer months (April-July). As a result of significant investment and collaboration across fishermen, gear manufacturers, and conservation organizations in response to the new opportunity for alternative gear in the RAMP regulations, we have assembled a complete application package demonstrating that the proposed system meets all the requirements for alternative gear under the RAMP. Under the RAMP regulations, CDFW shall approve any system that meets the specified criteria.

The gear, Sub Sea Sonics TR4RT Ropeless Trap Timer, is a precise timed-release pop-up system using a digital timer. All lines and buoys are fastened in a coil to the top of a traditional fishing trap and are released at a preset time. We propose a maximum line length of 250 ft. in the authorization to prevent the use of the gear at depths deeper than at-sea trials to date.

- **Detectability:** All deployed gear is detectable by enforcement and other fishers when within ¼ mile of the gear using a free, accessible virtual gear marking app.
- **Reliability:** In 130 at-sea trials under normal fishing conditions in Dungeness crab grounds, the gear has been shown to reliably surface on time with gear loss rates less than 10%.
- **Ability to identify:** The virtual gear marking app allows CDFW to identify the permit holder of the gear when submerged.
- **Benefit:** The gear reduces the risk of entanglement by at least 90%, as there will be no vertical lines in the water column when the gear is deployed, and fishers retrieve the gear within hours of the gear surfacing.
- **Enforceability:** Enforcement can find, retrieve, and redeploy gear using the virtual gear marking app, which indicates the precise location and time the gear is set to surface.

We conducted 130 at-sea trials of the Sub Sea Sonics TR4RT Ropeless Trap Timer system from September to December 2021 indicated the gear surfaced reliably on over 95% of the trials, and reliability continues to improve. During these trials, we tested a virtual gear marking app that enables detectability of all deployed gear, allows enforcement to identify the permit holder associated with any deployed gear, and allows enforcement to retrieve and redeploy gear by indicating the precise time the gear will surface. The app is accessible on iOS, Android, and internet platforms, allowing required access to the data by gear operators, other fishers, and CDFW. A solar logger from Pelagic Data Systems will operate at all times recording vessel location, course, and speed while providing full access to CDFW to meet RAMP Electronic Monitoring requirements and ensure that no gear is being deployed without marking the gear in the virtual gear marking app.

Together, our proposed system provides safeguards against gear loss, gear conflict, and illegal use of gear while providing a thoughtful, incremental approach to authorizing pop-up gear in California. The virtual gear application is simple, free, and can be used with different pop-up systems as an interim step as more complex interoperable applications are developed. Relative to acoustic, on-demand ropeless systems, the timed-release approach has a lower cost, easier operability, absence of acoustic transmissions, and thus overall, much easier to implement and manage. Specifically, the use of timed-release pop-up gear enables the gear to be enforceable without the need for new equipment on enforcement vessels. These advantages combined with the ability for ongoing regulatory monitoring of the system effectiveness in risk reduction provide a practical pathway to the introduction of ropeless gear to the Dungeness crab fishery.

This request for gear authorization is a building block that will pay dividends for future efforts to develop alternative gears under the RAMP that will ultimately increase fishing opportunities for fixed gear fishermen while making our oceans safer for whales and sea turtles. This authorization will only allow fishing after April 1 in areas closed to prevent entanglements with a limited number of fishers and available gear. While Experimental Fishing Permits will be helpful in the future to explore use of the gear beyond what we are proposing in this gear authorization, we believe there is enough data now with a robust management and enforcement plan to authorize this gear system for use this spring as proposed.

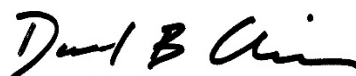
We appreciate the participation of the CDFW Marine Region and Law Enforcement Division staff in early demonstration trials of the gear at sea. They provided thoughtful guidance, collaboration, and feedback which we have taken to heart and incorporated into the proposal.

Please feel free to contact us with any questions, and we are amenable to discuss and resolve any additional conditions or requirements necessary for Department authorization in addition to the safeguards in this proposal.

Sincerely,



Geoffrey Shester, Ph.D.  
Oceana



Bart Chadwick, Ph.D.  
Sub Sea Sonics

## Request for Alternative Gear Authorization

1. Name, address, and contact information of requestor; and, if applicable, name, address, and contact information of Alternative Gear manufacturer.

Requestor:

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Request co-authored by Kacy Cooper, Oceana Research Intern

Alternative Gear Manufacturer:

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Sub Sea Sonics  
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## 2. Detailed description of each component of the Alternative Gear and how it operates.

This request for alternative gear authorization is for the Sub Sea Sonics TR4RT Ropeless Trap Timer system to be used with a virtual gear marking application “Trap Timer” and a Pelagic Data System solar logger. Descriptions of the gear, its subsystems and operational methods are provided below.

### **Sub Sea Sonics TR4RT Ropeless Trap Timer**

The Sub Sea Sonics TR4RT Ropeless Trap Timer was developed specifically for application to low-cost ropeless trap fishing. The design of the system focused on addressing key inputs from the Dungeness crab fishing communities on the US west coast to provide a system that:

- Minimizes/eliminates exposure of whales and sea turtles to entanglement hazards in the water column;
- Has the potential to be capitalized and operated at costs that will not impose burden on fishers;
- Is simple enough to be easily integrated into the existing fishing process without undue impact to the time and effort required to deploy and retrieve the fishing gear;
- Is easily stowed within the footprint of the existing trap and allows stacking of traps;

- Is reliable and redundant to the degree that the amount of equipment loss is expected to be either the same or less when using the ropeless system compared to the traditional system;
- Provides comparable visibility on the surface to the traditional system when retrieving gear, and;
- Integrates a means to determine the location and identify the gear by fishers and enforcement agencies in the absence of surface buoys.

The system integrates three main components including the TR4RT release unit, the line handling system, and the gear marking capability. The concept of operation is that the ropeless trap is deployed including the trap, the timed-release with line and float (Figure 1). The timed-release is preprogrammed so that the buoy will pop up just before the next visit, thus minimizing exposure and risk for entanglement of nearby whales. At the time of deployment, the real-time geolocation system is used to mark the location of the trap and transmit that location to a database that houses all of the regional trap locations and other meta-data. The geolocation system is also used to display the locations of other nearby traps so that interference or gear conflicts among trap locations can be avoided. For turnaround/retrieval, the float is at the surface when the fisher arrives. The trap is then recovered using normal handling gear. The TR4RT is then re-set with the recoiled rope and buoys and the trap is re-deployed following the sequence described above. Details of the specific sub-systems are provided below.

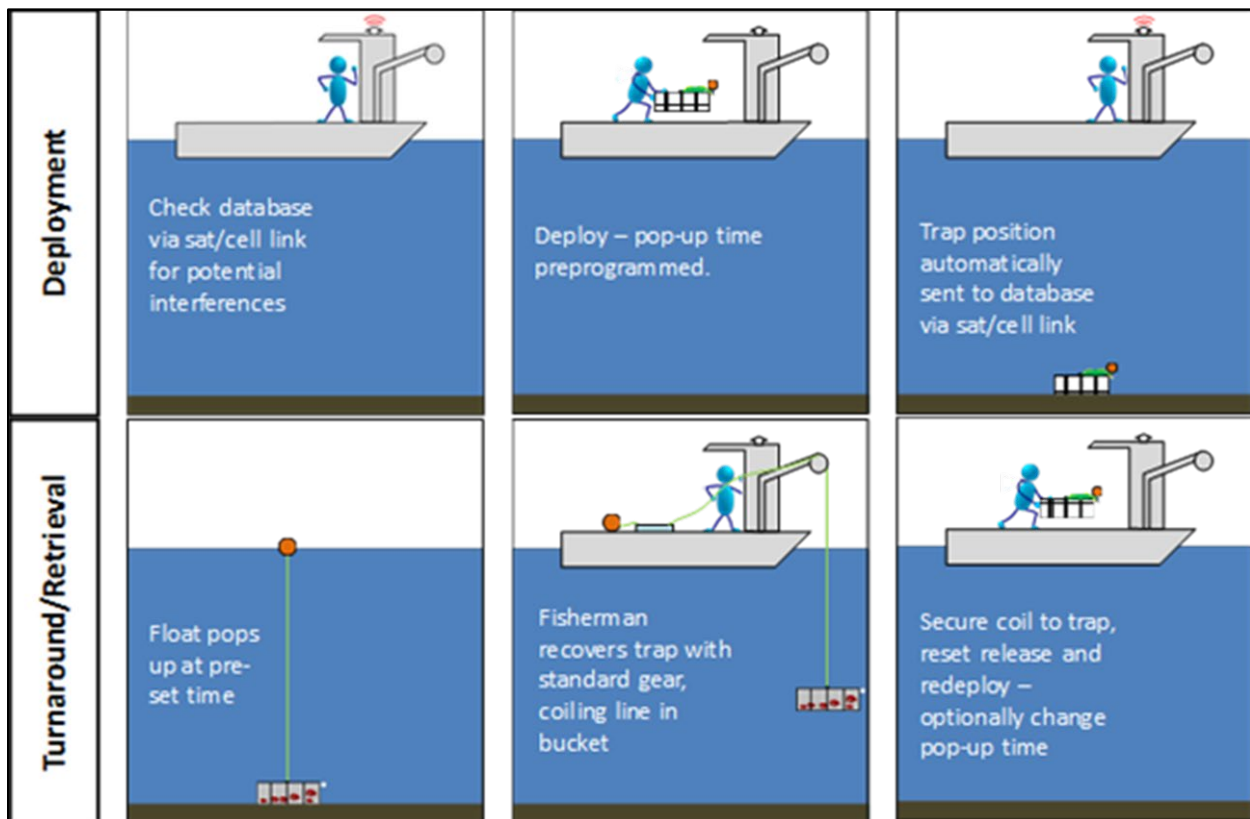


Figure 1. Concept of operations for the TR4RT Trap Timer ropeless fishing system.

## Release Unit

The TR4RT release unit consists of an underwater housing, a rotating release and programming cam, and a release line retainer (Figure 2). The system works on the principle 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 to activate the release. This releases a coil of line and float that are secured to the top of the trap; the float comes to the surface; and the equipment can then be retrieved. The system can also be disarmed using a cam rotation sequence. A small LCD screen on the unit provides user feedback on the command sequence and time setting. Figure 3 shows the typical command sequences that are used to program, arm, and disarm the system.

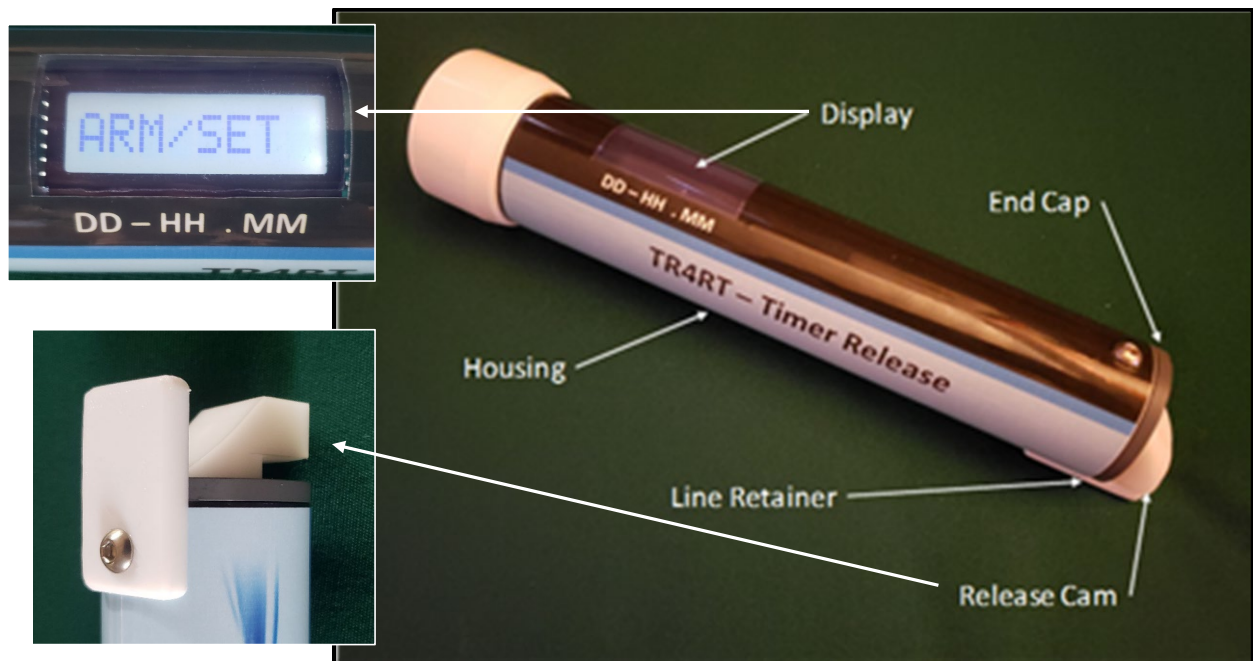


Figure 2. The TR4RT ropeless release unit.

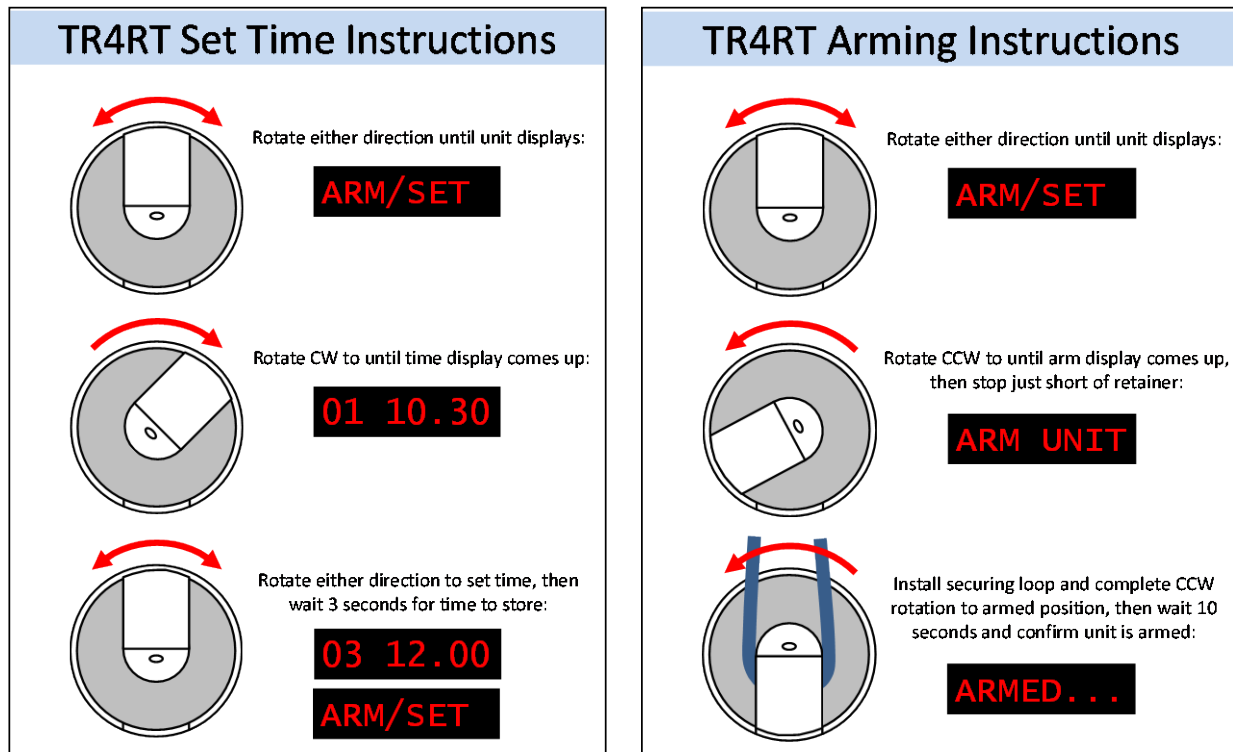


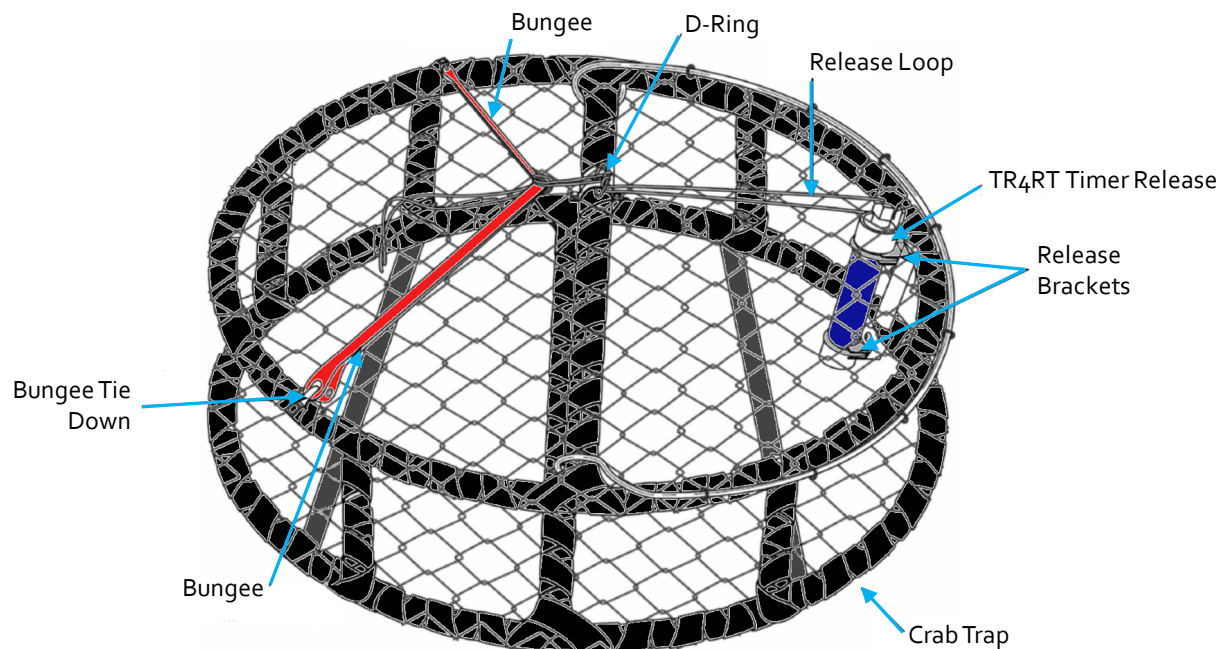
Figure 3. Typical command sequences for the TR4RT release unit.

For simplicity, once the TUR is set in the unit, the system can be subsequently armed over and over if the same time setting is desired without having to reprogram the time for each deployment. Cam rotation is generally done using a small screwdriver to provide leverage. No other tools, deck units, or devices are needed for operating the system.

### Line Handling

The line handling for the system was developed based on input from West Coast lobster and crab fishers. The approach focuses on providing a reliable retrieval system while utilizing existing gear and handling systems as much as possible. The line used is the same type of line that is currently in use on the traps. Traditional foam buoys generally need to be replaced with hard floats for operations in greater than 100 feet of water depth. Various options for hard floats are available and have been tested. The preferred floats based on the testing are Polyform A-0 8" X 11.5" floats (main and trailer). These floats have proved to be very rugged, safe to handle, and effective for working at depth. Compared to hard floats they have the advantages of being much safer and also having lower buoyancy when the trap is on the bottom (thus less tendency for the traps to walk) and more buoyancy at the surface to resist current and wave drag. The line coil and floats are secured to the top of the trap using a three-point tie down system that is formed using a bungee cord and the release line loop that goes to the release unit. There is a D-ring mounted at the center of the top of the trap to act as a guide for the release line (Figure 4). The release itself is generally secured to a vertical member of the trap using pipe clamps. As a backup, a cotton line is secured between the bungee and the release line so that if the release fails, the line and float will still release when the cotton degrades.





*Figure 4. Line handling system for the TR4RT release installed on a Dungeness crab trap.*

In operation, the line is coiled (either by hand or with a coiler) into a tub with the floats set to the side. The tub is then inverted, and the coiled line is placed on the top of the trap. The release unit is programmed, and the cam is rotated to a position close to the closed position but with sufficient gap for the release loop to be installed. The release loop is then fed through loops at the base of each float (main and trailer), then fed thru the D-ring, pulled in tension such that the bungee secured over the line coil, and then secured onto the release cam. The release cam is then rotated to its final armed position. Figure 5 shows the typical sequence.

During setup for the testing, the Department expressed concern that placing the line coil on the top of the trap has the potential to impede escape of crabs through the required escape rings and the “rotten cotton” biodegradable cords. To address this, the rotten cotton sections are installed on the sides of the trap and the sections on the top of the trap are replaced with stainless steel wire. In addition, escape rings are installed on the side and are not impeded. Escape rings allow undersized crabs to exit the trap during fishing operations or if a trap is lost. Biodegradable “rotten cotton” allows larger crabs to escape if trap is lost, as it typically degrades in sea water within weeks.



*Figure 5: Configuration including degradable “rotten cotton” and steel escape ring installed on the side of the trap.*

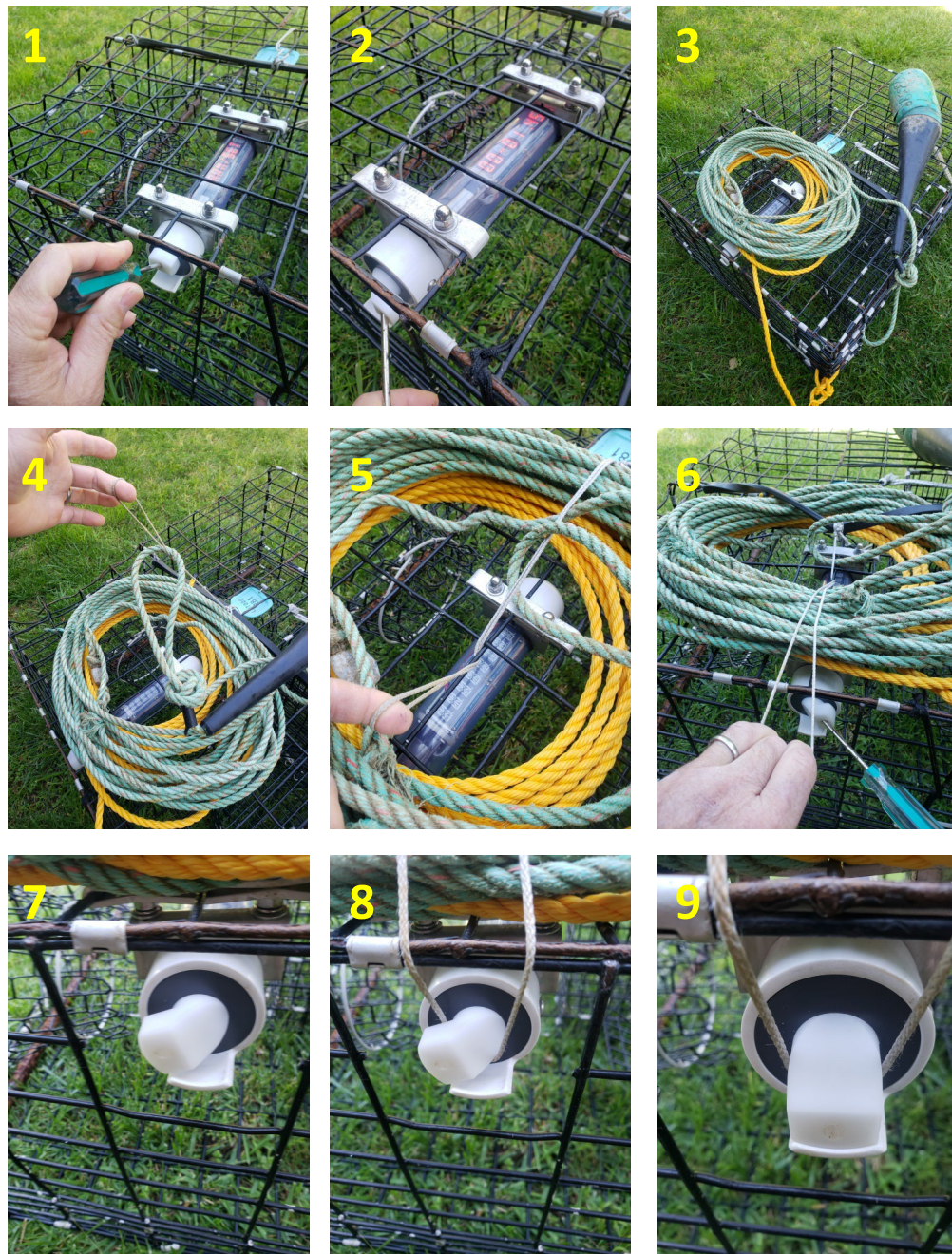
All trials to date have been at depths less than 200 feet, and the reliability results are applicable to this depth range. Therefore, we propose to limit the total amount of line to 250 feet, which will limit the depths for which the gear can be deployed to those depths where reliability has been demonstrated, while allowing some additional slack in the line consistent with Best Practices Guide.

“Rotten cotton” cord will also be used as a backup measure to release the fishing line and buoy coil in the event that the release mechanism fails. The biodegradable cord attaches the release line to the bungee that holds the rope coil in place (see Figure 6)



*Figure 6: Rotten cotton connecting the release line to the bungee allows provides a backup release mechanism for the fishing line and floats if the primary release mechanism fails.*





*Figure 7. Typical rigging sequence for the TR4RT line handling system.*

### **Virtual Gear Marking**

In order to enable the use of ropeless fishing traps, there is a concurrent requirement for maintaining the ability to regulate and enforce the use of traps while preventing gear conflicts. The TR4RT system is supported by a tablet/cell-based app, a website, and a database to provide this capability. The app (Trap Timer) has versions that can be used onboard fishing boats, enforcement vessels and public vessels. The website is setup primarily for regulatory use. Access to the app is provided through an onboarding

website that requires administrative approval by Sub Sea Sonics. Administrative approval includes verification of the user identity and role (fisher, enforcement, public). Once the user has been verified, the user is established in the database, and a private link to download the app from the app store is provided. For regulatory personnel, this process also provides access to the website. The app is free and available to the public.

### Trap Timer App

The fisher app is setup and operated on a cell phone or tablet (Android or iOS) with the following features:

**Map:** A map display showing the location of the deployed traps overlaid on a nautical chart (Figure 8). This is the default screen. A symbol indicates the location of the boat on the screen. The deployed traps are color coded to indicate their popup status including green (up), yellow (down but coming up soon) and red (down). The map view displays all of the fisher’s traps that are within the view window, along with other fishers’ traps (as a different symbol) that are within ¼ nautical mile.

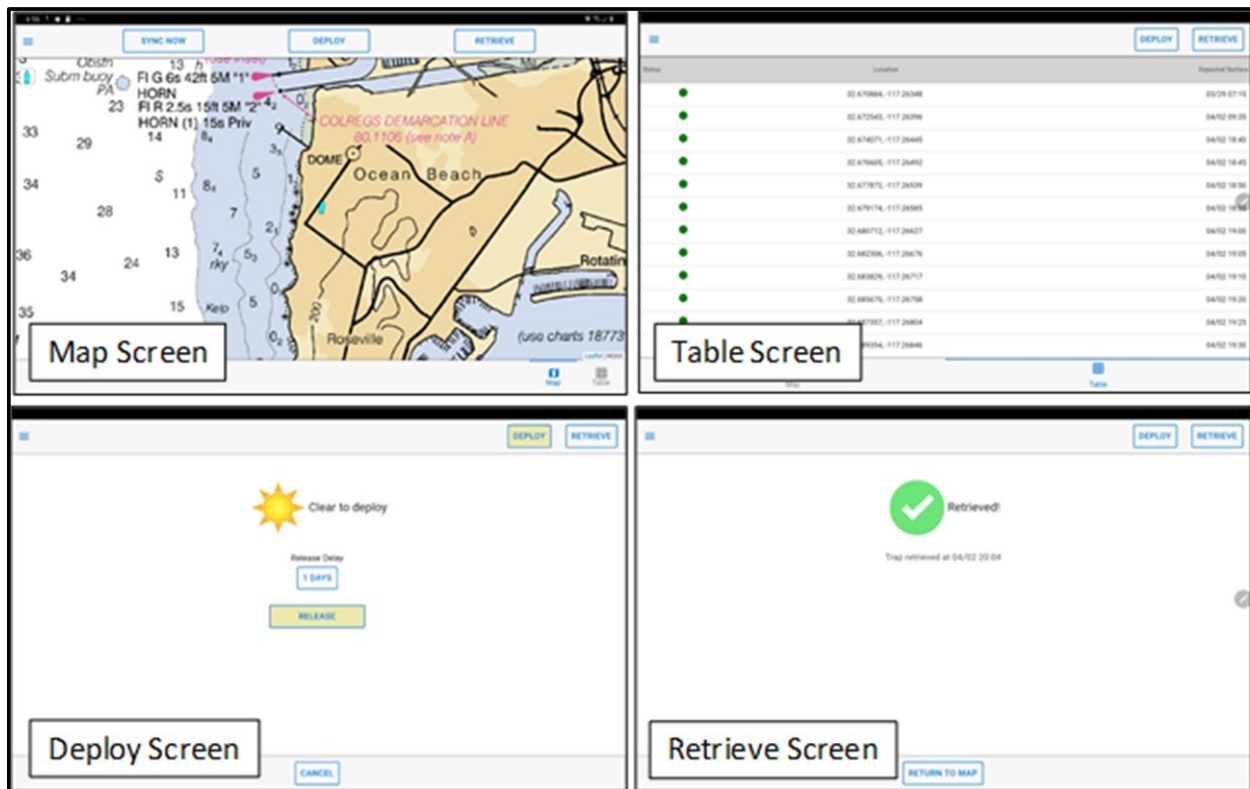


Figure 8. App screens for the Trap Timer app.

**Table:** A table display that shows the latitude and longitude of the fisher’s deployed traps and the expected popup time (Figure 8).

**Deploy:** A button labeled “Deploy” that shows in both the Map and Table screens and activates a popup window that prompts the fisher for the TR4RT timer setting and warns the fisher if there is another fisher’s trap within a pre-specified radius of the location (Figure 8). If the time setting is selected, a



calculator/converter is available that automatically converts the TR4RT release delay time into a calendar date and time. There is also a “Release” button that executes the deployment of the trap, recording the position and then returning to either the Map or Table screen.

**Retrieve:** A button labeled “Retrieve” that shows in both the Map and Table screens and activates a popup window that indicates that the trap has been retrieved and the retrieval time. By default, the closest trap to the boat is selected. Alternatively, the user can click on a specific trap in either the map or table mode and the option to retrieve it will come up in a popup window (Figure 9). The retrieve action also allows the fisher to mark the trap as lost or left in the event that the trap cannot be retrieved.

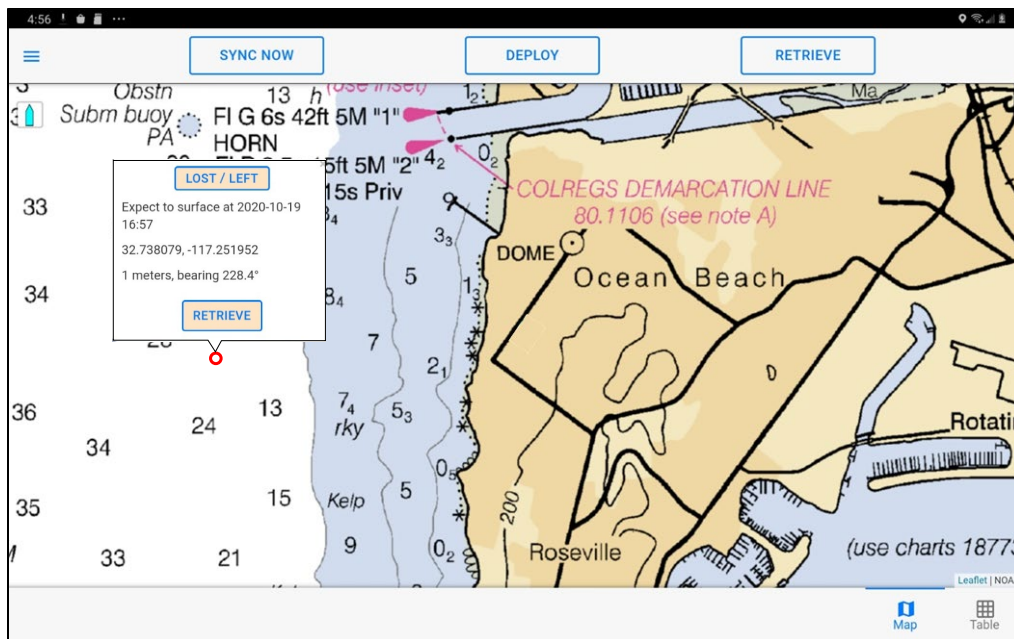


Figure 9. Popup window on the retrieve action.

**Synchronize:** There is a Sync button on the main screen that synchronizes the app with the shoreside database. Synchronization to the database can occur when the user is within Wi-Fi or cellular range. The system has settings options to select manual, Wi-Fi only, or Wi-Fi and cellular. When this function is executed, the system sends all user data since the last successful sync and retrieves others’ data (interference data) since last successful sync for the area covered by map.

**Settings:** An item from the upper left menu that allows the fisher to specify a name, password, boat name, interference radius, synchronization option, and default TR4RT release time setting.

The enforcement version of the app is the same as the fisher version except that traps for all fishers are displayed that are within ¼ nautical mile of the enforcement vessel. From within the map or table view, they can access information about the trap including location, deployment time, popup time, range, bearing and associated permit number.

The public version of the app is the same as the enforcement version except that they cannot access any information about the fisher, only have visibility of any traps that are within ¼ nautical mile.

### ***Ropeless Regulatory Web Portal***

The regulatory website (Ropeless Regulatory Portal) provides CDFW Law Enforcement and Marine Region Staff access to all data associated with users that are (or have been) actively fishing with ropeless gear. The website includes three main panels including a map view, a fisher table, and a data table (Figure 10). These views can all be filtered based on the data parameters of the database. In general, the data are first filtered in the fisher window by fishery, date, and then fishers within that fishery can be selected based on name, vessel name, or permit number. The filtered data are then displayed in the map view and the data view. The data view also provides multiple tabs to view general information, detailed information, and summary statistics associated with the filtered data.

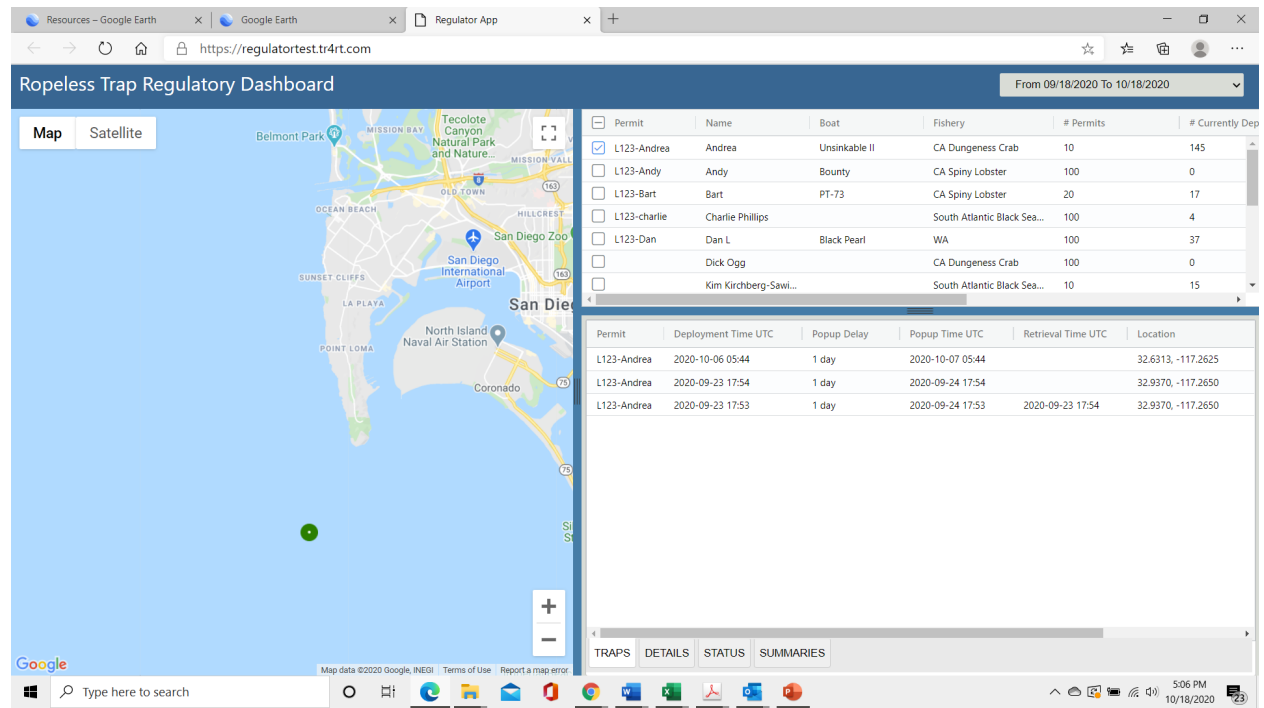


Figure 10. Screen shot from the Ropeless Regulatory Web Portal.

### ***Electronic Monitoring***

All vessels using the Trap Timer system will have an operational Pelagic Data Systems solar vessel location data logger electronic monitoring systems affixed to the vessel that will record location at all times. These systems track and record vessel location using GPS coordinates at a frequency of less than five seconds during fishing operations. This provides much higher resolution than the RAMP criteria of a frequency of no less than once a minute during fishing operations. Solar logger data is transmitted in near-real time to Pelagic Data Systems through a cellular or Wi-Fi connection. Fishing participants will grant CDFW with full real-time permissions and access to all electronic monitoring data collected by Pelagic Data Systems.

### 3. Alternative Gear research trial results

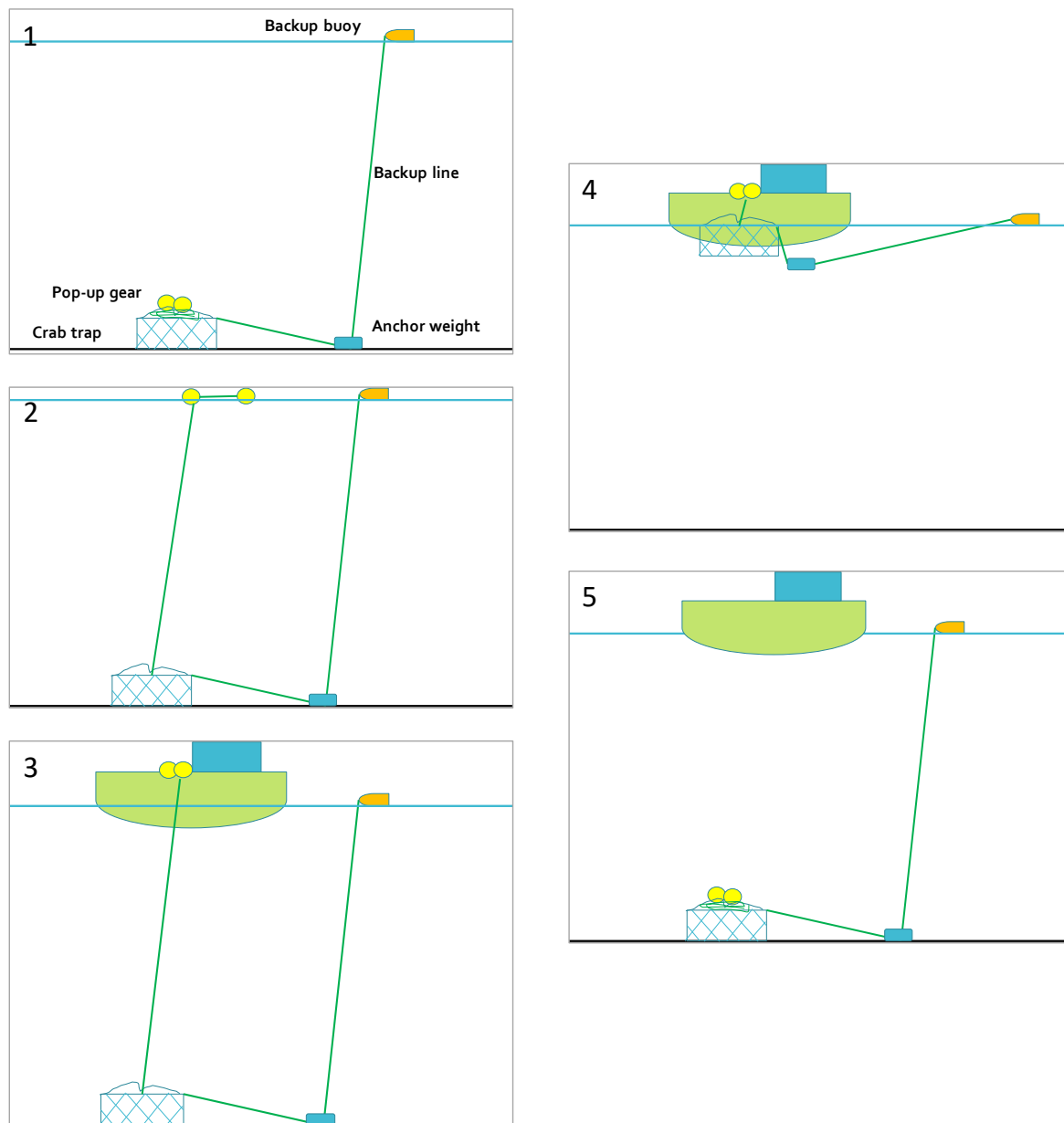
Testing for the Trap Timer system with Dungeness crab traps was conducted out of Santa Cruz Harbor. We consulted the CDFW Marine Region and Law Enforcement Division staff during all phases of testing to assure that gear was properly marked, backup buoys were in place, and traps were properly configured (Figure 11). We conducted an initial phase of testing from September through October of 2021 in the commercial rock crab fishery using Dungeness crab traps. A second phase of testing was conducted in December 2021 in the commercial Dungeness crab fishery. For the trials, five to ten traps were fitted with TR4RT release units and line handling systems. During each deployment, the gear was marked on the surface with a backup line and float and was also marked virtually using the Trap Timer app. Data collected for each trial included:

- Environmental data for the set and retrieval of the gear: current (knots), wind speed (knots) and direction, wave height (ft), air temperature (°F), depth (ft), and bottom substrate
- Coordinates for location of gear deployment
- Deployment time, release delay, pop-up time, and retrieval time
- Success with descriptions of any failures

While the RAMP regulations do not specify a minimum number of trials to evaluate the 90% retrieval success rate (or a gear loss rate of no more than 10%), we relied on informal guidance from CDFW that 100 trials in actual fishing conditions and in fishing grounds in California (i.e., a variety of fishing conditions, locations, depths, and currents) would represent a reasonable sample size to evaluate reliability.

Results for the trials are provided below in relation to the specified requirements in the RAMP.





*Figure 11. Gear handling procedure used to accommodate the backup buoy during the testing phase. Steps are as follows: 1) initial gear setup after deployment with pop-up gear stowed on top of trap, and back-up buoy line separated from trap and pop-up gear using anchor weight; 2) pop-up gear released to surface separated from back-up line; 3) retrieval of pop-up buoys and line by fishing vessel; 4) retrieval of trap using pop-up line by vessel without use of back-up line; 5) redeployment of trap with pop-up gear stowed on top of trap.*

### Overview of Trial Results

We conducted a total of 130 trials during the two testing phases. Of these, 124 were successful for an overall success rate of 95%. Successful trails required that a complete deployment and recovery cycle of the ropeless system be achieved without any intervention using the backup float, grappling or any other

means to assist in the gear recovery. All trials were conducted in Zone 4 which extends along the California coast from latitude 36° 0'N to 37° 11'N. Testing occurred off of Santa Cruz, California in Monterey Bay as shown in Figure 12.



*Figure 12. Map of Monterey Bay, California (Zone 4) showing the area off Santa Cruz (red box) where we conducted reliability trials.*

### **Gear loss rates**

No gear was lost during the trials due to the back-up buoys. Therefore, we evaluate gear loss rates by defining success in the trials as a full cycle of deployment and retrieval where gear is retrieved solely with the pop-up line and buoy. A failure is when the pop-up line and buoy do not surface after the release delay and the gear is retrieved using the back-up buoy. During the trials, the gear was found to be highly reliable with a success rate of 95%. Of the 6 failures that occurred (Figure 13), two were related to a loose battery in one of the units that was subsequently corrected (mechanical issue). Line tangles were the cause of three failures and this issue was also corrected by implementing a more consistent line coiling and securing procedure. The cause of one other failure could not be determined. In general, the system was found to be highly reliable and issues that were identified during the trials have been addressed through corrective measures.

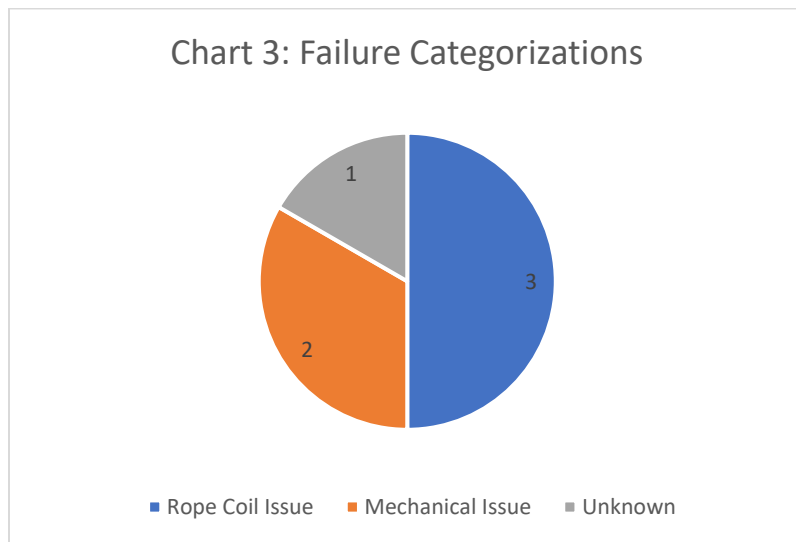


Figure 13. Description of Failure Categorizations.

### Release Delays

A variety of release delays were tested during the trials, from 30 minutes to 42 hours (Figure 14). Success rates did not appear to vary based on release delay or depths fished.

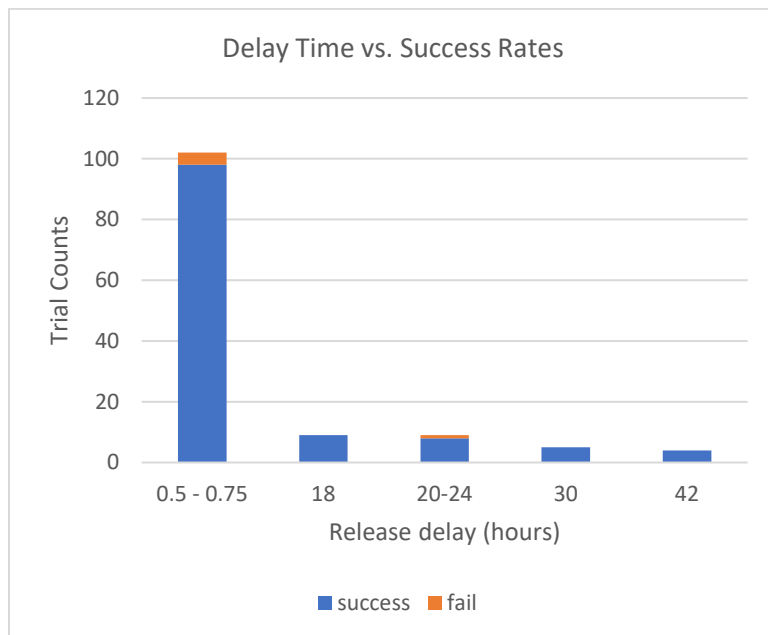


Figure 14. Delay time versus success rates.

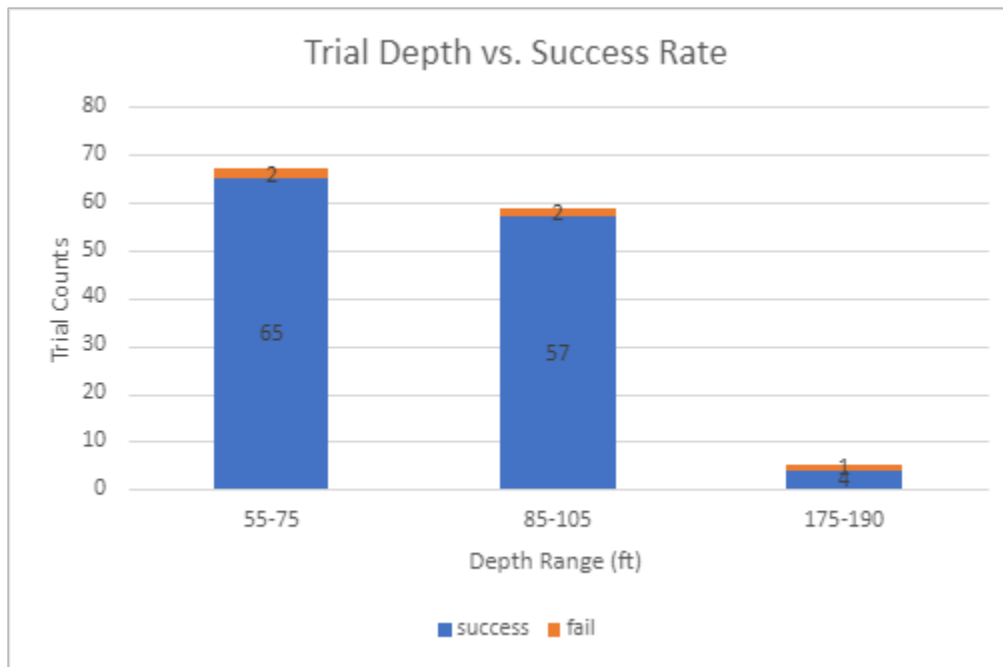


Figure 15. Depth distribution for the reliability trials.

#### Environmental conditions during trials

The RAMP does not provide specific guidance on the requirement for ocean conditions during the trials but requires that the conditions during the trials be reported in the application. Environmental conditions during the trials are summarized below.

Trials were conducted in a variety of conditions (Figures 15 & 16). Depths during the trials ranged from 55 – 190 feet, with most of the trials conducted between 55 – 75 ft. Wind speeds during the trials ranged from 0 to 15 knots, with most trials conducted with a wind speed of 5 knots. Wave heights ranged from 1 to 4 ft, with most trials conducted with wave heights of 2 ft. Currents ranged from 1 to 4 knots, with most trials conducted with a current of 1 knot. Air temperatures ranged from 45 to 59 degrees F and the visibility was greater than six miles to 10 miles. While we do not have a method to definitively identify bottom substrate type, we categorized the bottom substrate as sand or mixed sand with rock for all trials. We did not identify a relationship between success rate and the environmental variables.

Overall, the gear surfaced when expected with a 95% success rate (124 successes of 130 trials). Over time, retrieval and redeployment efficiency improved significantly. The Trap Timer virtual gear marking app worked consistently and enabled successful gear tracking both on the fishing vessel and remotely using the website.

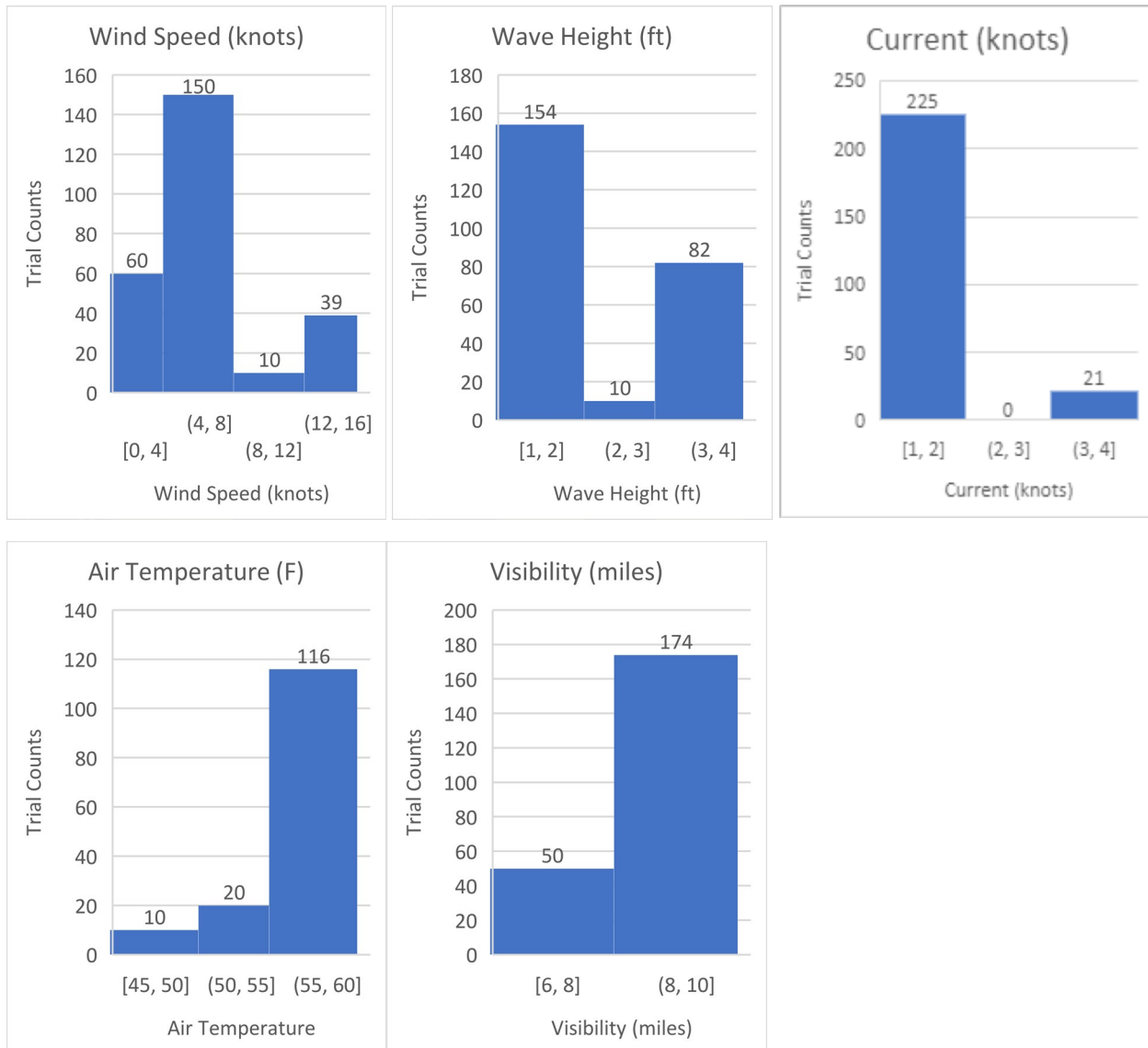


Figure 16. Environmental conditions recorded during the set and retrieval of each trial. Includes set and retrieve data points. Note some environmental data points were not collected during some sets as the data collector did not record those variables, so the total data points may differ from the number of trials.

Table 1: Ranges of environmental conditions during deployment and retrieval on at-sea trials.

Environmental Condition	Minimum	Maximum
Depth (ft)	56	190
Wind speed (knots)	0	15
Wave Height (ft)	1	4
Current (knots)	1	4
Air Temperature (f)	45	59
Visibility (miles)	6	10+ (unlimited)



#### 4. Documentation of how the Alternative Gear performs to meet the criteria outlined in the RAMP

The RAMP regulations state that the Department shall authorize Alternative Gear that meets specified criteria. The Ropeless Trap Timer system as proposed provides a full range of capabilities to satisfy the RAMP requirements for alternative gear. Details are provided below for each of the criteria.

##### **Detectability**

RAMP Requirements: “detectability by the department, fishermen and public, including description how location of Alternative Gear is available visually or virtually, equipment specifications including costs, and any required specialized equipment or training to deploy, operate, or detect the gear. If “ropeless,” the gear must be used with software that enables department law enforcement and other fishing vessels within ¼ mile of the gear to identify the location of the gear at all times when it is deployed.”

The Trap Timer app provides detectability of the gear for fishers, enforcement, and public users. When the gear is underwater, the app shows the location of the gear on a tablet or cell phone that synchronizes with a shoreside database. When the gear is at the surface, both the app and floats are used to provide visibility. The equipment required to detect the gear include a tablet or cell phone with cellular and Wi-Fi capability (typical cost \$100-300) with the Trap Timer app (currently free but may require a subscription or support fee in the future) installed. As described previously, the app provides virtual visibility to the fisher of all their gear and provides ¼ nautical mile visibility to enforcement and public users. Training in the use of the app is available from Sub Sea Sonics at no charge. The app is available for Android and iOS via the respective app stores once the user has signed up via the onboarding website.

##### **Retrievability**

RAMP Requirements: “means of retrieval, including description of release mechanism, equipment and any specialized training needed to deploy and/or retrieve Alternative Gear, description of safeguards and procedures to minimize gear loss and ghost gear, with gear loss rates of no more than 10%. Gear must include a back-up release capability so it will surface in the event of an equipment failure and must include a gear recovery plan if the gear does not rise to the surface.”

The Ropeless Trap Timer system uses a timer and does not require additional equipment to trigger the release. The gear is retrieved using standard hauling equipment along with a coiling tub and a coiler (or alternatively coil by hand). No other specialized equipment is needed. Sub Sea Sonics can provide training on the use of the release and the setup of the line handling system for fishers upon request. See Section 2 above for a full description of how to operate the gear.

As shown in the 130 reliability trials described above, the ropeless components of the gear have demonstrated a 95% success rate when used with a backup buoy, which equates to a gear loss rate of 5%. This meets the RAMP criteria of gear loss rates no more than 10%. We anticipate even greater success as a result of the lessons learned from the few failures that we encountered. First, the cause of mechanical failure has been identified and corrected in all units. Second, changes to rope coiling made after initial rope tangle failures in the initial trials resulted in no rope tangle failures in the second phase

of trials. It is important to the reliability that the rope is coiled cleanly and secured properly in the line handling system to avoid the potential for fouling or tangling. We believe that continued work to improve reliability will achieve loss rates well below the loss rates with traditional gear.

The system utilizes a backup cotton between the bungee and the release loop that will degrade and release the float and line if the release unit fails, thereby allowing the gear to be retrieved.

The Department expressed concern about gear being up and visible at the end of the season. To accommodate this concern, all TR4RT release units will use a firmware setting that only allows for the maximum allowable soak time of 96-hours consistent with the current maximum service interval. Timer settings longer than this would not be available on the system. This will ensure all gear has surfaced at the end of the season prior to lost gear recovery efforts. In addition, the app and website both provide specific information on the expected pop-up time of each trap so that it will be clear if there are traps that are still subsurface at the end of the season.

The gear will be used with a maximum of 250 feet of total line to ensure fishing takes place within depths where reliability has been shown. In addition, a depth restriction of 200 feet can be implemented in conjunction with this gear authorization if that additional safeguard is deemed necessary by CDFW.

### **Ability to Identify**

RAMP Requirements: “means of Alternative Gear identification, including the method or description of the mechanism required for the department to identify Alternative Gear to permit holder both remotely when submerged, and at the surface.”

The TR4RT ropeless system provides the ability for enforcement personnel to identify the alternative gear both when submerged and at the surface. When the gear is submerged, the regulatory version of the Trap Timer App provides enforcement the ability to identify the permit number associated with any trap that is within ¼ nautical mile of the vessel. These traps are visible in the map and table views of the app. Clicking on the trap brings up the required information including position (GPS coordinates), deployment time, popup time, range, bearing and associated permit number. When the gear is at the surface, the app can still be used in the same way, or the gear can be identified based on the traditional float markings. Enforcement can also access the location and permit holder of all deployed gear using the *Ropeless Regulatory Web Portal*.

### **Benefit**

RAMP Requirements: “evidence Alternative Gear reduces risk or severity of entanglement.”

The benefit of the TR4RT system in reducing entanglement risk is based on removal of the vertical line during the time between deployment and gear surfacing. The degree of risk reduction is a function of percentage of time the system is in ropeless mode (i.e., the rope and buoy have not surfaced yet), which is determined by the return time of the fisher relative to the popup time. In general, these times can be very close and risk reduction for entanglement should be on the order of 90% or greater. We propose to service gear as soon as possible after gear surfaces and within a maximum 6 hours of gear surfacing under normal conditions. For a 2-day (54-hour) release delay, this would represent a minimum of 90% reduction in risk. In some instances, vessel breakdown or unanticipated weather events may extend the

time it takes to recover the gear after popup, but these events are expected to be relatively rare. The percent of ropeless time is tracked within the Ropeless Regulatory Web Portal on a fishery-wide basis as well as down to the specific permit holder level, so that monitoring of the effectiveness of the system can be determined and adjustments made to operations if necessary.

Risk Reduction for each ropeless trap is calculated using the following formula:

$$\% \text{ Risk Reduction} = \frac{\text{Deployment Time} - \text{Popup Time}}{\text{Deployment Time} - \text{Retrieval Time}} \times 100$$

### **Enforceability**

RAMP Requirements: “including means by which department law enforcement can find and retrieve the Alternative Gear at sea and costs of any necessary equipment and/or training. Department law enforcement must be able to retrieve and redeploy the gear.” In addition, to assure that fishers are not using the gear in areas or during times that are not allowed or without marking the gear location in the virtual gear marking app, the RAMP requires “all vessels must have an operational electronic monitoring system affixed to their vessel and must be recording location while engaged in any fishing activity for commercial Dungeness crab. Electronic monitoring systems must be capable of tracking and recording vessel location using GPS coordinates at a frequency of no less than once a minute during fishing operations. Electronic monitoring data shall be made available to the department or authorized agent upon request for the duration of the fishing period and 60 days thereafter.”

Enforcement officials will have access to the Trap Timer app and the Ropeless Regulatory Web Portal that provide information on trap locations, associated pop-up times, and permit holders. Enforcement can use the data to determine which pop-up gear they want to check-in on and when. Timed-release gear cannot be accessed until its pre-programmed popup time set at the time of deployment, so this effectively prevents fishers from tampering with the gear. This will allow enforcement to continue to conduct random checks of the gear, while obviating the need for enforcement to use new equipment. We were pleased to have Law Enforcement Division staff observe at sea testing of the gear and their positive feedback on this approach to ensure random gear checks are possible while minimizing Department costs. The costs for the necessary equipment are associated with the tablet used for the app, of which the less expensive versions are currently available in the range of \$100-300, if enforcement does not already possess tablets.

To meet the requirement for vessel tracking and to assure that fishers are not using the gear in areas or during times that are not allowed or without marking the location in the virtual gear marking app, we propose to include the Pelagic Data Systems Solar Loggers on each vessel that is using the ropeless alternative gear. All vessels using the Trap Timer system will have an operational Pelagic Data Systems solar vessel location data logger electronic monitoring systems affixed to the vessel that will record location at all times. This system provides both logged and real-time access to vessel location data at time resolutions (at least once every five seconds) that exceed the minimum requirement of the RAMP (at least one every minute). In addition, this capability directly addresses a concern expressed by the Department that fishers might use the gear without marking it in the gear marking app. The Solar Loggers have already been tested in the fishing fleet, and the hardware, subscriptions and data access systems are all readily available. Solar logger data is transmitted in near-real time to Pelagic Data

Systems through a cellular or Wi-Fi connection. Fishing participants will grant CDFW with full real-time permissions and access to all electronic monitoring data collected by Pelagic Data Systems throughout the duration of the fishing period and 60 days thereafter. Therefore, CDFW will be able to log in from any computer to be able to view all real-time vessel location data through Pelagic Data Systems. We have confirmed this capability with Pelagic Data Systems and their California vendor Johnson Hicks Marine Electronics.

Reporting: Any permit holder using the requested Alternative Gear will submit an annual report summarizing pounds of crab harvested with Alternative Gear, amount and location of gear deployed, and amount and location of lost gear. The report will be submitted within 30 days of the close of the Fishing Season to [Whalesafe fisheries@wildlife.ca.gov](mailto:Whalesafe fisheries@wildlife.ca.gov).

## 5. Description of an Alternative Gear recovery plan in the event retrieval is unsuccessful.

The Alternative Gear recovery plan for the TR4RT Trap Timer system incorporates three key aspects. These include 1) a backup release system on every trap, 2) an accurate gear marking and documentation system for lost gear, and 3) alternate methods to recover gear that does not popup. As described previously, every trap is fitted with a secondary release system consisting of a biodegradable cotton cord tied between the tension bungee and the release loop. In the event that the release malfunctions, this cotton will eventually degrade and release the line and float to the surface. While the timing of this degradation and release is not highly accurate, regular checks on the location (which is documented in the gear marking app for every trap) should provide a straightforward recovery.

In the event that both the release and the backup fail, the alternate recovery method will be by grappling. Given that the gear is accurately marked using the app, and that the lost status is flagged in the database, this will provide a reliable search location for the grappling activity. The vessel should also be fitted with a high-resolution sounder (fish finder), that can be used to identify potential targets in the search area. During search and recovery operations, the app should also be used to update the status of any gear that is recovered. Given the documented reliability of the release system, and these multiple backup recovery methods, it is expected that loss rates should comply with RAMP requirements and not exceed current levels. The Ropeless Regulatory Web Portal can also be used to track statistics of gear loss associated with the Alternative Gear so that any issues or trends can be identified and addressed.


If grappling attempts are unsuccessful, small Remote Operated Vehicles and/or scuba will be used. At depths less than 200 feet, Remotely Operated Vehicles and scuba salvage operations can be used to actively search on the seafloor for the lost gear and attach retrieval ropes using a mooring hook tip. Finally, any lost traps with pop-up gear will be reported to the coordinators of the Trap Gear Recovery Program to partner on recovery efforts.

## 6. Description of gear retrieval system required by department law enforcement to retrieve and deploy gear.

Law enforcement will be able to retrieve gear using traditional methods at the time it surfaces and will deploy gear the same as traditional gear. Law enforcement will be able to access Electronic Monitoring data and Virtual Gear Marking data to identify gear location through an internet connection. To use the Trap Timer app to locate gear while at-sea, law enforcement will need an iOS or Android tablet with the Trap Timer app. If Law Enforcement does not already have tablets, inexpensive tablets are currently available in the range of \$100-300. The Trap Timer app is free. Access to the app is provided through an onboarding website that requires administrative approval by Sub Sea Sonics, and permissions will be granted to Law Enforcement to see the location of all deployed traps. The regulator website “Ropeless Regulatory Portal” is straightforward and should not require formal training. Sub Sea Sonics will provide any needed guidance or training in the use of the website or app to Law Enforcement upon request. Other than the tablet and the Trap Timer app, the retrieval and deployment gear required for department law enforcement is the same as for traditional gear. As described in Section 4, *Enforceability*, Enforcement can arrive at the marked location of the gear before it is scheduled to surface and retrieve the gear using traditional line haulers immediately after the gear surfaces (or thereafter). Enforcement can deploy the gear as traditional gear with the line and buoys released, as the fisher is required to retrieve and redeploy the ropeless system within hours of surfacing. Therefore, deployment by enforcement is the same as deploying a traditional crab trap.

## 7. Signed statement verifying all information provided is accurate.

We hereby verify that all information provided in this application is accurate to the best of our knowledge.



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Geoffrey Shester, Ph.D.



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Bart Chadwick, Ph.D.