

T.B. Werner, J. Partan, and K. Ball
Evaluation of Rope-less Fishing
for Reducing Large Whale
Entanglements



Why rope-less fishing?

“Complete removal of buoy lines is recognized as the most ‘whale safe’ technique for utilization of fixed gear”

NMFS, 2000

“...any lines [*sic*] rising into the water column has [*sic*] the potential to entangle a whale.”

NMFS, 2005

“...the only certain method that we can imagine to eliminate deadly entanglements of right and other large whales is the complete removal of ropes from the water column.”

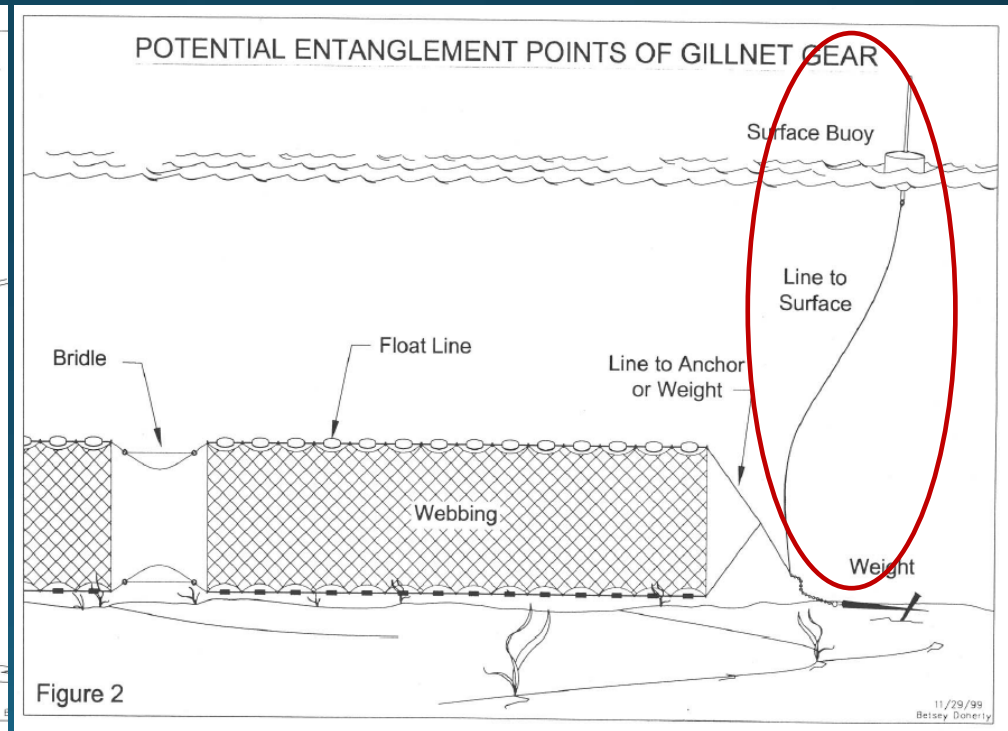
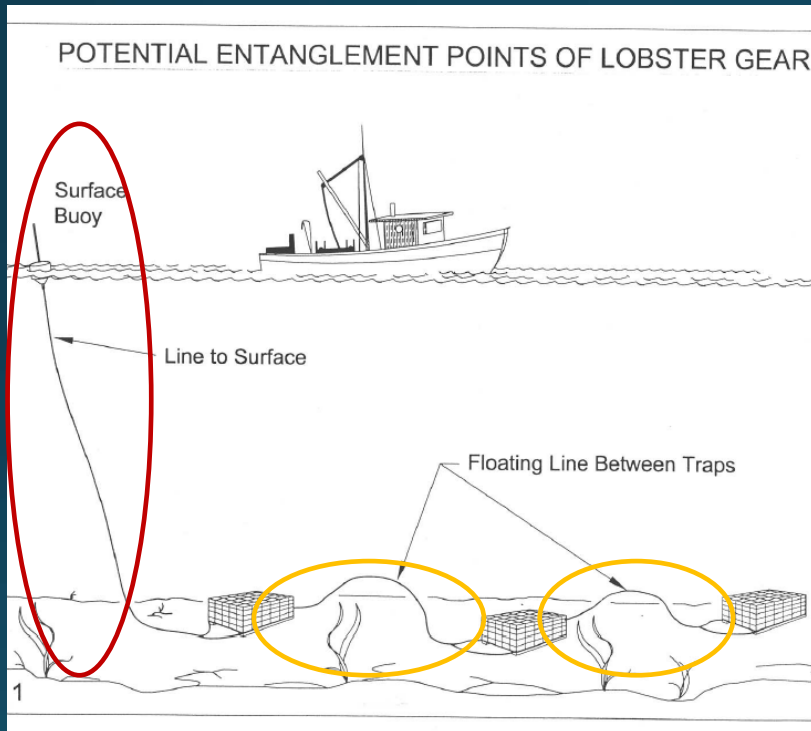
The Large Whale Entanglement Working Group, 2008

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What is Rope-less fishing?

Pot/trap fishing without using ropes *altogether*, or retention of sink net and pot buoy lines at or near the sea-floor except during hauling

Target: Vertical Lines

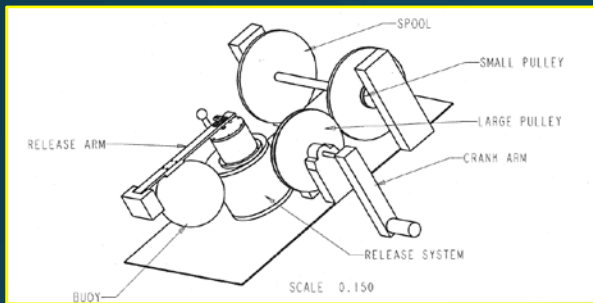


Previous Research

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- DeAlteris, J. 1999. Design, testing and evaluation of an **acoustic release system** for offshore lobster pot buoy lines. NMFS Project No. 40EANF800065, submitted to AI Blot of the NMFS Fisheries Engineering Goup, Kingston, RI, 16pp.
- Hopkins, N. and W. Hoggard. 2006. A pilot study to investigate possible alternatives to reducing Vertical line entanglements by marine mammals. Report by the Harvesting Systems Gear Team of NOAA's Southeast Fisheries Science Center. In: Salvador, G., J. Kenney, and J. Higgins (eds), Large Whale Gear Research Summary, NOAA/Fisheries Northeast Regional Office (NERO), Protected Resources Division (PRD), Gear Research Group, December, 2006. Accessed at <http://www.nero.noaa.gov/whaletrp/plan/gear/2006%20Large%20Whale%20Gear%20Research%20Supplement.pdf> on 4/29/13.
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- Liggins, G., and S. Westley. 2011. "**Acoustic release technology**: Application in lobster fisheries: the New South Wales Experience" (*Powerpoint* presentation). NSW Department of Primary Industry, 24pp.
- Liggins, G. 2013. "At call" release of **submerged head-gear**: Application and benefits of an acoustic release system for the NSW deep-water lobster fishery (*Powerpoint* presentation). NSW Department of Primary Industry. 32 pp.
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Buoy line retention at depth

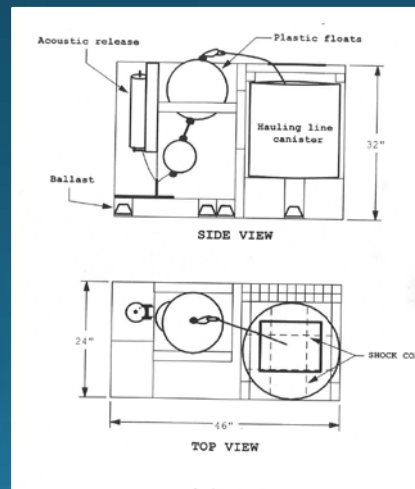
"Baldwin buoyless" (1999)



DeAlteris et al "trap" (1999, 2007)



Australian mesh bag (2007)

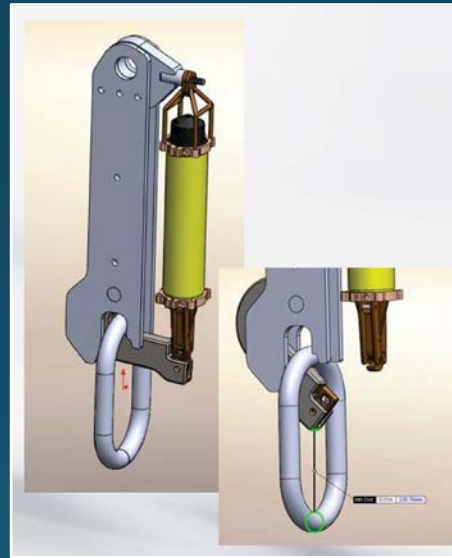


Releasing buoy line mechanically

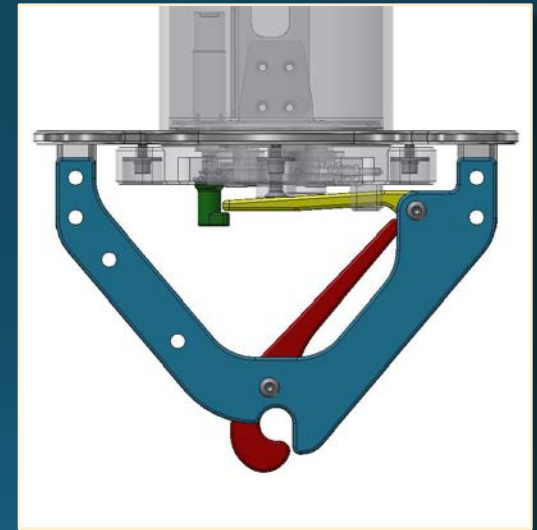
Corroding "burn" wire



Solenoid with cam and lever



Motor with cam and lever



Releasing trigger mechanism

Galvanic corrosion



Underseareleases.com

Digital timer



Acoustic signal (~14 kHz)



DeAlteris, 1999

CANISTER

- 3/8" polyester/nylon double braid (5000lb)
- 14" diam. rigid plus 8" diam. float (45 lbs flotation)
- 50 lbs ballast
- 1000' line in 19" diam. X 18" ht. cannister
- Spare empty cannister on deck where haul line is coiled to redeploy
- Solenoid release

DeAlteris, 1999

- Deployment 1:
 - 150', RI Sound
 - *Edgetech* release (abandoned when malfunctioned)
 - *Benthos* (10 sets: 8 successful, 2 with snags)
"Snagged on deployment, after the acoustic release triggered"
(Problem: Slack in shock cord retainer)
- Deployment 2:
 - Shock cord replaced without slack
 - 20 sets: 20 successful hauls
- Deployment 3:
 - 300', GofME
 - 20 sets: 19 successful (in failed case line incorrectly attached to acoustic release); used both *Benthos* and *EdgeTech* releases

Allen and DeAlteris, 2007

- Same basic design as DeAlteris, 1999
- 4 fishermen: S. New England, mid-shelf (2); Edge of shelf, S. New England; E. edge George's Bank
- Drum gillnet and lobster trawl
- Benthos (solenoid) and Subsea Sonic (burn wire) releases
- For gillnet, modified line/release cage to a net to function for ship-board storage and deployment

Percent	Number	Category
57%	74	Fully successful releases
8%	10	Successful release with slow surfacing
15%	19	Failed-buoy up when gear hauled form other end
12%	16	Failed - released but line tangled
7%	9	Failed - did not release
1%	1	Failed - Other

Hopkins and Hoggard, 2006

- Commercial lobster pots
- Release mounted “horizontally and vertically” to test performance
- Depths: 40-60 feet
- Subsea Sonics burn wire releases
- Reliable (100%) releases from 926m away (horizontal or diagonal distance?)

NSW Eastern Rock Lobster Pot Fishery





Goal: Eliminate lost and stolen gear

~ 40 fishermen vs thousands

115 fm max depth

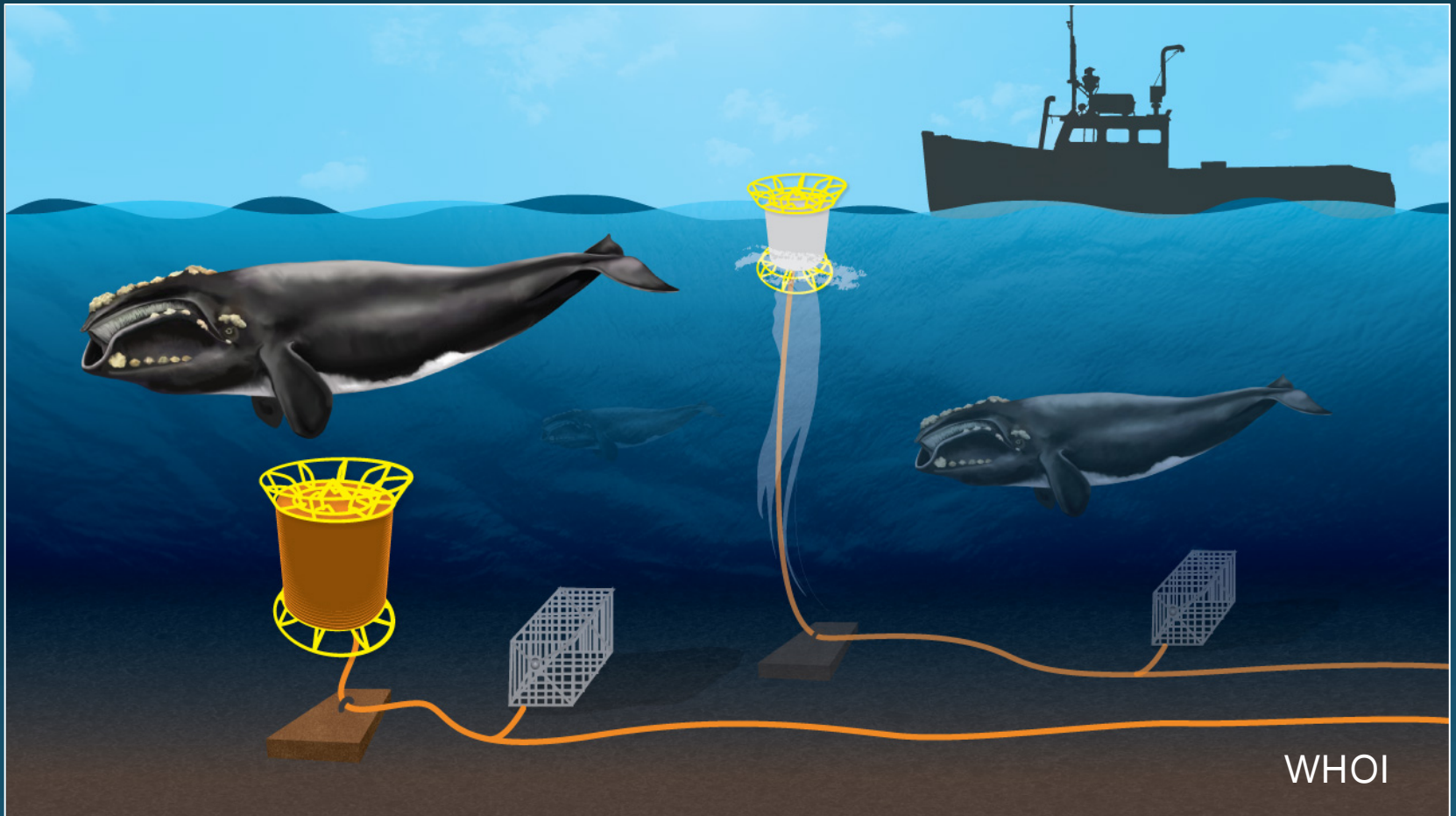
180 fm rope in bag! Bag suspended by rope
10fm above trap; Desert Star (burn wire)

Trap size: 6ft x 5ft x 2ft 6inches

Soak time: 2 weeks-3 months vs ~3+ days

"A good catch" = \$10-15/lb vs \$2-4/lb

Pop-up Flotation Spool Concept

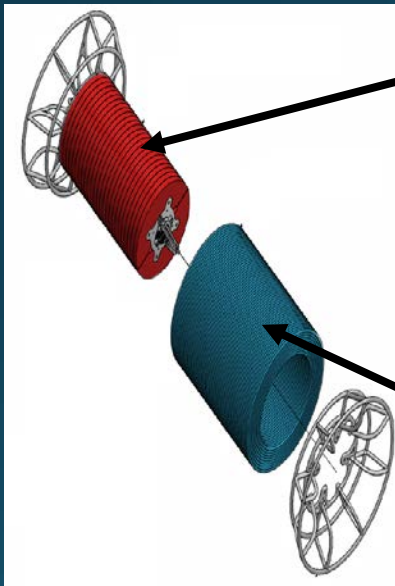


Offshore Rope-Less Gear Prototype Design



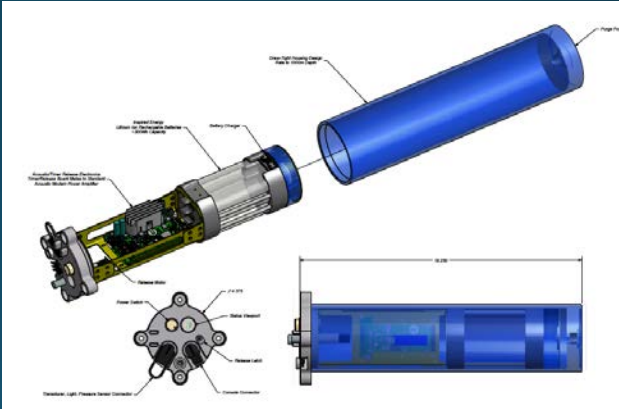
←
32" diameter; 43" tall
130 lb empty (as hauled aboard)
340 lb w/ 900m 1/2" line

Acoustic Release
fits inside spool core



Low-Density Syntactic Foam (450m operational depth)
>180lb buoyancy

To respool rapidly,
remove "cheek cage",
slide on pre-spooled
line cartridge.



Acoustic tag readable by
any vessel with deck unit
Unique signal for each
owner/trawl

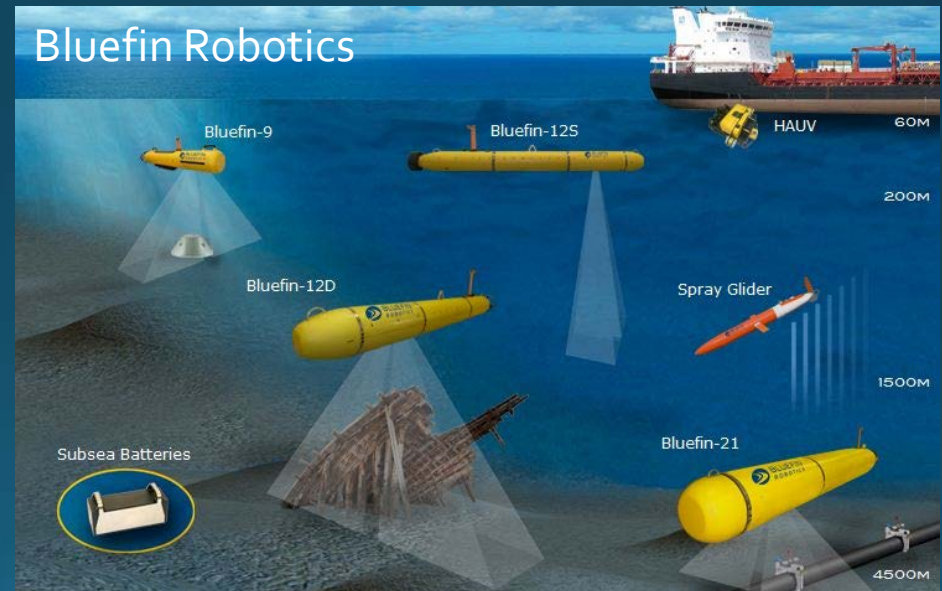
Modular design for application in multiple environments

Science *Non-fiction* – autonomous traps

Mooring Systems Inc.



Bluefin Robotics

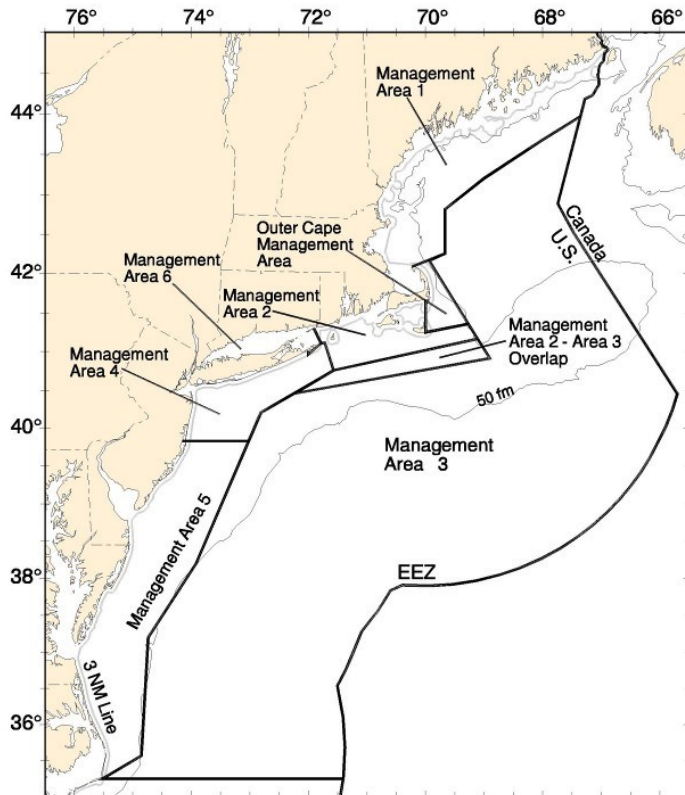


Concerns for Industry/Government

- Cost
- Dragged gear
- Overlaying gear
- Snags and tangles (in floating groundline, gangion, and in opening of cage)
- Deck space
- Increased operating time?
- Monitoring
- Trade-off between degree of buoy flotation and off-setting ballast.
 - Need enough flotation but this increases gear weight
 - Too much buoyancy influences how the trap/unit lands on the sea floor (Allen and DeAlteris, 2007)

Incentives/Off-setting increased cost

American lobster Management Areas established for the purpose of regional lobster management.



LMA	Estimated Annual Trap Loss	Estimated Annual Value of Lost Gear
LMA1	175,878	\$13,190,882.52

LMA	Estimated Total Economic Loss
LMA1	\$16,842,008.88

Use autonomous vehicles to enforce regulations

Communication satellite



Wave Glider



Trap



Trap



Trap

Potential Upsides and Incentives?

Cost - High now, but would come down with economy of scale and technology advances/cost savings

Rope canister can substitute as anchor

Lower gear loss from acoustic detectability and release of gear?

- Dragners can “see” gear better
- Easier to retrieve re-located gear = reduced gear replacement cost?
- Less marine debris and ghost fishing
- Higher catches

Visualizing the gear



The only whale gear mod so far that would also work for leatherbacks!



Next steps

TECHNOLOGY

Flotation spools - Refine design based on dock tests

Deploy off research vessel (May 2017)

Deploy with MA lobster fishermen (June-August 2017)

Seek sustained funding to support investigations with fishermen and engineers of appropriate technologies and gear refinements, including accurate visual pinpointing of bottom-set gear

COMMERCIAL AND REGULATORY VIABILITY

Need parallel assessment that addresses operational safety, commercial viability, and regulatory support

Working Strategy



18 Dec 200 GDNR

Use whale-release rope (at least in the short term and with lighter duty gear) that is visually enhanced; evaluate “ropeless” technologies, mainly targeting offshore, heavier duty gear for future implementation

Acknowledgments

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