OCEANWATCH AUSTRALIA

Final Report

Helping Fishers and Humpback Whales Coexist: Closing Critical Mitigation Gaps

2024 "Ropeless" Gear Trials

Australian Government

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The Helping Fishers and Humpback Whales Coexist: Closing Critical Mitigation Gaps project, as part of the East Coast Whale Entanglement Mitigation Program, is supported through funding from the Australian Government's Threatened and Migratory Species Fisheries Bycatch Mitigation grant.

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1. Executive Summary

The *Helping Fishers and Humpback Whales Coexist: Closing Critical Mitigation Gaps* project, undertaken as part of the Australian Government's East Coast Whale Entanglement Mitigation Program, addresses the growing challenge of whale entanglements in set fishing gear—particularly along the migratory corridor of the recovering East Coast humpback whale population. The 2024 gear trials focused on assessing the feasibility of acoustic-release "ropeless" or "rope-on-command" fishing technologies as seasonal mitigation tools in the New South Wales Ocean Trap and Line (OTL) demersal fish trap (DFT) fishery.

Two international systems were tested: Ashored Innovations' Rope-on-Command MOBI system (Canada) and LiftLabs' Ropeless Lift system (USA). Each system was trialled across a range of conditions and habitats by experienced NSW OTL DFT fishers. The trials included over 140 deployments between June 2024 and February 2025, supported by training, configuration adjustments, and remote developer engagement.

While the Ashored and LiftLabs systems showed some theoretical potential, several technical and operational barriers emerged throughout the trial period. Most notably, retrieval success rates declined sharply outside of training scenarios with direct gear developer support, highlighting reliability concerns for less technologically savvy individuals. Challenges included gear failures, unreliable ascent in strong currents, slow buoy deflation times, mechanical breakdowns, and complications integrating the gear into single-set fishing operations. In addition, the high cost and complexity of the technology significantly limited its commercial viability for broader industry uptake.

Fishers demonstrated a strong willingness to adapt and co-develop solutions, actively contributing design feedback and operational modifications. However, both systems, originally designed for North American lobster fisheries using strings of lightweight traps in shallow water, require substantial redesign to better meet the physical, environmental, and economic realities of Australian offshore and single-trap fisheries.

This report concludes that while ropeless fishing gear is not currently viable for widespread adoption, it holds potential as a targeted, seasonal risk mitigation tool during peak whale migration periods. With further innovation and localisation, these technologies may eventually support fisheries access in areas where rope presence poses unacceptable entanglement risk.

Key recommendations from this project include:

1. Prioritising the development of simpler, locally-adapted gear systems;
2. Establishing fisher-developer collaboration hubs to enable iterative design;
3. Enhancing regional technical support capacity;
4. Promoting seasonal, not full-scale, deployment of ropeless gear;
5. Expanding monitoring of whale interactions to inform gear use;
6. And extending national coordination and knowledge-sharing across jurisdictions and fisheries.

Ultimately, these gear trials reinforce the importance of fishery-specific, collaborative innovation pathways to deliver effective, practical whale entanglement mitigation strategies—supporting both the sustainability of Australian fisheries and the conservation of our iconic whale species.

2. Background

As whale populations in the southern hemisphere recover from past commercial whaling, there has been increasing community interest and economic activity associated with observing whale migrations, accompanied with a heightened community awareness of broader animal welfare issues. Concurrently, there has been an increase in media reports and community concern relating to whale entanglements in fishing gear.

Whale entanglements are complex and often dangerous incidents to respond to. Due to the size of whales, disentanglement operations require staff to have specialist training and skills. While disentanglement provides a means for dealing with incidents as they arise, the optimum solution to the problem involves reducing the risk of entanglement.

Humpback whales (*Megaptera novaeangliae*) migrate along the Australian East Coast between March and November, with a high percentage of the population found between 1 and 5 nm of the coast. The exact timing of the migration period can change from year to year, and may be influenced by water-temperature, the extent of sea ice, predation risk, prey abundance, and location of feeding grounds[1]. The migrating whales tend to follow a corridor, colloquially called the "Humpback Highway," and spend the majority of their migration in shallow coastal waters less than 50m deep[2].

The population of humpback whales that migrate along the Australian East Coast has risen from an estimated 2,000 to about 40,000 individuals from 1994 to present[2]. The population has seen a steady annual increase of about 10% since the commercial whaling ban was implemented[33] and is expected to reach it's carrying capacity by 2030, with a peak population between 2021-2026[3].

Humpback whales have unique wart-like protuberances (bumps or tubercles) that occur on the head forward of their blowhole and on the edges of their flippers.

Southern Right Whales (*Eubalaena australis*) are typically encountered along the southern east Australian coast between May to November, spending most of their time in waters less than 10m depth. Their migration may extend north to Forster or Port Macquarie, with most records of sightings occurring south of Sydney.

Although entanglement incidences involving Southern Right whales are rare, they are of conservation interest due to their low population level, estimated at less than 300 individuals in the South Eastern Australian population.

Whale entanglements are complex and often dangerous incidents to respond to. Due to the size of whales, disentanglement operations require staff to have specialist training and skills. While disentanglement provides a means for dealing with incidents as they arise, the optimum solution to the problem involves reducing the risk of entanglement.

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[1] Humpback Whale Recovery Plan 2005-2010, DCCEEW

[2] NSW NPWS Scoping Workshop Presentation, ECWEMP – Final Report 31 Dec 2020

[3] Noad et. al, 2019 'Boom to bust? Implications for the continued rapid growth of the eastern Australian humpback whale population despite recovery.' Population Ecology, 61, 198-209. Doi: 10.1002/1438-390X.1014

2.1. Whale Protection Measures

International

The Humpback whale is afforded a degree of international protection through listing:

- On Appendix I of the Convention of International Trade in Endangered Species (CITES)
- On Appendix II of the Convention on Migratory Species, and
- As vulnerable under the World Conservation Union's Red List

Additionally, Australia participates in several other international agreements that directly or indirectly relate to the conservation of marine mammals.

Australia is also a founding member of the International Whaling Commission, is the host country of the Convention on the Conservation of Antarctic Marine Living Resources, and is a key player in Antarctic Treaty Consultative Meetings[4].

National

All cetaceans (whales and dolphins) are protected in Australian waters through the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Humpback whales are listed as a Vulnerable species within the EPBC Act and NSW Biodiversity Conservation Act 2016.

Southern Right Whales are listed as an Endangered species within the Commonwealth EPBC Act and NSW Biodiversity Conservation Act 2016.

2.2. New South Wales Ocean Trap and Line Fishery

A comprehensive Fishery Management Strategy (FMS) has been prepared for the NSW OTL Fishery and was approved by the Minister for Primary Industries in November 2006. Prior to finalisation, the FMS was subjected to a wide-ranging Environmental Impact Assessment process under the NSW Environmental Planning and Assessment Act 1979.

There are six types of NSW Ocean Trap and Line (NSW OTL) endorsements, with the WEM being focussed on NSW OTL Demersal Fish Trap (DFT) and NSW OTL Spanner Crab (SC) fishing methods which utilise buoy lines and surface floats attached to set demersal fishing gear as an integral component of the fishing operation.

NSW DPI Fisheries management regulations used to require Demersal Fish trap (DFT) and Spanner Crab (SC) set fishing gear to be marked with a buoy of minimum 100 mm diameter at the surface. However as a result of previous gear trials through the East Coast Whale Entanglement Mitigation Program, since September 2023, DFT and SC set fishing gear can be indicated by a buoy that is held below the surface of the water using either a galvanic time release or programmable time release mechanism (DFT) or has a tag attached to a subsurface horizontal rope (SC).

Demersal Fish Trap

A DFT endorsement authorises the holder to take fish from ocean waters by means of a fish trap set on the sea bed. DFTs are permitted in all NSW waters excluding Marine Parks.

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[4] NSW DPI Fisheries Scoping Workshop presentation, ECWEMP – Final Report 31 Dec 2020

The DFT sector of the NSW OTL fishery is managed by input controls which limit the fishing capacity of fishers, thereby indirectly controlling the amount of fish caught. These controls include restrictions on the number of endorsements, number of traps, design and dimensions of traps and the waters that may be worked.

There are strong regional differences in catch and effort. Effort reported in the fishery has been steadily declining, with 75% of current effort reported by 24 fishers. On average approximately 40% of the total value of the fishery is landed between July and September each year.[4] Since 1998, the DFT sector has shown an estimated decline in fishing effort by about 66%, measured by comparing trap lifts with total trap days during the winter season. [5]This change in fishing effort indicates there are significantly fewer traps fishing now during the winter humpback whale migration season than there have been historically.

Many OTL DFT fishers have fishery shareholdings that permit them to work more traps than is practical or efficient for their business.

Spanner Crab

A NSW OTL Spanner Crab (SC) Northern Zone or Southern Zone endorsement authorises the holder to use a spanner crab net, commonly referred to as a dilly, to take spanner crabs from ocean waters.

The SC sector of the NSW OTL fishery operates from Hat Head to the NSW/Queensland border and is managed through a Total Allowable Catch and input restrictions.

SC fishers are restricted to operating a maximum of 40 dillies. Fishers generally operate with between 10 and 14 dillies attached to a demersal trot line that runs for over 1km.

Seasonal closures are in place to protect spawning females between 21st October and 20th January the following year, and males between 21st November and 20th December.

Recently there has been a large decline in fishing effort, measured by both days fished and gear lifts. Currently, there are less than 650 days fishing reported from less than 20 fishing businesses per annum. On average, over 40% of the total value of the fishery is landed between July and September each year.[5]

2.3. Whale Entanglements

Humpback whales are vulnerable to entanglement with set fishing gear due to their morphology, behaviours and spatial distribution. As the population of Humpback whales on the East Coast of Australia has risen, the potential for interactions between whales and commercial fishing operations is increasing, with most entanglements occurring since 2006. New South Wales Context

Humpback whales are present in New South Wales coastal waters between May and November each year as they migrate from their Antarctic feeding grounds to their tropical breeding grounds. Their presence peaks between June-September, which correlates with peak entanglement rates during those months. The humpback migration season has gotten longer

[5] Schilling et. al, 2023, “Regional oceanography affects humpback whale entanglements in set fishing gear”, Conservation Science and Practice.

over the years due to the increases in the population, with whales sighted along the NSW coastline beginning in April and late into December.

In 2019, whale entanglements in fishing gear saw a notable increase in NSW. The NSW OTL industry, with the help of the Professional Fishers' Association, called together an initial workshop to understand the issues associated with whale entanglement and processes to reduce those entanglement risks for set fishing gear like pots/traps. The workshop helped identify key gear modifications industry were interested to trial. These modifications included:

- Swapping polypropylene rope for lead core rope in trot line
- Swapping polypropylene rope for neutrally buoyant rope in head rope or trot line
- Using Galvanic Time Release submerged headgear bags
- Submerging headgear and grappling to retrieve

Additional workshops were held in 2021 and 2022, and further gear trials were conducted using:

- Desert Star time/acoustic release technology to submerge headgear
- Bronze hauling plates for NSW SC fishers

These gear trials showed varied success based on fishers' specific operations, and future gear trials were still deemed necessary to find options to suit both inshore and offshore operations. The trial results proved that there is no one-size-fits-all solution to effectively and viably reduce whale entanglement risk.

2.4. Whale Season Code of Practice

The NSW OTL industry co-developed a Code of Practice (CoP) for fishing during the humpback whale migration season with OceanWatch Australia in 2020, with support from the Australian Government. This code provides fishers with a supplementary guide to the existing NSW OTL Fishery Code of Practice, aiming to assist fishers in minimising the risk of whale entanglements during the annual whale migration season.

Key components of the code include:

1. **Best Practice Fishing**
   The CoP outlines humpback whale-specific best practices tailored for NSW OTL fishers, focusing on gear configurations and operational procedures that reduce entanglement risks.
2. **Gear Modification Trials**
   Recognising the need for practical solutions, the CoP encourages fishers to trial modified fishing gear, such as the use of negatively buoyant ropes and galvanic time releases, to better assess their effectiveness in real-world conditions
3. **Whale Entanglement Response**
   The CoP provides detailed protocols for fishers who encounter an entangled whale, emphasising fishers should *not* attempt to disentangle a whale themselves, and provides the necessary contact information to report the entanglement
4. **Regular Review and Update**
   The CoP is reviewed periodically to incorporate feedback from ongoing whale research, new mitigation technologies, and operational lessons learned from both successful and unsuccessful gear adaptations.

The implementation of the NSW OTL Whale CoP has resulted in greater awareness among fishers about the timing and risks of whale interactions. The CoP has helped promote an industry cultural shift toward proactive entanglement prevention, supported by practical advice and training. Gear trials and modifications trialled have already contributed to reducing the incidence of entanglements in high-risk periods. The CoP's emphasis on safe and coordinated whale encounter reporting ensures that professional disentanglement teams can respond effectively, further strengthening conservation outcomes for migrating humpback whales along the NSW coast.

2.5. Innovation from Overseas

The development of ropeless fishing technology has advanced rapidly in North America in response to the critical decline of whale populations, particularly the endangered North Atlantic Right whale (estimated at roughly 370 individuals[6]). Whale entanglements in fishing gear have led to fishery closures, including the Dungeness crab fishery, and imposed significant regulatory challenges on sectors such as the Northeast lobster fishery, where fishers frequently must travel over 150 km to access open fishing zones during the North Atlantic Right whale season. Conservation efforts have also impacted the industry, with Atlantic lobster being downgraded to "Avoid" on the Monterey Bay Aquarium's Seafood Watch[7] and losing its Marine Stewardship Council certification[8] due to interactions with North Atlantic Right whales.

To address these challenges, the Woods Hole Oceanographic Institute initiated the annual Ropeless Consortium in 2018, bringing together industry stakeholders to explore solutions that reduce whale entanglements while maintaining viable fisheries. Stakeholders include innovative thinkers and gear developers who are looking to revolutionise the way we think about set-gear fishing and providing various options that help reduce the amount of time rope is in the water column or remove ropes entirely. However, their goal is not to replace traditional trap gear entirely but rather to enable continued fishing in restricted areas during the whale migration season. Technology solutions vary from simple time-release mechanisms to advanced acoustic release systems with underwater GPS. Gear lending libraries in the U.S. and Canada provide fishers with access to trial technologies suited to their fishing operations.

In 2023, OceanWatch took five set-gear fishers from Australia (representatives from New South Wales, Queensland, Victoria, South Australia, and Western Australia) to attend the annual Ropeless Consortium conference. The goal of this educational trip was to gain insights into the emerging technologies and further assess the practicality of adapting such systems into Australian fishing operations. Fishers were exposed to 11 systems through gear demonstrations throughout the conference week and provided their feedback regarding potential for Australian fisheries.[9] While there, the NSW fisher was able to witness the gears he would be trialling in 2024 in action and present his ideas to better adapt them to NSW OTL fishing techniques.

Despite significant progress in gear development, ropeless/rope-on-command technology is still an extreme investment for fishers to implement and has yet to become totally viable for widespread fisheries uptake, still requiring further innovation and industry collaboration.

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[6] North Atlantic Right Whale, NOAA Fisheries
[7] American Lobster *Homarus americanus* Report, Monterey Bay Aquarium Seafood Watch
[8] MSC certificate suspended for Gulf of Maine lobster fishery, Marine Stewardship Council, 16 Nov 2022
[9] Ropeless Consortium 2023 Trip Report, OceanWatch Australia

3. 2024 “Ropeless” Gear Trials

3.1. Ashored Innovations

Ashored Innovations is a Rope-on-Command fishing gear supplier from Canada working to solve commercial fishing problems with whale entanglements through acoustic release systems.

In response to critically endangered North Atlantic Right Whale population interactions with North American lobster fisheries, they have developed an acoustic-release rope-on-command system called a “MOBI” to reduce the amount of time rope is in the water column. The MOBI system houses the headline and headgear within a cage that can be attached either directly atop a trap or connected as a separate sled (Figure 1). The system operates using a magnetic key that is triggered to release when called by the surface transducer. This then allows the lid, with buoys and rope attached, to release and float to the surface for fishers to grapple and retrieve.

Figure 1. Ashored MOBI acoustic-release system with 90 fathom rope within.

In late May 2024, Ashored Innovations equipped both NSW OTL offshore DFT fishers with a deckbox, transducer, two small-cage MOBI systems (hold ~100 fathom rope), one large-cage MOBI system (hold ~200 fathom rope), and a tablet to implement into their individual fishing operations. Trial fishers and OceanWatch Australia support staff were provided with a one-week training to get familiarised with how the gear operates, explore configurations that may adapt the gear better to the NSW OTL DFT fishery, and identify potential areas where troubleshooting may be necessary throughout the trials.

The fishers identified and trialled two primary configurations of the Ashored MOBI systems:

1. Using the MOBI cage as an additional sled/anchor attached to their fish trap via ground line; and
2. Attaching the MOBI cage atop their fish trap.

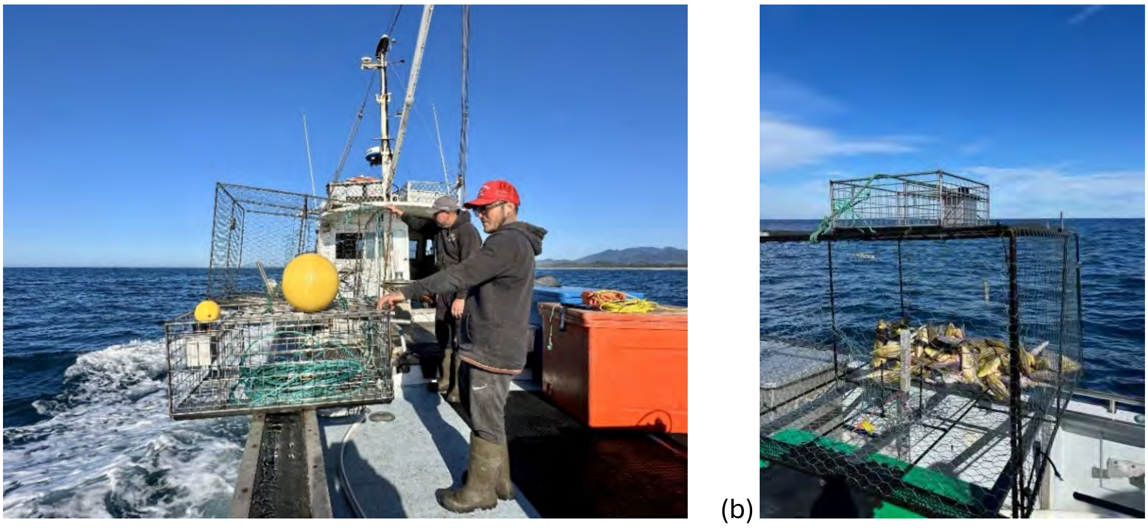
(a)  (b)

Figure 2. Ashored MOBI systems: (a) MOBI attached as separate sled, (b) MOBI attached atop fish trap.

3.2. LiftLabs LLC

LiftLabs LLC is an alternative fishing gear developer from the United States East Coast working to develop fast and user-friendly ropeless gear with local fishers to help reduce whale entanglements in fishing gear.

Figure 3. LiftLabs inshore acoustic-inflate system.

They are a start-up company that have developed and are continuing to refine an innovative solution to removing rope from the water column by creating ropeless Lifts to attach to strings of traps. The system operates to directly lift the trap from the seafloor , with an inflatable buoy attached to a small air canister that can be acoustically triggered by the fisher as they approach the gear (Figure 3). The Lift system has traditionally been attached to strings of small lightweight traps as a separate anchor or atop the final trap in the string. Prior to this project, the Lift system was only rated to 41 fathom depth and 34kg lift capacity. As the NSW OTL DFT offshore fishers operate in depths up to 120 fathom in large, heavy traps that start at 25kg (without including catch weight), LiftLabs worked to develop an offshore system that could withstand the loads and pressures necessary to suit the NSW OTL DFT fishery.

In late May 2024, LiftLabs equipped both trial fishers with a deckbox, transducer, an inshore Lift system, an air tank for canister refills, and a phone app to implement into their individual operations. A spare inshore Lift system was provided to OceanWatch Australia in case malfunction occurred throughout the initial trial period. Trial fishers and OceanWatch support were provided with a one-week training period to get familiar with how the system operates, explore configurations that may adapt the gear better to the NSW OTL DFT fishery, and identify potential areas where troubleshooting may be necessary throughout the trials. This initial training week was also crucial in helping LiftLabs better understand operational requirements the offshore system would need to meet to adapt for use in the NSW OTL DFT fishery.

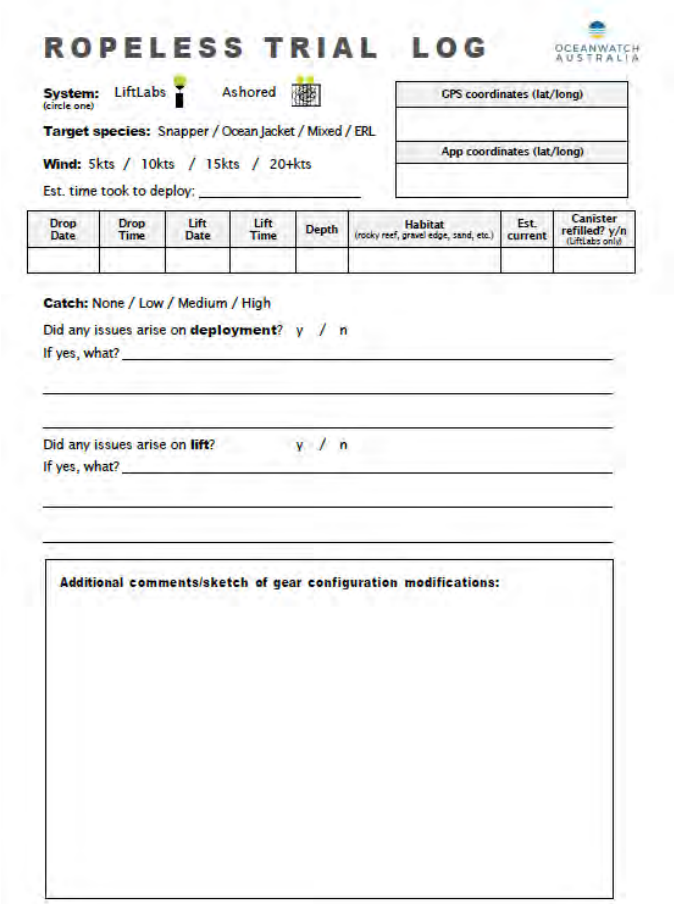
Following the May 2024 training, LiftLabs was in continuous contact with the trial fishers and OceanWatch Australia through phone calls and Zoom meetings to develop the offshore Lift system that could meet operational requirements. In August 2024, LiftLabs provided the trial fishers two offshore prototype Lift systems each that could comfortably lift over 300kg and withstand depths up to 200 fathom. They also provided an additional tank and canister "refill station" adapted specifically to each fisher's vessel setup. During this offshore training week, each fisher trialled the configurations provided, but also offered solutions to better adapt the Lifts to suiting their operation. For instance, one fisher found trialling it as an anchor sled was more practical for his fishing, while the other chose to modify an existing trap to fit the Lift system down the center to lift the trap itself up (Figure 4).

Figure 4. LiftLabs offshore acoustic-inflate system: Sled configuration (right) and centre trap-mounted configuration (left).

3.3. Trial Methods

Trials were conducted in NSW inshore and offshore waters off the Mid North Coast (Coffs Harbour) and Central Coast (Terrigal) from June 2024 through February 2025. Fishers were provided with trial logbooks to record crucial information regarding each drop and lift of their Ashored/LiftLabs adapted traps (Figure 5). Such information included:

- General conditions (e.g. wind, depth, habitat, estimated current, etc.)
- Date/Time of drop or lift
- GPS coordinates
- Target species and level of catch compared to traditional traps
- Any issues that arose on deployment
- Any issues that arose on retrieval
- Additional comments/sketch of configuration adjustments



ROPELESS TRIAL LOG

OCEANWATCH AUSTRALIA

System: (circle one) LiftLabs Ashored

GPS coordinates (lat/long)

App coordinates (lat/long)

Target species: Snapper / Ocean Jacket / Mixed / ERL

Wind: 5kts / 10kts / 15kts / 20+kts

Est. time took to deploy: ______

Drop Date	Drop Time	Lift Date	Lift Time	Depth	Habitat (rocky reef, gravel edge, sand, etc.)	Est. current	Canister refilled? y/n (LiftLabs only)

Catch: None / Low / Medium / High

Did any issues arise on deployment? y / n

If yes, what? ______

Did any issues arise on lift? y / n

If yes, what? ______

Additional comments/sketch of gear configuration modifications:

Figure 5. Example trial logbook page

The trials and information collected throughout was designed to assess whether these two systems could be adapted to the NSW OTL fishery, whether they are operationally viable for NSW OTL fishers to implement, and whether they could be a feasible option to add to the growing "tool-kit" to help fishers reduce their humpback whale entanglement risk. This information could then also be used to help inform the gear's potential for other similar Australian fisheries that experience whale interactions.

Both fishers trialled the gear in various configurations, depths, habitats, and fishing conditions to assess the practicality of the gear in their daily operations and those of others in the NSW OTL DFT fishery. Fishers were given autonomy in how they adjusted the gear to suit their specific fishing operations but were required to note any changes they made to better adapt the gear configurations in their logbooks. Fishers also kept OceanWatch Australia support personnel aware of both successes and challenges they encountered throughout the gear trials so troubleshooting assistance could be provided when necessary.

3.4. Trial Fisher Experiences

3.4.1. Ashored

From May-December 2024, trial fishers performed a total of 84 lifts (including those from the training period). Lifts occurred during an average current of 0.6kts. Both fishers noted challenges when trying to retrieve the Ashored system in current higher than 1kt, as the lid/buoys did not ascend quickly enough and were likely held under by the current. On average, the gear took about 7.5 minutes for fishers to set. Fishers noted a medium-low catch rate for traps fishing with the Ashored MOBI system attached (for both sled and top attached set-ups).

Fishers experienced an 80% success rate on setting their traps with the Ashored MOBI system attached. The primary that arose on setting was the MOBI buoy lid detaching as the trap entered the water. Discussions with Ashored support indicated that this was likely due to the angle the MOBI entered the water which dislodged the magnet mechanism that holds the lid in place.

Fishers experienced a 61% success rate on retrieval of the traps with the Ashored MOBI system attached (Table 1). This includes the training week, where Ashored expert support was available to assist and troubleshoot immediately if the system did not connect when triggered. Outside of the training period, fishers experienced a 46% success rate on retrieval, likely due to technical challenges and difficulties they were unsure how to properly address (e.g. Tablet reporting the MOBI system was "disarmed" but did not come to the surface within 20 minutes).

Table 1. Percentage of successful Ashored gear retrievals throughout trial period

System	Fisher 1	Fisher 2	Training	Overall	Excl. training
Ashored	52%	61%	57%	61%	46%

Fisher 1 experienced challenges with extensive rusting on the MOBI cage, both on the magnet key's connection point and along the base runners, after only 6-7 weeks use in the water (Figure 6a). Ashored support theorised this may be due to the warmer waters NSW fisheries operate in (18-20°C SST) compared to the cooler water temperatures the gear has traditionally been used in (10-17°C SST). Fisher 1 remedied this challenge by attaching a zinc anode to the Ashored cages (Figure 6b), akin to how they attach zinc anodes in the mesh of their fish traps.

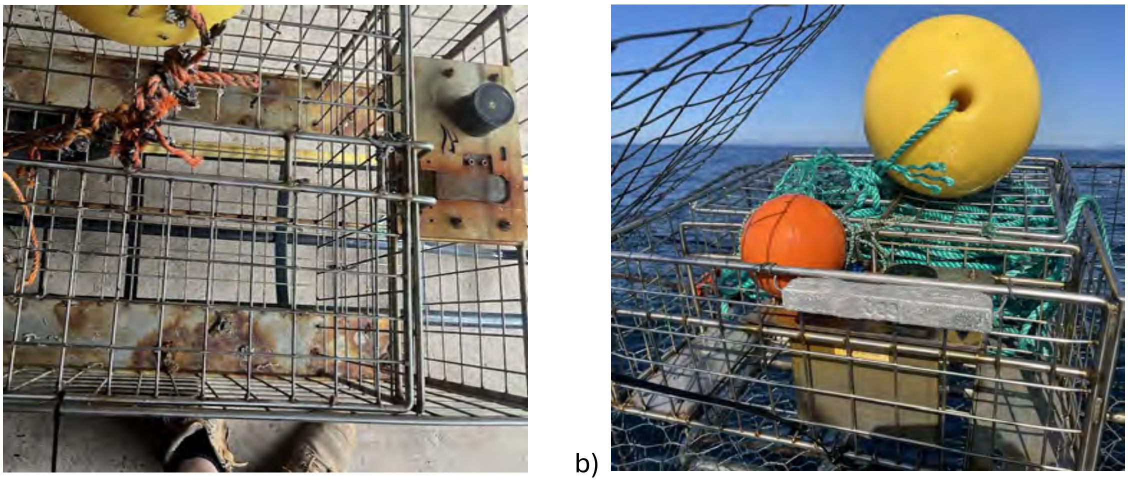

a) b)

Figure 6. (a) Rust challenges with Ashored MOBI system; (b) Zinc anode attached to Ashored cage

Fisher 1 also experienced challenges with the Ashored MOBI cage and buoys collecting barnacles more quickly than expected (Figure 7). This was particularly evident following a failed retrieval attempt during higher current. When the fisher went back to attempt to retrieve their gear three days later, the buoy was floating on the surface and was covered in barnacles. Upon retrieval of the trap, he noted the whole cage was covered in barnacles and needed to be removed from the water to properly clean. Fisher 1 also experienced challenges with the Ashored MOBI battery. One of the MOBI units seemed to drain its battery at an expedited rate compared to the other units, requiring fisher one to fully remove it from the water to recharge it three times throughout the trial period.

Figure 7. Barnacle-covered Ashored MOBI cage and buoy.

Fisher 2 experienced far fewer challenges with the Ashored MOBI system and had a higher rate of successful deployments and retrievals than Fisher 1 (Table 1). He primarily used the Ashored system attached atop his fish trap. Most of his lifts were in 61 fathom, and the maximum depth he trialled the system in was 75 fathom. This fisher was interested to continue to use the system beyond the trial period as he felt it was practical and useful for some of his fishing efforts. While Fisher 2 did experience some challenges with the Ashored MOBI system, it was primarily due to the buoy and lid getting tangled up in the backup rope when retrieving. Fisher 2 also noted that by attaching the MOBI cage to the top of his trap, it made the trap much more top-heavy, which created some additional handling challenges onboard when deploying/retrieving/re-setting the gear.

Fishers assessed the utility of the Ashored MOBI rope-on-command system:

Fisher	Ease to modify	Setting Efficiency	Retrieval Efficiency	Impact on catch?	Impact on crew?	Impact time at sea?
Fisher 1	Moderate	More Difficult	Moderate	No	No	Yes
Fisher 2	Easy Enough	More Difficult	Moderate	No	No	Some

Fishers assessed safety aspects of using the Ashored MOBI rope-on-command system:

Fishery	Impact vessel survey?	Additional safety hazards?	Vessel Damage	Hauler Damage?	Gear Damage?	Overall Safety Ranking
Fisher 1	No	Some	No	No	Some	Safe
Fisher 2	No	Some	No	No	No	Safe

Fishers assessed any impacts the Ashored MOBI rope-on-command system had on their lost gear:

Fishery	Lost Modified Gear?	Did Ashored use contribute to loss?	Recovered lost gear?	Lost Normal Gear?	Recovered Normal gear?
Fisher 1	No	No	N/A	Yes	Yes
Fisher 2	No	No	N/A	Yes	Yes

The high cost of this rope-on-command system for a single-set trap fishing operation was a major concern for both fishers, as such solution would need to be more affordable to be a viable option for broader fisheries uptake. Ashored is coming out with a “Leasing Model” that would allow fishers to hire out the gear as necessary during the whale migration season to help reduce the financial burden of adopting their technology. This model is currently being implemented in North America, however Ashored would require a distributer and warehouse in Australia for this model to be feasible for Australian fishers.

3.4.2. LiftLabs LLC

Inshore Lift

As the inshore Lift system has been designed to suit strings of small, lightweight traps fishing in shallow depths, the initial inshore training and trials required trialling many different configurations to better assess whether the inshore Lift had the buoyancy to lift an empty NSW fish trap (Figure 8). The inshore trials ran from June-September 2024 and overall had a total of 27 lifts (including the training period). The inshore system had to be tested in relatively shallow waters and on lighter weight traps.

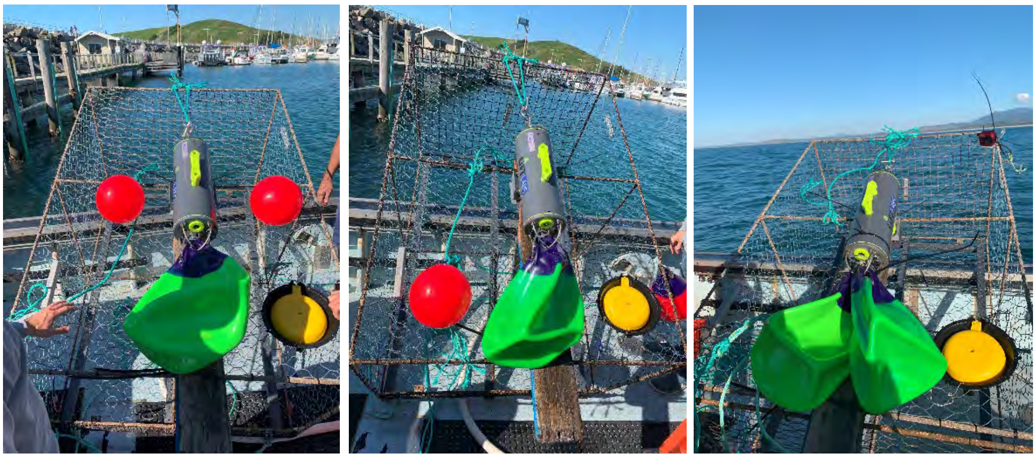


Figure 8. Inshore Lift configurations used to assess lift capacity of system.

Fisher 1 did not have a trap light enough that the system would lift in depths deeper than 10 fathom, and so they attached the trap as a way to assess any impacts on catch rate, however did not deploy the system throughout their inshore trials. Fisher 1’s Lift could not withstand the pressure at 36 fathom and imploded on their third trial.

Fisher 2 attached the system to a smaller trap, however the inshore Lift still struggled to produce enough buoyancy to float the trap off the seafloor due to the additional pressure. However, once the backup line was winched up slightly, the Lift would float the trap to the surface, indicating the system just needed a bit more buoyancy for the initial lift off the bottom.

Overall, retrieval success was 41% (including the training period), however this dropped to 0% success rate outside of the training when LiftLabs personnel were not available to troubleshoot. This indicates significant reliance on operator proficiency in the system's mechanics and suggests a steep learning curve.

Average catch rates were medium to low, reflecting little to no impact on catch rates. Camera footage from one of the traps indicated that fish were still entering the trap and interested in the bait, despite the additional gear attached to the top.

In inshore system proved inadequate for lifting larger traps, limiting its utility for the NSW OTL DFT fishery. These results highlighted both the promise and limitations of the inshore gear. While the acoustic trigger mechanism functioned as designed, the inability to retrieve the large traps poses a significant barrier to broader adoption.

Offshore Lift

Following consistent feedback from both trial fishers throughout the inshore training and trials period, LiftLabs designed an offshore system that was over-engineered to withstand depths up to 100 fathom and lift over 135kg (Figure 9). The offshore Lift trials ran from September 2024 – February 2025. Fishers performed 35 lifts of the offshore Lift system (including the training period). Lifts occurred during an average current of 0.3 knots. Both fishers noted concerns about triggering the Lifts in current greater than 0.5 knots anticipating the gear may drift away as it was ascending to the surface. On average, the system took 8-10 minutes to deploy. Fishers experienced medium-low catch rate while trialling the offshore Lift systems.

Figure 9. Offshore Lift system protective cage, configured as a separate sled.

Setting success rate was relatively high at 88%, showing the system was generally reliable to deploy. Retrieval success rate was 55% overall, including the training period. Outside of the training period, success rate dropped to 20%, revealing continued challenges with consistent recovery, similar to the inshore Lift. The offshore Lift demonstrated more than sufficient lift capacity, easily handling heavy traps and lifting the traps easily at greater depths.

Table 1. Percentage of successful LiftLabs gear retrievals throughout trial period

System	Fisher 1	Fisher 2	Training	Overall	Excl. training
LiftLabs	31%	0%	25%	55%	20%

Fisher 2 configured the offshore Lift as a separate sled/anchor attached by a 50 fathom rope (Figure 10). Following much trial and error during the training period, Fisher 2 determined a suitable operational setup to allow the trap to be pushed off by their deckhand and the offshore Lift system to be pulled off the back once the connecting line had run out, allowing both the Lift and the trap to sink at the same rate.

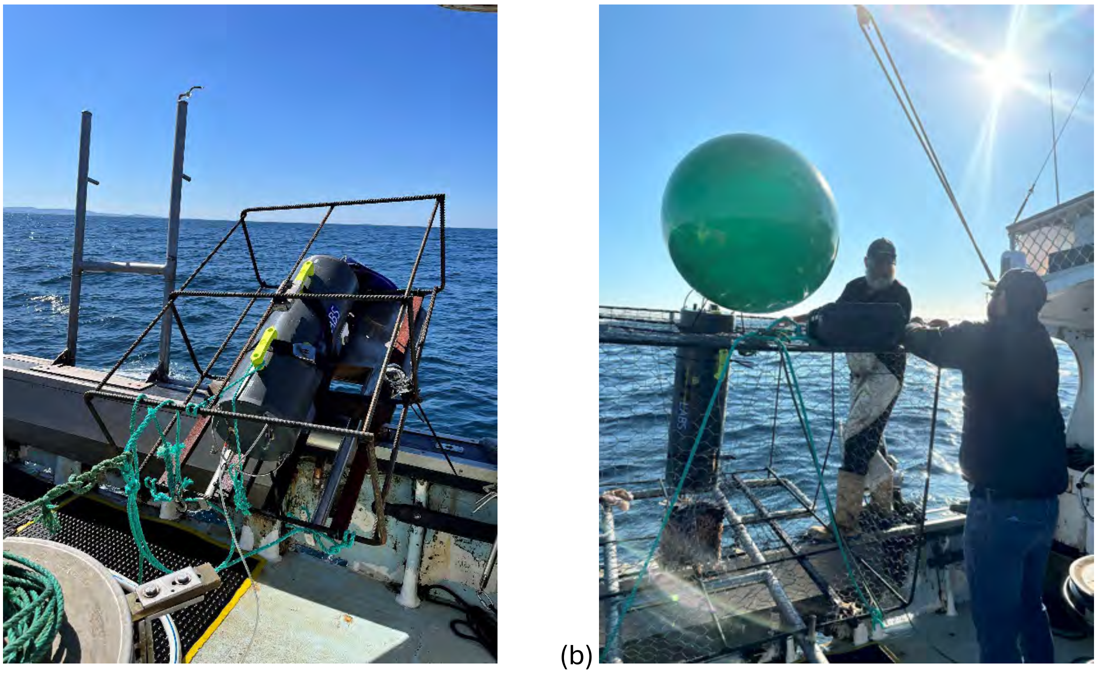
Figure 10. Offshore Lift system protective cage, configured as a separate sled.

Fisher 2 experienced some mechanical setbacks with the Offshore Lift system when it was not in use in the water. This was most notable in one of the canisters outside Fisher 2's shed which imploded (Figure 11). LiftLabs support hypothesized that the pressure release within the canister was insufficient and likely blew out the lid of the canister when it heated up in the sun. LiftLabs support provided support and supplies to help increase the internal pressure release capabilities, which both fishers updated their Offshore Lift canisters with.

Figure 11. Fisher 2's imploded Offshore Lift canister.

Fisher 1 struggled to find an optimal logistic operational flow with the offshore Lift within the cage it was provided as it was too thin to bring onboard using his large pot tipper. Therefore, they adapted a lobster trap frame to house a canister and allow offshore Lift to still act as a sled/anchor (Figure 12a). However, this was still operationally challenging given Fisher 1's vessel layout and the sheer weight of the offshore Lift.

To find a more suitable solution, Fisher 1 worked with the LiftLabs team to adapt one of their existing fish traps to house the canister vertically down the centre, allowing the buoy to inflate out the top (Figure 12b). This configuration seemed to be the best option for Fisher 1, as they were able to effectively manoeuvre the trap and Lift onboard.



(a) (b)

Figure 12. Fisher 1's Offshore Lift configurations: a) Offshore Lift mounted within a lobster trap frame sled; b) Offshore Lift mounted vertically within fish trap.

This second configuration showed some success once implemented in late November 2024, however the buoy attached to the canister configured this way ultimately exploded following surface of the gear on it's third trial (Figure 13). The LiftLabs developers worked to address this by testing the inflate capacity of the buoys, and found there must have been a manufacturer's defect in Fisher 1's buoy, as they were able to add two full 18L air tanks to a buoy without it exploding. They hypothesized that the manufacturer's defect, along with the slow pressure release mechanism they had implemented likely led to this setback. LiftLabs provided both fishers with system updates that increased the pressure release capabilities. Following the updates in mid-December 2024, excess buoy pressure was not noted as an issue.

Figure 13. Offshore Lift mounted within fish trap with exploded buoy

One key drawback identified by both fishers during offshore trials was the length of time required to deflate the larger buoys. This introduced delays and logistical inefficiencies as the buoys took nearly 15 minutes to deflate, which is far longer than it takes fishers in the NSW OTL fishery to grade their catch and reset their traps. Towards the end of the trial period, LiftLabs developed a solution that used a similar sized lift bag (Figure 14), which could easily be deflated in less than one minute. Fisher 1 was able to trial this liftbag system twice towards the end of the trials and found it was more suitable to his needs. Fisher 2 was unable to trial this, however, is still in contact with the LiftLabs gear developer and may trial it on his own when time allows.

Figure 14. Updated Offshore Lift option with easily detachable lift bag buoy.

Another major drawback to the offshore system was the sheer size and weight of the Lift. As it required greater lift capacity, the offshore Lift uses a larger internal air canister to inflate the larger buoy, making the system at least tripling the size of the inshore system. This added additional weight, making the system itself nearly 40kg. However, when the system was thrown into the water the first time, it was surprisingly buoyant. This is likely due to the excess trapped air between the housing and the air canister. Fisher 2 identified concerns that this would sink slower than the trap, ultimately causing the trap to drift and land misplaced. Fisher 1 felt the in-water buoyancy was akin to a wooden trap, which they have experience in placing.

Fishers assessed the utility of the LiftLabs ropeless Lift system:

Fisher	Ease to modify	Setting Efficiency	Retrieval Efficiency	Impact on catch?	Impact on crew?	Impact time at sea?
Fisher 1	Moderate	Moderately more Difficult	Moderate	No	No	Yes
Fisher 2	Moderate	More Difficult	More Difficult	No	No	Some

Fishers assessed safety aspects of using the LiftLabs ropeless Lift system:

Fishery	Impact vessel survey?	Additional safety hazards?	Vessel Damage	Hauler Damage?	Gear Damage?	Overall Safety Ranking
Fisher 1	No	Yes	No	No	No	Safe, but not in current state
Fisher 2	No	Yes	No	No	No	Safe, but not in current state

Fishers assessed any impacts the LiftLabs ropeless Lift system had on their lost gear:

Fishery	Lost Modified Gear?	Did LiftLabs use contribute to loss?	Recovered lost gear?	Lost Normal Gear?	Recovered Normal gear?
Fisher 1	No	No	N/A	Yes	Some
Fisher 2	Yes	Yes	No	Yes	Yes

The high cost of this ropeless system for a single-set trap fishing operation was a major concern for both fishers, as such solution would need to be more affordable to be a viable option for broader fisheries uptake. LiftLabs is working towards a Leasing model for fishers to hire the gear as necessary, but as the gear is still in the development and refinement stages, this is unlikely to occur quickly.

Despite the relative lack of success during trials, Fisher 1 is still intrigued by the potential for the LiftLabs gear to be a potential solution. However, there is still immense research and development necessary to find a suitable design that could suit the NSW OTL DFT fishery. Fisher 2 was less enthusiastic about the LiftLabs gear's potential, however is still open to continuing with the gear developer to refine their technology.

While the LiftLabs system seemed to show potential for reducing impacts on fishers' ability to precisely set their gear, the system's complexity, weight, and need for frequent adjustments indicates there is still research and development necessary to make it a suitable option for the NSW OTL DFT industry. Improvements such as faster deflation, smaller and lighter design, simpler deployment, and a more user-friendly deckbox could help adapt the gear better for industry.

3.4.3. Videos

Both fishers were asked to provide additional feedback about their experience trialling the Ashored and LiftLabs systems through videos that could be shared more widely to industry. The final video can be found at: https://youtu.be/neQygbjQtuI.

3.5. Key Gear Trial Takeaways

Overall, the 2024 gear trials showed that there is still much work to be done to find solutions that reduce the amount of time or completely remove rope from the water column in Australian fisheries. The gear is complex and neither trial fisher would be interested to swap their entire operations to fishing with the Ashored or LiftLabs systems. The key takeaways from the gear trials include:

1. The transition from traditional to ropeless/rope-on-command gear involved a steep learning curve, though not insurmountable. This was particularly evident with the low retrieval reliability for each system outside of the training periods.
2. The geographical distance between the gear developers and trial fishers provided an additional layer of complexity in terms of troubleshooting any challenges fishers faced throughout the trials.

3. Current technologies show promise, but are not yet fully reliable nor practical for single-set fishing operations.
4. Further research and more localised development are necessary to adapt these systems to Australian fisheries.
5. Ropeless/Rope-on-command systems are not a one-size-fits all solution, and even within the same fishery, trial fishers experienced very different challenges/successes with each system.

4. Considerations for Extended Use

As humpback whales migrate across vast stretches of the Australian coastline — and overlap with multiple fisheries — the question of how to minimise entanglement risk is complex and multifaceted. While Australian whale entanglement events are most frequently recorded with humpback whales, interactions with southern right whales, which spend more time nearshore during calving seasons, are of increasing concern. The Australian Southern Right whale is listed as "Endangered" under the EPBC Act 1999, and the southeast population which extends from South Australia to Southern NSW has shown minimal signs of clear recovery following the whaling ban.[10] This population is particularly vulnerable due to their low numbers and overlap with inshore fisheries, where even a small number of mortalities can significantly impact population recovery.[11] The Southern Rock Lobster fisheries in Victoria and South Australia have regulations in place during Southern Right Whale season (May-October), such as reducing slack line, not leaving pots in water when not actively fishing, and reporting any confirmed missing pots to relevant authorities.[12,13] These are crucial measures industry has already taken, however, concerns remain regarding potential whale entanglements in these fisheries' gear, which will require more fishery-specific solutions that are both reliable and practical.

Ropeless fishing technology has made great strides in recent years; however, the overall practicality of using such systems for single-set traps is minimal. Most of the ropeless systems, including the Ashored and LiftLabs systems trialled through this project, have been designed to best suit North American lobster fishing practices, which use long strings of small traps in shallow depths. These systems are currently best suited to be added as an additional sled to the string, with only one system required to lift 5–10 traps — making the investment more worthwhile. In contrast, many Australian set-gear fisheries — including the NSW Ocean Trap and Line (OTL) fishery, the Southern Rock Lobster fisheries, and various trap and pot fisheries in South Australia, Victoria, Tasmania, and Western Australia — typically operate using single traps or short strings of two, significantly increasing the cost and logistical burden of implementing ropeless systems fleet-wide.

This challenge is further compounded in fisheries where fishing takes place in deeper waters and stronger currents, such as the offshore NSW OTL and Southern Rock Lobster fisheries. In this project's gear trials, the Ashored and LiftLabs technologies were found to be unreliable and inconsistent in performance under the more extreme offshore conditions. As both fishers

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[10] Bannister, et al. 2016, "Population trend in right whales off southern Australia 1993-2015

[11] Commonwealth of Australia, 2012. Conservation Management Plan for the Southern Right Whale: A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999. 2011-2021.

[12] Victorian Fisheries Authority, 2024. Victorian Rock Lobster Fishery Management Plan 2024

[13] Department of Primary Industries and Regions, 2017, Fisheries Management (Rock Lobster Fishery) Regulations 2017

indicated throughout the trials, to promote any gear for broader industry uptake around Australia, the gear needs to be more or less “foolproof” and reliable 99% of the time.

Another important barrier to consider is that current ropeless systems come with a steep learning curve and are primarily developed overseas. Throughout the 2024 NSW OTL trials, this posed additional challenges when technical issues arose, as response delays from developers due to time zone differences made troubleshooting inefficient for both fishers and OceanWatch Australia support staff.

It is important to note that these trials were never intended to promote a full-scale industry shift to ropeless fishing, but rather to explore their viability as a seasonal mitigation tool during the annual whale migration when entanglement risk is highest. Trial fishers showed genuine interest in refining their use of both Ashored and LiftLabs systems and expressed a willingness to be part of future innovation with both systems. However, while these systems have potential to be useful during periods of elevated whale presence or shipping restrictions, they are not yet reliable, cost-effective, or operationally suitable for broad adoption in Australia’s diverse and often challenging fishing environments.

In theory, ropeless gear presents an exciting solution to reduce whale entanglements. In practice, however, the current systems are not well aligned with the operational requirements of many Australian set-gear fisheries — including those fisheries that overlap significantly with Southern Right Whale critical habitat. As such, while continued testing and development is warranted and crucial to develop solutions that benefit both industry and whale populations, the trialled ropeless technologies are not yet a viable option for mitigating whale interactions across the broader Australian fishing industry.

5. Recommendations following Gear Trials

Progress has certainly been made through the East Coast Whale Entanglement Mitigation Program to better identify potential solutions for reducing whale entanglement risk in East Coast fishing gear. While there is novel emerging technology to help reduce rope in the water column, this technology is still in its infancy and it’s current reliability remains minimal. However, there still remains many unknowns in this evolving challenge that industry is committed to pursuing.

Based on feedback from the multiple workshops and fishers engaged in gear trials along the east coast, key priorities for the ongoing development of promoting safe passage for both whales and Australian fishers were identified. The following recommendations have been made:

1. Prioritise Practical, Fishery-Specific Gear Innovations
Continue exploring and refining gear modifications that are viable and cost-effective for small-scale and single-set trap fisheries. Given the limited operational success of Ashored and LiftLabs technologies outside of training conditions, emphasis should shift toward developing simpler, more robust systems suited to Australia's fishing conditions, particularly offshore and high-current areas.

2. Foster Localised Development and On-Ground Support
Invest in local partnerships to adapt ropeless systems to the unique operational needs of Australian fisheries. Local manufacturing, distribution, and technical support—such as regional

leasing models—would reduce dependency on overseas developers and address logistical challenges caused by time zone delays and system unfamiliarity.

3. Establish Fisher–Developer Collaboration Hubs
Formalise collaborative spaces (e.g. gear trial innovation hubs) where fishers can work directly with developers to iteratively test, adjust, and co-design ropeless gear tailored to their operations. These hubs should integrate hands-on workshops and live demonstrations to build user familiarity and operational confidence.

4. Expand Research on Real-Time Whale Interactions and System Performance
Develop research initiatives that track real-time whale movements and fishing gear interactions, especially in regions with high entanglement risk. This will help identify priority areas for mitigation and assess the reliability of ropeless gear under true working conditions.

5. Support Seasonal and Situational Use of Ropeless Systems
Position ropeless gear as a targeted seasonal tool during peak whale migration rather than a full-scale replacement for traditional gear. This aligns better with the economic realities and operational patterns of most Australian fisheries while still addressing conservation goals.

6. Advance National Guidelines and Knowledge Transfer
Extend the lessons learned from NSW trials to other regions that experience whale interactions, such as Victoria, South Australia, and Tasmania. Support development of state-specific Codes of Practice informed by these findings, and create a unified national framework to share innovations, outcomes, and training opportunities across jurisdictions.

7. Promote Industry-Backed Public Communication
Develop a proactive communication strategy that showcases industry-led efforts to reduce whale entanglement risk, enhances public understanding, and encourages constructive dialogue between the conservation and fishing sectors.

8. Commit to Iterative Trials and Funding
Recognise that successful mitigation solutions will not emerge from one-off trials. Secure ongoing funding and trial phases to support long-term gear development, including continuous training, performance monitoring, and feedback loops involving fishers from diverse fisheries.