

Innovative Technologies

to Alleviate Whale Entanglements in Fishing Gear:

Time Tension Line Cutter (TTLC)

Description

The time-tension line cutter (TTLC) is a cylindrical device, housing internal blades, that can be secured to a buoy line. The blades are factory-set to be triggered when the line is subject to continuous tension of a specific amount. It allows the buoy line to function at full strength during normal hauling, and severs the line only when the tension limit is exceeded for a set amount of time, as in the case of a whale entanglement.

The TTLC is designed for use with fixed gear such as pot/trap and gillnet. The high-density plastic casing is 60 cm long, 7 cm in diameter, and weighs 2 kg for up to 7/16 inch diameter rope and is larger in size for greater diameters. The device is designed to last over ten years, and to withstand the severe loads experienced during hauling, line handling, fishing, and seafloor interactions.

How it works

The time and tension are pre-set in the factory based on knowledge of the specific fishery, to prevent a TTLC from cutting the buoy line during normal operations. Depending on the needs of local fisheries and marine mammals, the devices are configured to sever rope after 3 to 30 minutes of excessive force, such as an entangled whale would produce. Once the TTLC severs the line, the whale can move more freely without the weight of the gear, and the lack of tension reduces the likelihood that lines will wrap more tightly around its body, flippers or tail. The TTLC's minimum cut threshold of approximately 135 kg (300 lb) can minimize the threat to whale calves and smaller species.

The TTLC can be fished at any depth; one or more units can be placed at any location along a buoy line. If a single unit is used, placement near the bottom of the line is expected to be most effective. TTLCs accommodate line sizes from 1/4 to 1 inch, and their associated tensional loads. The buoy line is fitted around the unit, with its end passing through a chamber housing two cutting blades.

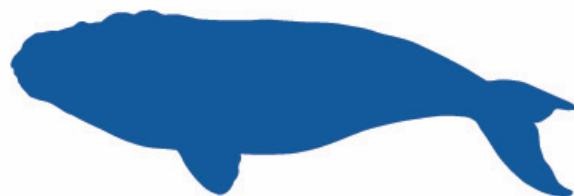
Installation takes approximately 2 minutes per unit, and requires no cutting or modification of the line. They can be installed and uninstalled easily on all line types, in all deck conditions, without special tools or detailed training. The newest version of the TTLC passes through the plate line haulers.

Cost

TTLCs fitted for 3/8 to 7/16 inch diameter line cost \$140 USD; from 1/2 to 3/4 inch line ~\$300-400 USD; price not yet fixed on larger units.



Figure 1. Four-step rigging of the Time Tension Line Cutter with buoy line (3/8 inch diameter).



Pros

Full rope strength during normal fishing operations ensures crew safety and operational efficiency. The TTLC can be set to cut at any tension level sustained over time, as low as 300 lb, if the tension is maintained long enough to exceed fishing operations and reflect entanglement conditions. Gear incorporating TTLCs can be hauled in at normal speeds. The status of the devices can be inspected visually during hauling, avoiding sudden unexpected line cuts. Rapid removal of gear, leaving only the buoy line, is anticipated to reduce whale entanglement trauma or death. The cut rope will remain as a bitter end that may facilitate disentanglement. TTLCs operate mechanically, with no need for electronics. The units are durable, with examples in operation for 10 years.

Cons

When a TTLC cuts a buoy line near the bottom, the whale may retain a length of rope that could wrap around its body, flippers or tail, or snag on other gear, complicating the entanglement. This risk can be reduced by including one or more weak links or segments of weak rope elsewhere in the line (see other factsheets in this series about weak link sleeves). A whale may drown if it becomes immobilized by an entanglement in mid-water, preventing it from surfacing to breathe before the time interval passes and the blades cut the rope.

Management and Enforcement

TTLCs are visually recognizable, though enforcement officers would need to be able to ensure that the device is operable. Movement in the size of the gap after hauling, indicating proper function, can take approximately 10 minutes.

Availability

Blue Water Concepts Inc. has manufactured >200 units to date, and indicate that production can be scaled up. Components can be manufactured in the U.S. and Canada. www.bluewaterconceptsinc.com

Field testing

In Canada

In Canada, preliminary tests are planned using snow crab gear in the Gulf of St. Lawrence in 2020.

Elsewhere

The device has been refined over time through testing in northeastern US fisheries. Maine lobster fishers tested 15 inshore units in January 2020, and 35 offshore units in March 2020. Preliminary results are promising.

Recommended Research

- Compare line diameter, tension setting based on load cell tests, placement location in buoy line, and ease of handling in a variety of fisheries, including those that use heavy gear (e.g. snow crab traps; lobster fisheries using trawls of 20 traps or more).
- Test cutting success at prescribed time intervals in real fishing situations.
- Examine durability over multiple years of use.
- Develop a simple, reliable method of enforcement check.



Figure 2. North Atlantic Right Whale

This series of handouts provides information about gear modifications that are expected to lessen the severity of whale entanglement in fishing gear, by lowering the breaking strength of conventional vertical line to below 1,700 lb without compromising crew safety or adding to gear loss. Successful methods are expected to vary by fishery. These modifications do not prevent entanglement, rather they increase the likelihood of entangled whales freeing themselves, thus enhancing their feeding success, growth, reproduction and chances of survival. The series may grow as additional methods are developed and refined. Methods developed to date result from the ingenuity of fishers, supportive industries, and entrepreneurs. The Government of Canada is not promoting or endorsing any of these products or methods, but is sharing the information to support fishers' exploration of options.

The Government of Canada, the Atlantic Provinces and the Province of Quebec are providing financial support for trials of fishing gear modifications through the Atlantic Fisheries Fund (dfo-mpo.gc.ca/fisheries-peches/initiatives/fish-fund-atlantic-fonds-peche/index-eng.html) and the Quebec Fisheries Fund (dfo-mpo.gc.ca/fisheries-peches/initiatives/fish-fund-quebec-fonds-peche/index-eng.html).