CCAMLR

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Commission pour la conservation de la faune et la flore marines de l'Antarctique
Комиссия по сохранению морских живых ресурсов Антарктики
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A versatile approach to minimise damage or loss of longline gear due to sea-ice

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Submitted by S. Hain, T. Brey and K. Teschke

Introduction

At SAM 2019, two documents (WG-SAM-2019/31 and WG-SAM-2019/33) reported damage and/or loss of longline gear, most likely due to impact by sea ice. Especially when operating in areas with difficult sea ice conditions and quickly varying sea ice cover, there is an increased risk that any parts of longline gear floating on the surface, i.e. top floats (e.g. Norway buoys and seine floats) and radio buoys, might get caught up and ensnarled by drifting sea ice flows or sea ice pressure ridges. Such an entanglement often leads to parts or the whole longline gear being dragged for considerable distances, sometimes for miles (see WG-SAM-2019/31). This does not only lead to damage and loss of gear, loss of catch, unaccounted mortality and (plastic) pollution by lost lines. The longitudinal and lateral movement of lines (or parts thereof) being dragged by sea ice can also cause severe impact on the sea floor and the species living there (see Welsford, D.C. et al., 2014).

Relevant CCAMLR discussions and documents

There have been numerous discussions within CCAMLR about the issue of damage and loss of longline gear. In the context of the notification of New Zealand’s intention to conduct exploratory longline fisheries for *Dissostichus* spp. in the 2008/09 season, a detailed ecological risk assessment of autoline longline fishing was prepared (CCAMLR-XXVII/19). If floats do become entangled with sea ice, the most likely scenario is that the line breaks somewhere on the backbone. Recovered lines indicate that in such event lines will mostly break within the first 100-200 m of the backbone, while the remainder of the backbone will be hauled normally from the other end. In order to avoid the scenario of "Broken-off downline and partial line dragged by ice", the use of "JB lines" with submerged endpoints was considered as an alternate gear configuration, in which a downline extending from the grapnels to the surface is replaced by a partial downline with floats suspended in midwater, to be re-located by radio transmitter and snagged by the fishing vessel using some sort of retrieval grapnel.

In the detailed analysis of bottom longline gear loss in the Ross Sea and Subarea 88.2 fisheries (Webber and Parker, 2012), downlines and fishing floats interacting with or being overtaken by moving ice was identified as one of the main causes for gear loss, especially in areas where vessels routinely fish in conditions of high ice cover or at times when ice is moving more rapidly. Webber and Parker (2012) recommend that when reporting on lost gear, the categorical reason for the loss of gear (e.g. 'floats lost due to sea-ice' or 'mainline broken during gear retrieval') should be reported in addition to number of hooks lost and other gear components lost.

The analysis of gear loss by fishing vessels in the CCAMLR Convention Area in the period 2008-2018 carried out by the CCAMLR Secretariat in 2018 (WG-FSA-18/17) confirms that gear loss events in areas that are likely to be influenced by sea-ice (specifically in Subarea 88.1 and Division 58.4.1) experience higher proportions of line loss. Both spatial and temporal patterns, such as the increase in gear loss in 2012, may well reflect variation in seasonal ice conditions. The report also highlights that because the materials used in the construction of fishing gear are durable, possess large structural integrity and degrade only slowly (especially in darkness and at low water temperatures), the marine debris from lost gear will accumulate over time. This has led to considerable (plastic) pollution of the benthic environment in certain areas over the last decade, e.g. in Statistical Areas 88.1 (3218.4 km of lost longline), 58.5.1 (2489 km of lost longline) and 48.3 (2442.7 km lost longline). In addition to the pollution effect, lost lines have the potential to cause ongoing mortalities of target or non-target species due to entanglement and hooking and can cause physical impacts on the seafloor and the benthic environment.

Equipment used and experiences gained by the Alfred Wegener Institute

For the last 30 years, the Alfred Wegener Institute (AWI), Helmholtz Centre for Polar and Marine Research in Germany, is operating around 20 -25 deep-water moorings in the Southern Ocean for long-term oceanographic research purposes. Each of these moorings has to be retrieved, maintained and re-deployed every 2-3 years. In order to avoid these moorings to come into contact with sea ice or ice bergs, the mooring line ends several hundred metres below the sea surface. The moorings are released via a hydro-acoustically activated double releaser system, which detaches the mooring line from the bottom weight, so that the equipment can float to the surface.

For short-term deployment of scientific instruments on the sea floor (e.g. landers, short-term moorings) AWI has in recent years increasingly and very successfully used so-called "**pop-up buoy recovery systems**". The advantage of this system is that the equipment cannot come into contact or entangled with sea ice and can be completely retrieved (including the bottom weight), so no waste remains on the sea floor. A pop-up buoy recovery system was also used when deploying and retrieving vertical longlines on *Polarstern* expedition PS 117 (see Fig. 1 and document SC-CAMLR-XXXVIII/BG/XX).

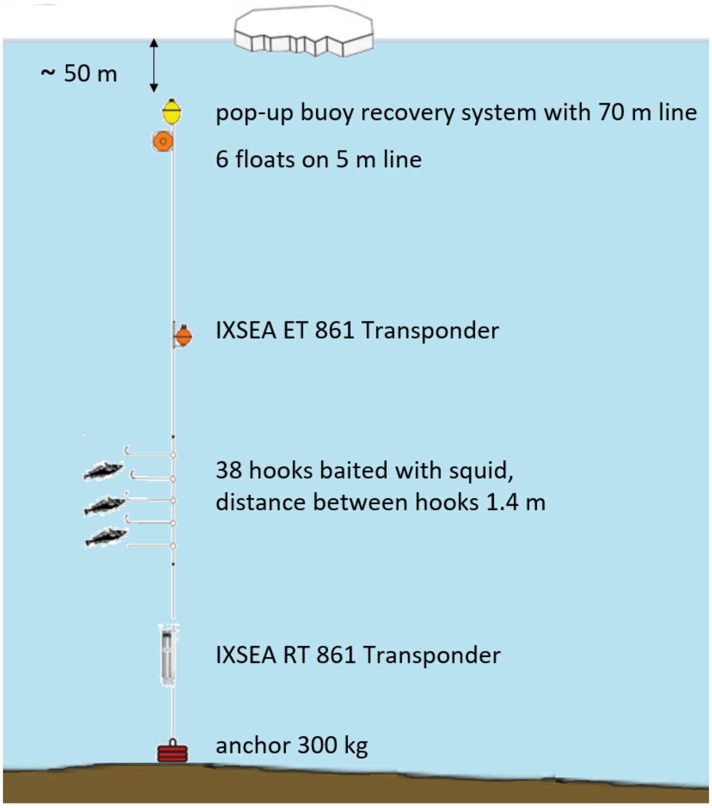


Fig. 1: Scheme of the vertical longlines deployed during RV *Polarstern* expedition PS 117

Please note that equipment deployed by AWI on the sea floor has usually two separate and independent release mechanisms, just in case one of these systems should fail. In case of the vertical longline design shown in Fig. 1, in addition to the pop-up buoy recovery system at the top there was an IXSEA Transponder/Releaser installed just above the anchor weight. If the pop-up buoy would have failed, this transponder/releaser would have been acoustically activated to detach the longline from the anchor weight.

<u>The principle and potential use of pop-up buoy recovery systems in longline fishing</u>

The principle of pop-up buoy recovery systems is that the end of the downlines coming up from the equipment on the seafloor reaches only up to 150-50 metres below the surface, depending on the type and specification of the system (see Fig. 2). This ensures that sea ice flows or sea ice pressure ridges will not come into contact with the equipment at the top of the downline line. At the top end of the downline line a special acoustic release pop-up buoy with a rope reservoir is installed. For retrieval, an acoustic signal is emitted via a separate transponding releaser deck unit. Upon receipt of the signal, the top portion of the pop-up buoy with a rope connection to the mooring / longline equipment is mechanically released and floats to the surface. In most systems, the top part of the pop-up buoy includes a transponder for easy location of the equipment at the surface.

Being installed on the top end of the downline, the pop-up buoy recovery systems do not have to withstand large water pressures (most systems have a depth rating of about 300 metres). The other advantage is that - unlike deep water release systems - the distance the uw-acoustic signal has to travel underwater to reach the release transponder in the pop-up buoy is only a few tens to hundred metres, which increases the reliability of the signal transfer and receipt/release. Nevertheless, it is always recommended to use two independent systems (one on each end of the longline), with one being the failsafe for the other.

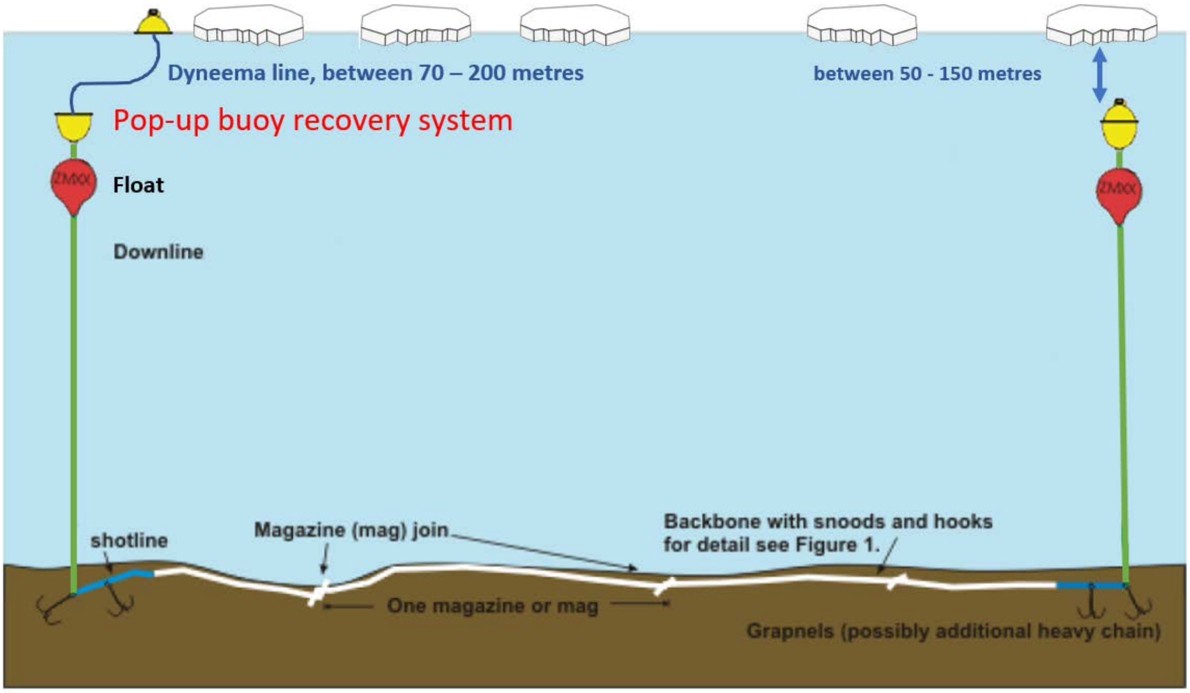


Fig. 2: Exemplary design of a pop-up buoy recovery system attached to a longline (here autoline) system
(The figure is based on Fig. 2 given in WG-FSA-08/60. The pop-up buoy recovery systems could be attached to Spanish or trotline gear in a similar way.)

Manufactures of pop-up buoy recovery systems

There are a number of pop-up buoy recovery systems currently on the market (see non-exhaustive list of examples at Annex 1) with different types and lengths of rope storage. The battery life of the release system in the pop-up buoys varies and can last up to 5 years. This means that in case the sea ice cover at the location of a deployed longline worsens during soak time, so that the fishing vessel cannot return to the location, the longline gear can be retrieved later or even in the next season, and CCAMLR can be informed about the location of the gear and the expected time of recovery.

Action requested

The Working Group on Fish Stock Assessment is invited:

a. to (re-)discuss, in the light of the recent reports given in WG-SAM-2019/31 and WG-SAM-2019/33, the issue of damage or loss of longline gear (due to sea ice), including the plastic pollution caused by lost gear and the potential environmental impact caused by gear being dragged over the sea floor by sea ice;

b. to consider recommending to SC-CAMLR that longline fishing vessels (especially when fishing in areas with high or rapidly changing sea ice cover) should use systems such as the acoustic pop-up buoy recovery systems set out in this document in order to prevent longline gear getting caught up and being dragged, damaged or lost by sea ice;

c. to determine whether there is adequate information available on this issue and/or whether there is a need to collect further, specific / targeted data.

References

CCAMLR-XXVII/19 (2008): Notifications of New Zealand's intention to conduct exploratory longline fisheries for *Dissostichus* spp. in the 2008/09 season - ANNEX I – ECOLOGICAL RISK ASSESSMENT. Submitted by the Delegation of New Zealand an available on the CCAMLR home page at https://www.ccamlr.org/en/system/files/cc-xxvii-19-Annex1.pdf

WG-FSA-08/60: The Autoline System – An updated descriptive review of the method with recommendations to clarify CCAMLR Conservation Measures regulating longline fisheries within the Convention Area. Submitted by Fenaughty, J.M. and available on the CCAMLR fishing gear library (https://www.ccamlr.org/en/publications/fishing-gear-library) at https://www.ccamlr.org/en/system/files/fsa-08-60.pdf.

WG-FSA-18/17: Analysis of gear loss by fishing vessels in the CCAMLR Convention Area as contribution to the marine debris program. Submitted by the CCAMLR Secretariat.

WG-SAM-2019/31: Report on implementation of research program for study of species composition, biology and resource potential of craboids (Anomura, Decapoda) in the Antarctic Pacific in 2019. Submitted by the Delegation of the Russian Federation.

WG-SAM-2019/33: Informational report on research fishing for *Dissostichus* spp. In Subarea 48.1 by Ukraine in 2019, submitted by P. Zabroda, L. Pshenichnov and K. Demianenko.

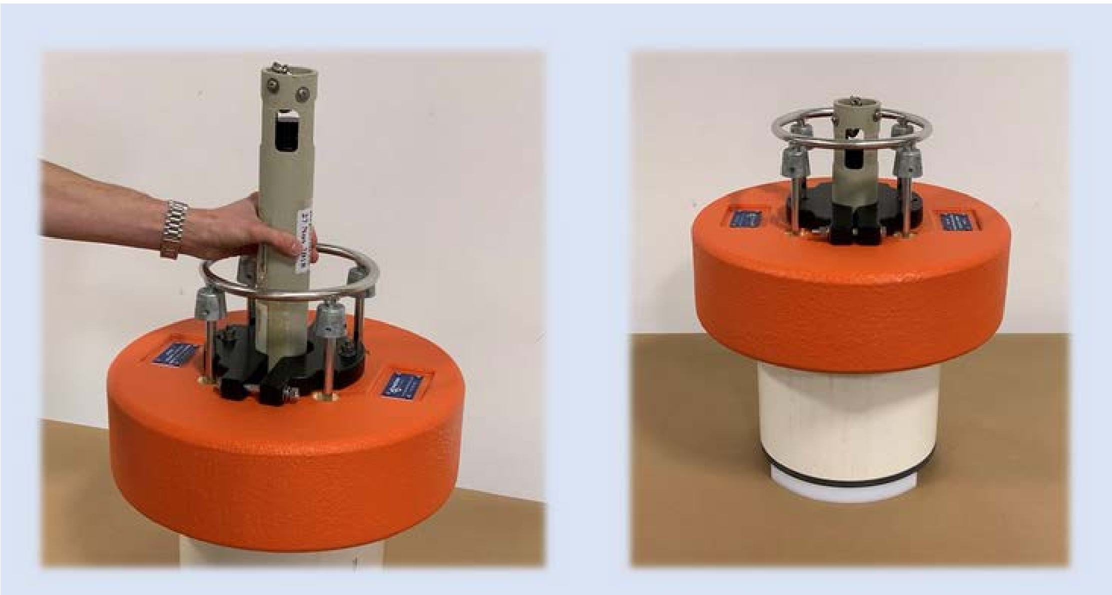
Welsford, D.C., Ewing, G.P., Constable, A.J., Hibberd, T., Kilpatrick, R. (eds) 2014: Demersal fishing interactions with marine benthos in the Australian EEZ of the Southern Ocean: An assessment of the vulnerability of benthic habitats to impact by demersal gears. 258 pp.

Webber, D.N., Parker, S.J. 2012: Estimating unaccounted fishing mortality in the Ross Sea region and Amundsen Sea (CCAMLR Subareas 88.1 And 88.2) bottom longline fisheries targeting Antarctic toothfish. CCAMLR Science, Vol. 19 (2012): 17–30

Examples of acoustic release pop-up buoy recovery systems [1]

(a) **Sonardyne**

https://deepwaterbuoyancy.com/product/popup-buoy/
https://deepwaterbuoyancy.com/pop-up-buoy-sonardyne-lrt-acoustic-release/



[1] The examples on this and the following pages are not exhaustive, i.e. there might be more companies offering pop-up buoy recovery systems.

(b) FioMarine

http://fiomarine.com/fiobuoy-models/

Fiobuoy AC100

On-demand acoustic release
Deployable to 100m (328')
Rope capacity: 120m of 10mm line

Fiobuoy AC200

On-demand acoustic release
Deployable to 200m (656')
Rope capacity: 250m of 10mm line

(c) Mooringsystems

https://www.mooringsystems.com/popup-buoys.htm

Above: Pop-up Buoy

Above: Tri-Pod with RDI and Pop-up Buoy

R500-PUB Kit Specifications:

Flotation Material Type Syntactic, 300m depth rated
Float Shape Ellipsoid, 16"x7.5" (406mm x 190mm)
Float Net Buoyancy 18 lbs. (8 kg), released from canister
Lifting Bail Material Type 316 stainless
Rope Canister Material High Strength Urethane (molded)
Anchoring Bail Material Type 316 stainless with isolator
Overall PUB Height 22" (558 mm)
Overall PUB Air Weight 22 lbs. (10 kg)
Rope Type Spectra/Dyneema 12-strand
Rope Option 1: 75 meters of 1/4" (6.35mm)
Rope Option 2: 120 meters of 3/16" (4.76mm)
Rope Option 3: 150 meters of 5/32" (3.96mm)

(d) Edgetech

https://www.edgetech.com/product/port-pop-up-recovery-system/

https://www.edgetech.com/wp-content/uploads/2019/07/EdgeTech-Acoustic-Transponding-Release-110114.pdf

MECHANICAL	
Release mechanism	Motor driven rotary type with thrust bearings and Ultem link
Release load rating	250 kg (550 lbs)
Lifting load rating	Depending on line selected
Depth rating	200 m (based on line length)
Line lengths / diameter	45 m (150 ft) 5/8" 100 m (325 ft) 3/8" 200 m (650 ft) 5/16" 400 m (1300 ft) ¼" Note: suggested line length is 2 times the operating depth
Weight in air	43 lbs
Positive Buoyancy in Water (with PORT Release)	15 lbs Note: Pop-up package comes with an extra flotation sphere which adds 7 pounds of additional positive buoyancy if desired. Good for high current environments.
ELECTRICAL	
Command frequencies	9.3 to 19.7 kHz (based on acoustic release selected for Pop-Up)
Command codes	BACS commands (EdgeTech formerly ORE Offshore)
Transmit Source Level	192 dB re 1 micro Pascal
Receiver sensitivity	100 dB re-1uPascal-meter