

Bycatch Mitigation FACT-SHEET 3 (Version 1)

Practical information on seabird bycatch mitigation measures

Demersal Longline: Integrated weight longlines

Line weighting is an essential component of seabird bycatch mitigation strategies, being one of the most effective known mitigation measures (a primary measure). Best practice weighting regimes should result in rapid initial line sink rates that will reduce the likelihood of seabird bycatch. Integrated weight lines with lead beads in the core were developed to address this problem.

What are integrated weight longlines?

Seabirds are vulnerable to mortality during the short period between hooks leaving the vessel and sinking beyond the bird's diving range. In demersal longline fisheries, lines are weighted in order to deliver hooks to the target fishing depth as efficiently as possible and maintain the line on the seabed.

Autoline gear consists of a single line with baited hooks attached at regular intervals (Figure 1). On autoliners, the addition of external weights at regular intervals is problematic. Prior to the development of integrated weight lines, fishermen using the Autoline System generally applied less external weight than was necessary to achieve the high initial sink rate needed to minimise bycatch. Integrated weight lines were developed to improve sink rates in autoline gear. The weight is distributed evenly throughout the line, which results in a uniform linear sink rate from the sea surface.

Effectiveness at reducing seabird mortality

To avoid catching seabirds and allow robust statistical analysis, experimental trials have used the sink rate of lines under different weighting regimes to evaluate the potential for reducing seabird bycatch.

Early sink rate experiments

- Smith (2001) examined the sink rate of autolines under varying weighting regimes and found that adding external weight at

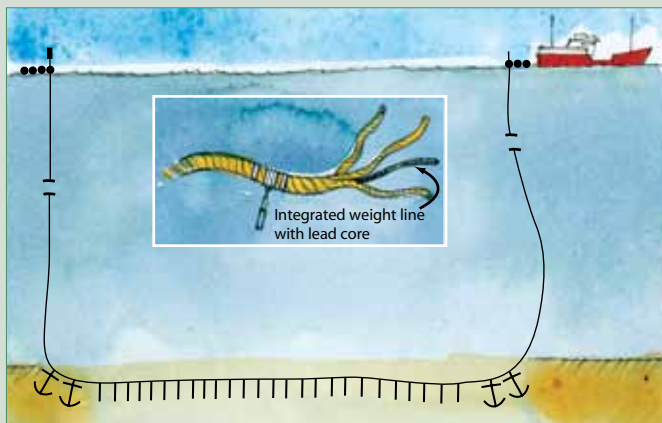


Figure 1. Autoline gear configuration.

large intervals (every 400 m) made no difference to the overall sink rate of the line.

- Robertson (2000) experimented with various external line weighting regimes on autoline gear. The results highlight the importance of weight spacing to achieving a steady sink rate. After examining several alternative regimes, Robertson concluded that a sink rate >0.3 m/s was desirable to minimise the exposure of the line to seabird strikes across a variety of setting speeds and weighting regimes.

Integrated weight experiments

- Trials in New Zealand found that the sink rates of lines with integrated lead beads (50 g/m) were similar to unweighted lines with 6 kg external weights every 42 m. Of particular importance to seabird bycatch is the initial sink rate – unweighted lines may float on or near the surface, held up by propeller turbulence, for up to 80 m astern. Integrated weight lines commenced sinking almost instantly and maintained a steady linear sink profile. These properties are reflected in the recorded sink rates of each line type: integrated lines averaged 0.2 m/s to 2 m depth and 0.24 m/s to 20 m, compared to unweighted lines, which lofted in propeller turbulence for >20 seconds before sinking and averaged only 0.11 m/s to 20 m depth (Figure 2).
- Improvements in the initial sink rate and sink rates to 20 m depth translated into a 95% and 60% reduction in white-chinned petrel mortality and sooty shearwater mortality, respectively (Robertson *et al.*, 2006) in the New Zealand ling fishery when using integrated weight lines.
- Integrated weight lines have also proven effective in reducing seabird bycatch in northern hemisphere fisheries (see Dietrich *et al.*, 2008), thus demonstrating the extensive applicability of the method. This study also demonstrated that integrated weight lines, when used in combination with paired streamer lines, very nearly eliminated seabird bycatch in the fishery in which it was undertaken.

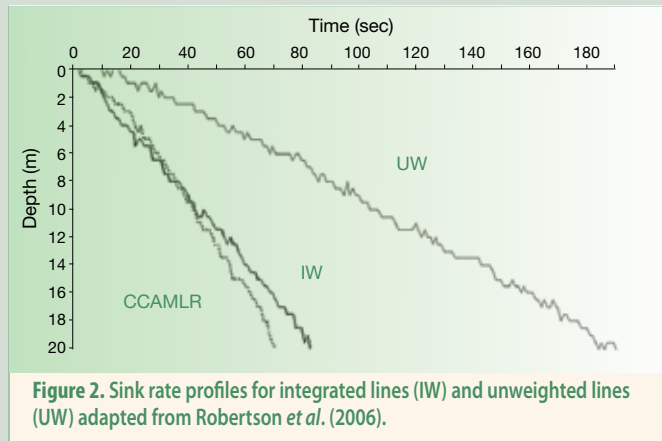
In addition to the amount of weight applied to longlines, several other factors influence the sink rate of autoline gear:

Weight spacing

The mass of weight added to lines is clearly an important consideration but spacing between weights is equally important. To achieve a uniform sink rate, weight should be evenly distributed along the entire line. Integrated weights minimise line lofting in propeller turbulence resulting in a linear sink profile.

Environmental

In rough seas, heavy swell can maintain the line close to the surface and expose it in the troughs between waves. The pitching of a vessel in rough seas reduces the sink rate and can bring hooks back to the surface.



Buoying effect of caught birds

Seabirds are often caught in clusters of several birds in quick succession. Once a bird is caught, it acts as a buoy exposing adjacent hooks to foraging birds. Good weighting regimes limit the time hooked birds are on the surface and reduce the likelihood of multiple captures.

Best practice recommendation

The best practice weighting regimes recommended here are intended to take baited hooks beyond the diving range of seabirds while under the protection of a standard streamer line, without compromising fish catch rates.

Setting a desired sink rate should be an integral part of any performance standard. For autoliners, integrated weight gear (50 g/m) achieves a sink rate of around 0.24 m/s to 20 m, which has proved to reduce the bycatch rates of white-chinned petrels and sooty shearwaters by over 90% and 60%, respectively, in the New Zealand ling fishery. Externally weighted autolines require 6 kg weights attached every 42 m to achieve a comparable sink rate to 50 g/m integrated weighted line (Robertson *et al.*, 2006).

The recent innovation of integrated weight autolines require no modification of fishing practices and may actually increase the efficiency of fishing operations. The adoption of integrated weight lines with a minimum of 50 g of lead beading per metre is recommended.

Properties of integrated weight lines

There are certain operational advantages and disadvantages associated with using integrated weight gear (Robertson *et al.* 2006).

- Integrated weight lines are about 10% weaker than conventional lines of the same thickness, which could lead to more gear losses. However, age of gear was shown to be the most important factor influencing breaking strengths (Dietrich *et al.*, 2008) and in fisheries where integrated weight gear has been routinely used, gear loss does not appear to be a serious problem.
- Length for length, integrated lines weigh 70% more than conventional lines.
- In 2006, integrated weight lines cost 14–23% more than conventional lines.
- Experienced fishermen indicate that integrated weight line is easier to coil and passes smoothly through hauling and setting gear reducing the incidence of line tangles.

- Superior handling properties and the lack of external weights reduce labour.
- Early indications suggest that there may be some benefits in terms of fish catch but more research is needed. Catch is likely to depend on the foraging behaviour of the target fish species.

Combinations of measures

Like many mitigation measures, it is not sufficient to rely solely on line weighting to manage seabird bycatch. Line weighting is one of the most important primary mitigation measures but to be effective must be used in combination with:

- **Streamer lines** (Fact-sheet 1)
- **Night-setting** (Fact-sheet 5).

Further research

- In some instances, there are indications that the target fish catch may be improved when integrated weight longlines are used (Robertson *et al.*, 2006). Trials should be extended to cover other demersal longline fisheries to establish whether this relationship is consistent across a range of fisheries.
- The time available for hooks to sink before they become exposed to foraging seabirds is a function of line sink rate, streamer line extent and vessel speed. Vessel speed is an important factor yet is not considered in current fishery regulations. Further research is needed to investigate the inter-relationship between these factors.
- The potential for incorporating integrated weight lines into other demersal longline gear types (such as the Spanish System) should be investigated.

Compliance and implementation

- Where fishing regulations require vessels to achieve a specified sink rate, integrated weight lines provide an efficient means of meeting these targets. With the potential for improved target fish catch, there is the possibility of voluntary uptake of integrated weight lines.
- Once integrated weight lines are installed on a vessel, they form an integral part of the fishing gear and therefore the need for further compliance monitoring is minimal.
- Line sink rate testing using bottle tests or Time-Depth-Recorder deployment is used in some fisheries to ensure that each vessel has a specific strategy regarding setting speed, streamer line coverage and line weighting to ensure adequate protection of the line from seabird strikes.

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References

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