ICES Journal of Marine Science, 55: 145–149. 1998

Short communication

Seabird by-catch and bait loss in long-lining using different setting methods

Svein Løkkeborg

Løkkeborg, S. 1998. Seabird by-catch and bait loss in long-lining using different setting methods. – ICES Journal of Marine Science, 55: 145–149.

Seabirds taking baits during long-line setting occasionally become caught and are killed, while the associated bait loss may have serious impact on long-lining efficiency and profitability. Two different setting methods were tested as a solution to this problem in the autoline fishery in the north Atlantic; lines were set either through a setting funnel that guided the baited line beneath the sea surface or a seabird scaring device was used. Bait loss and the catches of target species and seabirds were compared with and without such methods. Accidental catches of birds were reduced by both methods, most effectively by the seabird scarer. Losses of mackerel bait were also significantly reduced by using the scarer, but not by using the setting funnel. No increase in the catches of target species was demonstrated by using either of the setting methods. However, bait loss caused by seabirds was regarded as a minor problem in this fishing experiment. Suggestions on how to improve the efficiency of the two methods tested are discussed, and a combination of these methods is proposed as a method to reduce greatly the incidental capture of seabirds in the autoline fishery in the north Atlantic.

Key words: bait loss, incidental mortality, seabirds, long-lining efficency.

Received 27 February 1997; accepted 19 May 1997.

Svein Løkkeborg: Institute of Marine Research, P.O. Box 1870, N-5024 Bergen, Norway. Tel. +47 55 23 68 26; Fax. +47 55 23 68 30; E-mail: svein.lokkeborg@imr.no

Introduction

Long-lining is one of our major fish capture techniques, and large proportions (15–90) of several of the most important groundfish resources in the north Atlantic are taken by the long-line fleet of several hundreds vessels operating in this region (Bjordal and Løkkeborg, 1996). In most respects long-lining is a conservation-oriented fishing method tending to catch mainly target species, the operation of long-line gear cause no destructive effect on bottom habitats and fish of high quality are captured at low fuel consumption. However, seabirds caught when the gear is set may be a problem in some fishing areas during certain seasons.

When long-lines are set, the baited hooks may float on the surface for a short while before they start sinking, and during this period they are available to foraging seabirds. Seabirds feeding on baits occasionally become hooked, and concern has been aroused about the by-catch of albatross in long-lining for tuna and other species in the Southern Ocean (Weimerskirch and Jouventin, 1987; Brothers, 1991; Cherel *et al.*, 1996). Such studies suggest that incidental mortality due to long-line fishing activity is the major reason for the decline of some populations of long-lived seabird species. Measures to reduce seabird by-catches have therefore been put into effect in the Southern Ocean.

In the north Atlantic, there is some concern about seabird mortality in fisheries and bait loss from long-lines. Northern fulmar (*Fulmarus glacialis*) comprise the great majority of seabirds caught in the long-line fishery in this region (author's observations; B. Åsbø, skipper of M/S *Stålbjørn*, pers. comm.), and although seabird by-catches in long-line fishing do not seem to cause declines in fulmar populations (see Lloyd *et al.*, 1991), the associated bait loss caused by seabirds may reduce the possible catch of fish by long-line fishermen. Bait loss rates of 70% due to seabirds have been reported, and in some fishing areas and during certain seasons, seabirds may have a severe impact on long-lining

1054–3139/98/010145+05 $25.00/0/jm970264

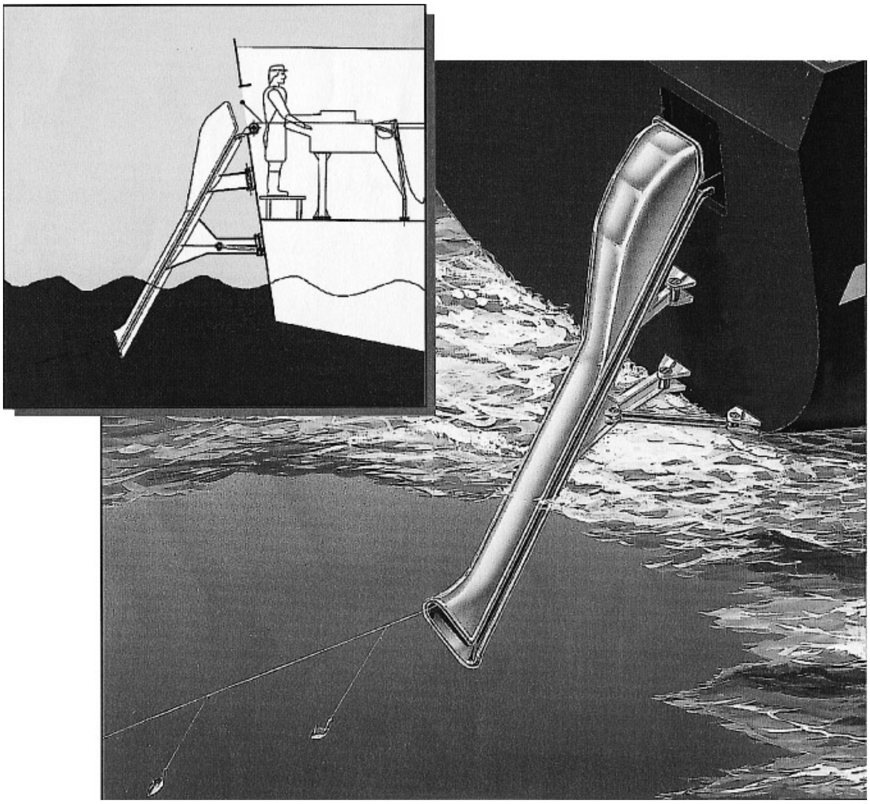

Figure 1. The setting funnel. (Redrawn after product brochure of Solstrand Shipyard, Norway.)

efficiency and profitability (Bjordal and Løkkeborg, 1996). In the north Atlantic, seabirds taking baits and occasionally becoming hooked are thus mostly a problem for fishermen rather than for seabird populations.

The various ways of solving this problem can be classified into three categories. Firstly, the baited hooks may be made less available to the birds by guiding the lines into the water through a submerged funnel, by confining line setting to the hours of darkness, or by weighting the lines and thawing the bait to increase the sinking speed. Secondly, the birds may be scared away from the area where the baited hooks are floating, either by a visual scarer or by noise. Thirdly, the birds may be lured from the lines during setting by discharging fish offal which is more easily available and thus a more profitable food source to the birds. The latter method has been shown to reduce greatly the incidental capture of seabirds in the fishery for Patagonian toothfish (*Dissostichus eleginoides*) in Kerguelen waters (Cherel *et al.*, 1996). In this fishery it is possible to release offal continuously during line setting because this process takes only 11–12 min, but not in the long-line fisheries in the north Atlantic where lines are often set continuously for several hours.

In this study, a funnel that guided the baited lines into the water and a seabird scaring device were tested in commercial long-lining off the Norwegian coast, targeting torsk (*Brosme brosme*) and ling (*Molva molva*). Bait loss, by-catch of seabirds and catches of target species of lines set traditionally were compared with lines set while using either of these two methods.

Material and methods

The experiment was conducted from 9 to 22 May 1996 on a commercial long-liner (M/S *Stålbjørn*) operating on the fishing grounds off the coast of mid-Norway (64°03′–65°50′N) at 172–455 m depth. The vessel used a Mustad autoline system, and three fleets of experimental lines (each with about 4725 hooks) baited with a combination of mackerel and squid (the bait width was 3 cm) was set and retrieved each day. One fleet was set through a setting funnel (Fig. 1), the second was set in conjunction with a seabird scaring device (Fig. 2) and the third was set as a control without any means of preventing birds from taking baits. The funnel guided the lines down to about 1 m beneath the surface. The seabird scarer was a 5 mm nylon line with twelve 8 cm-wide streamers of

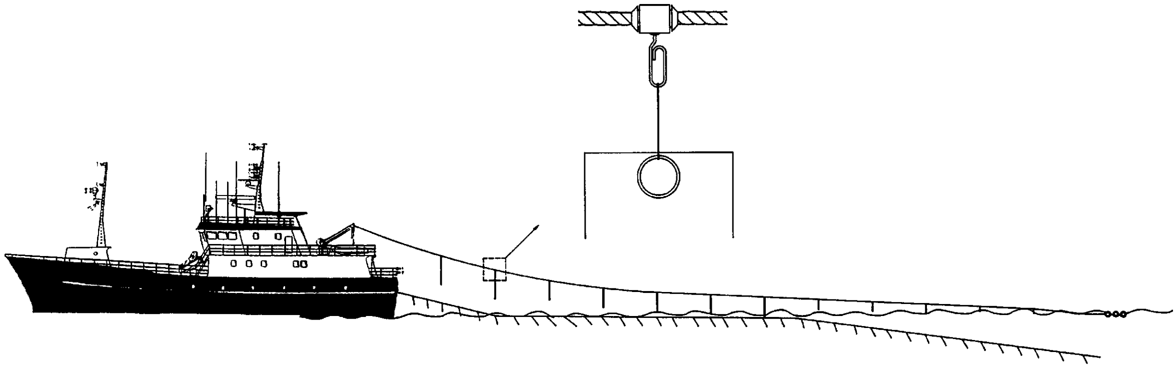

Figure 2. The seabird scarer.

Table 1. Bait losses (percentage of hooks without bait or with bait remnants) of mackerel and squid bait for long-lines set traditionally, through a setting funnel and using a seabird scarer. Total numbers of hooks set are given in parentheses.

Setting method	Mackerel	Squid
Traditional	19.5 (758)	21.1 (199)
Setting funnel	22.7 (815)	26.0 (192)
Seabird scarer	13.1 (687)	17.2 (191)

yellow tarpaulin attached to it by swivels at intervals of 5.1 m. The streamers were from 0.5 to 3.0 m long, decreasing in length with increasing distance from the vessel. Four gillnet float rings were attached to the aft end of the scarer. For each of the three fleets of lines, the catches (in weight) of the target species and the number of birds caught were recorded.

In order to determine bait loss caused by seabirds, long-lines were also set without anchors and immediately retrieved to prevent them from sinking to the seabed. The three different methods described above were also used in this part of the experiment, and lines baited with both mackerel and squid were set. When the lines were retrieved, the bait loss was recorded. Because line setting with an automatic baiter causes a proportion of the hooks (5–20%) to be set without baits, the recorded bait loss will only partly be caused by seabirds taking baits.

Results

The lines set when using the bird scarer lost significantly less mackerel bait than the two other setting methods (chi-square, p=0.001; Table 1). The same tendency was observed for lines baited with squid, but the difference was not statistically significant.

There were significant differences between the setting methods in the by-catch of seabirds; lines set without any devices caught 99 birds (1.75 birds per 1000 hooks), lines set through the funnel caught 28 birds (0.49 birds per 1000 hooks), and lines set with the bird scarer caught

Table 2. Catches of target species (kg) and seabirds (number) for long-lines set traditionally, through a setting funnel and using a seabird scrarer.

	Traditional			Setting funnel			Seabird scarer		
Day no.	Seabird	Torsk	Ling	Seabird	Torsk	Ling	Seabird	Torsk	Ling
1	0	167	25	0	80	16	0	196	20
2	0	375	105	1	356	100	0	338	142
3	9	440	40	0	475	55	0	455	120
4	21	425	30	3	570	55	2	450	38
5	14	467	13	4	400	80	0	255	10
6	0	340	20	0	450	30	0	396	60
7	5	286	50	2	380	6	0	480	20
8	14	378	54	3	605	115	0	512	208
9	22	630	90	8	460	95	0	574	50
10	14	310	50	7	272	16	0	502	170
11	0	240	0	0	265	0	0	120	0
12	0	320	40	0	310	27	0	395	38
Total	99	4378	517	28	4623	595	2	4673	876

two birds (0.04 birds per 1000 hooks) (Kruskal–Wallis, $p<0.01$; Table 2). The great majority (>95%) of the birds caught were fulmars.

The total catches of target species, torsk and ling, were similar for the three setting methods, although there was a tendency in the direction of higher catches of ling on lines set using the bird scarer. This difference in the catches of ling could be mainly attributed to the catch differences observed during three of the days (nos 3, 8 and 10; see Table 2) when several birds were caught on the lines set through the funnel and the lines set without any devices.

Discussion

Incidental by-catch of seabirds in long-lining and the associated bait loss vary due to factors such as area fished, season, light level, weather conditions and setting method. This experiment was carried out during the fulmar nesting season when lower numbers of birds frequent the offshore fishing grounds (B. Åsbø, skipper of M/S *Stålbjørn*, pers. comm.). Relatively few seabirds were thus aggregating around the vessel, and problems associated with birds taking baits were regarded as minor compared with early spring and autumn when fishermen experience severe bait losses due to seabirds. Another factor to be considered when interpreting the present results is that the experiment was conducted during the last part of a fishing trip when the trim of the vessel is less advantageous and reduces the efficiency of the setting funnel (see below).

The proportion of hooks baited in mechanized long-lining normally varies between 80–95%. This means that the bait loss caused by seabirds in this study was much lower than the figures given in Table 1. From this it also follows that the relative differences between the setting methods in bait loss caused by seabirds were higher than is suggested by the results. In a similar experiment, a large difference in losses of mackerel bait was observed between lines set using a bird scarer (26%) and lines set without using any devices (70%) (Løkkeborg and Bjordal, 1992). The setting funnel was shown to cause the proportion of hooks baited to fall. The reduced baiting efficiency was probably due to baits being thrown off the hooks when they passed through the funnel as lines are set at high vessel speed (7–8 knots) which causes high tension on the lines and the baited hooks.

Differences in the catches of target species were not demonstrated between the three setting methods tested in this study. However, as relatively few seabirds were aggregating around the vessel during the experiment, bait loss caused by seabirds was a minor problem. Bait loss rates as high as 70% caused by seabirds have been documented (Løkkeborg and Bjordal, 1992; Bjordal and Løkkeborg, 1996). Under such circumstances, larger catches are likely to be made with the help of a device that prevents birds from taking baits.

This study demonstrated large differences in accidental catches of seabirds between the setting methods tested. The relatively high number of birds caught when the funnel was in use was probably caused by the wake and turbulence created by the propeller, which may have brought the baited hooks close to the surface. Furthermore, the efficiency of the funnel evidently decreased as the fishing trip proceeded. During the trip, the pitch angle of the vessel changed as the bait storage room (aft) emptied and the main freezing room (middle/fore) filled up with the catch, the depth of the setting funnel decreasing from about 1.5 to 0.75 m (B. Åsbø, skipper of M/S *Stålbjørn*, pers. comm.). Thus it is likely that the funnel would have been more effective at the beginning of the trip, or throughout the trip by using a funnel whose length could be increased as the trip proceeded.

The efficiency of the seabird scarer may also be improved. When operating under strong wind conditions and setting lines across the wind direction, this device will be less efficient as the wind will bring the streamers out of their ideal position which is right above the line. The two birds caught when using the scarer were caught under such conditions. A solution to this problem might be to replace the floats at the end of the scarer with a device that keeps the scarer in the centre of the vessel's wake.

The population of northern fulmar has undergone massive increases of range and number over the last 2–3 centuries (Lloyd *et al.*, 1991), accompanying an increase in high-seas fishing activites during the same period. Although seabird by-catches in long-line fishing do not seem to cause declines in seabird populations in the north Atlantic, reduction or elimination of environmental effects of marine fishing activities by development of responsible fishing methods is an important topic. The combination of the seabird scarer and a modified setting funnel is proposed as a method to reduce greatly the incidental capture of seabirds in the autoline fishery in the north Atlantic. In this fishery, methods such as discharging offal during setting, weighting the lines, or using thawed bait, either are not possible or involve practical problems.

Acknowledgements

I am grateful to K. O. Mikkelsen and skipper B. Åsbø for their helpful assistance during the fishing experiment.

References

Bjordal, Å. and Løkkeborg, S. 1996. Longlining. Fishing News Books, London. 156 pp.

Brothers, N. 1991. Albatross mortality and associated bait loss in Japanese longline fishery in the Southern Ocean. Biological Conservation, 55: 255–268.

Cherel, Y., Weimerskirch, H., and Duhamel, G. 1996. Interaction between longline vessels and seabirds in Kerguelen waters and a method to reduce seabird mortality. Biological Conservation, 75: 63–70.

Lloyd, C., Tasker, M. L., and Partridge, K. 1991. The status of seabirds in Britain and Ireland. T. and A. D. Poyser, London.

Løkkeborg, S. and Bjordal, Å. 1992. Reduced bait loss and bycatch of seabirds in longlining by using a seabird scarer. Document to Working Group FSA-92 CCAMLR, Hobart, Australia, 5 pp.

Weimerskirch, H. and Jouventin, P. 1987. Population dynamics of the wandering albatross, *Diomedia exulans*, of the Crozet Islands: causes and consequences of the population decline. Oikos, 49: 195–213.