Solutions to Seabird Bycatch in Alaska's Demersal Longline Fisheries

By

Edward F. Melvin
Marine Fisheries Specialist
Washington Sea Grant Program, University of Washington

Julia K. Parrish
Professor
School of Aquatic and Fishery Sciences/Department of Zoology, University of Washington

Kimberly S. Dietrich
Research Associate
School of Aquatic and Fishery Sciences, University of Washington
and

Owen S. Hamel
Research Associate
Quantitative Ecology and Resource Management, University of Washington

In cooperation with the Fishing Vessel Owners Association, North Pacific Longline Association, National Marine Fisheries Service and U.S. Fish and Wildlife Service.

This research was funded by the Saltonstall-Kennedy Grant Program of the National Marine Fisheries Service (NMFS) award NA96FD0120, the U.S. Fish and Wildlife Service, Endangered Species and Migratory Bird Management Programs, Award 70181-9-J194, the Washington Sea Grant Program NOAA Grant No. NA76RG0119, Project A/FP-7, and the Alaska Region and the Alaska Fisheries Science Center of the National Marine Fisheries Service.

August 31, 2001

Cover Photo. Left to right, northern fulmars, black-footed albatross, Laysan albatross, and short-tailed albatross feeding on discarded offal.

Executive Summary

The incidental mortality of seabirds in longline fisheries is a serious conservation issue worldwide. In Alaska 10,000 to 27,000 seabirds are hooked each year. Most (75% of total number) are northern fulmars and gulls. However, regulatory and conservation attention is focused on bycatch of the endangered short-tailed albatross. Under the U.S. Fish and Wildlife Service's Biological Opinion, takes exceeding 6 short-tailed albatross within a 2-year period (4 in the groundfish fishery and 2 in the Pacific halibut fishery) would trigger an Endangered Species Act (ESA) Section 7 consultation and could interrupt or close Alaska's $300 million (ex-vessel value) demersal longline fishery. The Biological Opinion requires that mitigation devices be used in the fishery and that research be conducted to test their effectiveness. Our research program stems from this imperative.

This research program compared seabird bycatch mitigation strategies over 2 years (1999 and 2000) in 2 major Alaska demersal longline fisheries: the Gulf of Alaska / Aleutian Island Individual Fishing Quota (IFQ) fishery for sablefish and halibut (referred to as the sablefish fishery) and the Bering Sea catcher-processor longline fishery for Pacific cod (referred to as the cod fishery). We conducted tests over two years to account for inter-annual variation and allow for improvement and innovation. A key feature of this program was an industry-agency-academic collaboration to identify possible deterrents and test them on active fishing vessels under typical fishing conditions. We report the results of experimentally rigorous tests of seabird bycatch deterrents on the local abundance, attack rate, and hooking rate of seabirds in both fisheries. Based on our results, we recommend a suite of bycatch mitigation measures.

Our goal was to identify mitigation devices that significantly reduced seabird bycatch with no loss of target catch or increase in the bycatch of other organisms. Control sets with no deterrent established a baseline and allowed exploration of seabird interaction with longline gear as a function of temporal and spatial variation, physical factors such as wind and sea state, and fishery practices.

Deterrents tested were identified by fishers in an ad-hoc committee process and included a mix of bird scaring strategies and techniques designed to minimize the time baited hooks are at or near the surface. See table "Deterrents by Year".

Participating vessels were recruited in cooperation with the Fishing Vessel Owners Association and the North Pacific Longline Association. Data were collected by specially trained National Marine Fisheries Service (NMFS) certified observers.

Deterrents by Year

	1999	2000
Sablefish Fishery	Added weight (0.5 lb/11 m)	Single streamer line
	Paired streamer lines	Paired streamer lines
		Paired streamer lines with weight
Cod Fishery	Added weight (10 lb/90 m)	Paired streamer lines
	Mustad line shooter	Single streamer line
	Mustad lining tube	Paired streamer lines with weight

In the sablefish fishery, effort was focused along the shelf break at 500 to 800 meters in the central and western Gulf of Alaska and in the Aleutian Islands, in NMFS Management Areas 630-620, 610, and 541-542. In 1999, we fished on 3 vessels from May 14 to June 6 and set over 400,000 hooks in 121 sets. We caught 348 metric tons of fish and 90 seabirds. In 2000, we fished on 5 vessels from April 18 to July 10, nearly doubling the effort to 800,000 hooks (226 sets). We caught 606 metric tons of fish but only 23 seabirds. In both years, seabird bycatch consisted of northern fulmars (1999: 80% of total; 2000: 30% of total), Laysan albatross (18%; 61%) and gulls (2%; 9%).

In the cod fishery, most effort was focused along the 100-meter isobath southeast of the Pribilof Islands in NMFS Management Areas 509, 513, and 517. In 2000, we extended effort farther north into areas 523 and 531 in an attempt to increase interactions with albatrosses. Research was conducted on 2 fishing vessels each year. In 1999, we set almost 2 million hooks (156 sets) in August and caught over 1,500 metric tons of fish and 403 seabirds. In 2000, effort more than doubled to nearly 4.5 million hooks (334 sets) through August and September; we caught 2,800 metric tons of fish but only 27 seabirds. The primary seabirds hooked in both years were northern fulmars (1999: 87% of total; 2000: 70% of total) and short-tailed shearwaters (12%; 26%).

Between years, target fish catch per unit effort (CPUE) remained constant (sablefish fishery) or declined slightly (13% cod fishery in 2000). However, changes in seabird abundance, attack rate, and bycatch as a function of both time (year and time of day) and fishing region (for the sablefish fishery) were dramatic. All measures of seabird interaction with the fisheries were two to three times higher in 1999 relative to 2000. Thus, despite a doubling of sampling effort between years, our absolute seabird catch dropped by 74% (sablefish fishery) and 93% (cod fishery), and sets that captured birds became very rare - 15% in control sets and 5% overall in 2000 (for both fisheries). Extreme inter-annual variation in rare event phenomena such as seabird bycatch has important implications for fisheries management. Specifically, we emphasize that adequate evaluation of seabird bycatch deterrents via observer programs will require multi-year data sets.

There were also dramatic differences in seabird bycatch rates within days. Seabird bycatch was significantly higher (10x) at night and sunrise relative to day and sunset. These differences were driven by interactions with northern fulmar – the dominant species caught in this fishery and the only species caught at night. In the sablefish fishery, one Laysan albatross was caught at night in each year. In regions such as Alaska, where night-active seabird species occur, fishing at night is not an effective seabird bycatch deterrent strategy. We conclude that in the North Pacific, the regulation that allows night fishing alone as a deterrent should be eliminated.

In the sablefish fishery, regional differences were apparent. In both years, seabird bycatch was highest in the Aleutian Islands (10x the Central Gulf of Alaska in 1999) and, in general, appeared to increase as fishing moved west. We caution that our study covered only a subset (3 weeks to 3 months) of the 8-month season and that we deliberately selected times and areas for high seabird interactions. Because comprehensive technical solutions (i.e., paired

streamer lines) were effective across regions, management action calling for regional closures are unnecessary and are not recommended.

Among all deterrents tested, paired streamer lines proved to be the most comprehensive solution. Paired streamer lines successfully reduced seabird bycatch in all years, regions, and fleets (88% to 100% relative to controls with no deterrent), despite the fact that we saw orders of magnitude variation in bycatch across years and in the case of the sablefish fishery, among regions. Paired streamer lines were robust in a wide range of wind conditions and required little adjustment as physical conditions changed. Functionally, paired streamer lines created a moving fence that precluded seabird attacks. Most significantly, this success came with no consequence to catch rates of target-fish or the rate of capture of other bycatch species, thus satisfying our primary goal.

In 2000, paired streamer lines virtually eliminated both Laysan albatross and northern fulmar attacks on baited hooks and completely eliminated albatross and northern fulmar bycatch. In 1999, paired streamer lines were slightly less effective, a difference we attributed to the dramatically higher attack rates in that year, as well as to evolving performance standards. Although short-tailed shearwater attacks were displaced astern with the use of paired streamer lines, these diving birds were able to attack the groundline beyond the effective range of the streamer lines, and bycatch and attack rates of this species were unchanged relative to controls.

Single streamer lines were slightly less effective than paired streamer lines, reducing seabird bycatch by 96 percent and 71 percent in the sablefish and cod fisheries, respectively. Behavioral evidence and qualitative observations support this conclusion. When single streamers were used, Laysan albatross attack rates were five times that of paired streamer deployments. This suggests that the risk of hooking albatrosses, including the short-tailed albatross, remains when single streamer lines are used.

In both fisheries, weighting gear had no negative effect on target catch; however, the effect on seabird bycatch was variable. In 1999, adding weight to the gear in both fisheries significantly reduced seabird bycatch relative to a control of no deterrent (37% for the sablefish fishery, 76% for the cod fishery), although the effect was not as pronounced as for paired streamer lines. In 2000, the addition of weight to the groundline in both fisheries provided no improvement in the already high bycatch reduction of paired streamer lines. Although adding weight to groundlines caused gear to sink faster, differences in vessel speed and vessel characteristics proved much more important. In the cod fishery, the attachment of additional weight to the groundline posed a safety hazard during both deployment and retrieval. For weighting to be a practical seabird bycatch deterrent, the weight should be integrated into the line. Adding weight may be beneficial in some cases - e.g., if seabird interactions are intense, gear is to be set into the updraft of the propeller wash, or is set gear at higher speeds.

The Mustad line shooter tested in the 1999 cod fishery was the only deterrent that significantly increased the rate of seabird bycatch and is, therefore, not recommended. The Mustad lining tube tested in the 1999 cod fishery significantly reduced bycatch to levels comparable to adding weight to the groundline. Because performance was variable and limited by a number of factors, and because the device is costly and inappropriate for some vessels, the Mustad lining tube alone is not a recommended seabird bycatch solution for the Alaska fleet. However, an improved setting funnel that sets gear well below the influence of propeller turbulence and, hence, beyond the diving capability of most seabirds, is likely to provide an efficient and reliable method of seabird avoidance for many fisheries throughout the world.

Several additional measures are discussed, including directed discharge while setting gear and the need for report card and peer-review systems, as well as the need for national and international action.

Paired streamer lines create a moving fence that precludes seabird attacks.

Recommendations

I. REGULATORY ACTION

A. Gear

Based on the results of the research program, we recommend that existing requirements for seabird bycatch reduction (50 CFR Part 679.24(e)(3) Gear Limitations) be replaced with the following requirements.

1. Paired Streamer Lines: All Alaska longline vessels must deploy a minimum of two streamer lines while setting longline gear. If both streamer lines cannot be deployed prior to the first hook, at least one streamer line must be deployed before the first hook and both streamer lines must be fully deployed within 90 seconds. In conditions of wind speeds exceeding 30 knots (near gale or Beaufort 7 conditions), it is acceptable to fly a single streamer line from the windward side of the vessel. In winds exceeding 45 knots (strong gale or Beaufort 9 conditions), the safety of crew supersedes deployment of streamer lines.

2. Performance Standard: Streamer lines must be deployed in such a way that streamers are in the air for a minimum of 40 meters aft of the stern for vessels under 30.5 meters (100 feet) and 60 meters aft of the stern for vessels 30.5 meters or over. The performance standard can be achieved in several ways: by increasing the height off the water at the stern (recommended minimum is 20 feet), minimizing the weight of

Laysan albatross attacking a baited longline hook.

streamer line components, and/or increasing drag at the far end of the streamer line with combinations of drogues, weights, and buoys.

3. Materials Standard: Minimum streamer line specifications include:
Length: 300 feet (~90 meters)
Spacing of streamers: Every 5 meters until performance standard is achieved.
Streamer material: Brightly colored, UV-protected plastic tubing or 3/8 inch polyester line or material of an equivalent density. An individual streamer must hang from the mainline to 0.25 meters of the water in the absence of wind.
Line material: Discretionary
Terminal end: Discretionary
Breakaways: Discretionary, but highly recommended.

B. Operations
We recommend that existing requirements for seabird bycatch reduction (50 CFR Part 679.24(e)(2)(ii) Requirements) be amended to include the following:

1. Directed discharge during the set: All Alaska longline vessels must eliminate directed discharge (through chutes, pipes, etc.) of residual bait or offal from the stern of the vessel while setting gear. Baits falling off the hook or offal discharges from other locations that parallel the gear and subsequently drift into the wake zone well aft of the vessel are not included. Vessels deploying gear amidships must eliminate directed discharge of residual bait or offal over sinking longlines during deployment.

II. OPTIONAL NON-REGULATORY ACTIONS
Based on qualitative observations, we recommend that the following actions be taken to minimize seabird interactions with longline gear, promote stewardship within the fishing fleet, and address bycatch at national and international levels:

A. Gear
1. Hand-Bait Chutes: Develop methods to deploy weights in a way that prevents longlines from going taut while setting gear. Actions might include a modification to the chute by adding a setting shelf that would prevent the need to lift weights from the deck up the full height of the chute thereby minimizing tension to deployed gear.

2. Auto-Bait Systems: Encourage companies that manufacture and sell auto-bait systems to refine designs to minimize hook foulings.

B. Education and Outreach
1. Report Card: Institute a system to annually inform the owners and operators of longline fishing vessels of their seabird bycatch numbers and rates (per 1,000 hooks) relative to their fleet based on NORPAC data. Fleets include IFQ sablefish, Pacific cod, and Greenland turbot. The Pacific halibut fleet should be included if observer data become available.

2. Peer System: Develop an industry-based peer system to reward vessels that successfully avoid seabird bycatch. Encourage dialogue among fishers to share information and methods to minimize the incidental capture of seabirds.

3. Fleet Education: Develop and deliver an education program targeting vessel owners, operators, and crew, illustrating the proper deployment and use of streamer lines, as well as the need for seabird conservation and related regulations.

4. National Action: Encourage other U.S. fishery management councils, including the Pacific Fishery Management Council and the NMFS Northwest Region, to extend recommended regulatory measures to demersal longline fleets in their jurisdiction. Extend recommended regulatory actions to Pacific halibut fisheries.

5. International Action: At a minimum, all demersal fisheries should use properly deployed paired streamer lines and eliminate directed discharge of residual bait and/or offal over sinking longlines. In the longterm, longlining nations in the Pacific Rim should be encouraged to develop, test and ultimately require seabird bycatch deterrents in their demersal and pelagic longline fisheries which virtually eliminate all seabird bycatch under all fishing conditions without the need for oversight and enforcement.

III. Future Research
Research programs testing seabird deterrent strategies are limited by existing technologies. Continued innovation and technology development are required in Alaska fisheries and worldwide to minimize seabird bycatch in longline fisheries. Accordingly, we recommend the following:

A. Fleet Innovation
Encourage continued development of seabird bycatch avoidance measures by the Alaska fleet.

B. Novel Technologies
Encourage the development of designs and technologies that eliminate the need to fly streamer lines. These include:

1. Underwater Setting. Technologies that deploy longlines below the surface beyond the reach of seabirds (tubes and chutes or novel hull designs).

2. Line Weighting. Fishing line that sinks quickly below the surface but also maintains the handling qualities valued by fishers.

30 Years as a Sea Grant College 1971-2001
Washington Sea Grant Program
University of Washington

Sea Grant Washington

Washington Sea Grant Program
Office of Marine Environmental and Resource Programs
College of Ocean and Fishery Sciences
University of Washington
3716 Brooklyn Avenue N.E.
Seattle, WA 98105-6716
206.543.6600
206.685.0380 fax
seagrant@u.washington.edu
http://www.wsg.washington.edu