# Test Plan
# to Evaluate Effectiveness of Seabird Avoidance Measures Required in Alaska's Hook-and-Line Groundfish and Halibut Fisheries

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With significant contributions by:
U.S. Fish and Wildlife Service, Endangered Species/Ecological Services; U.S. Fish and Wildlife Service, Migratory Bird Management; International Pacific Halibut Commission; Washington Sea Grant Program.

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Note: This test plan is a working document which will be updated and amended as needed. Comments should be directed to: Dr. Steve Zimmerman, Assistant Administrator for Protected Resources, National Marine Fisheries Service, P.O. Box 21668, Juneau, AK 99802

Definitions of some terms are provided in Appendix E

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## INTRODUCTION

Seabird bycatch in longline fisheries is a global problem, and has received considerable attention in recent years from resource agencies, industry and the environmental community. “Seabird bycatch” in longline fisheries is the incidental mortality of seabirds on longline hooks. Mortality occurs if seabirds attempt to steal bait from longline hooks as the line is being deployed from the stern of the fishing vessel. Until the line sinks below a depth at which it is accessible to surface feeding seabirds, it attracts birds; birds that attempt to take bait off the line can be hooked, dragged underwater and drowned. Seabird bycatch occurs internationally, but the magnitude of the problem in fisheries around the North Pacific has only recently become evident.

Longline fisheries in Alaska’s waters are demersal longline fisheries, and in general use three types of longline gear: autoline, fixed and snap gear. Autoline gear consists of a machine that baits the hooks as they are set, and racks the hooks in a magazine upon retrieval. Fixed gear consists of sections of groundline that get baited, tied together, set, and retrieved by crew members. Snap gear is groundline wound on a drum such that baited hooks are snapped onto the line as it spools off the drum, and unsnapped as the drum retrieves the line. Autoline gear is used almost exclusively by large freezer vessels which fish for Pacific cod and sablefish. Fixed gear is used by freezer longliners, by some other vessels fishing for groundfish, and by most halibut and sablefish vessels. Snap gear is used by smaller halibut and groundfish vessels, by inexperienced crews, or in regions that prefer the gear for other reasons.

In all cases, the gear interacts with the water in a similar manner (Figure 1). Gear on fixed gear vessels is set off the stern over a chute that uses centrifugal force to straighten out the gangion and drop the bait away from the groundline to minimize tangles. The groundline and bait float for a

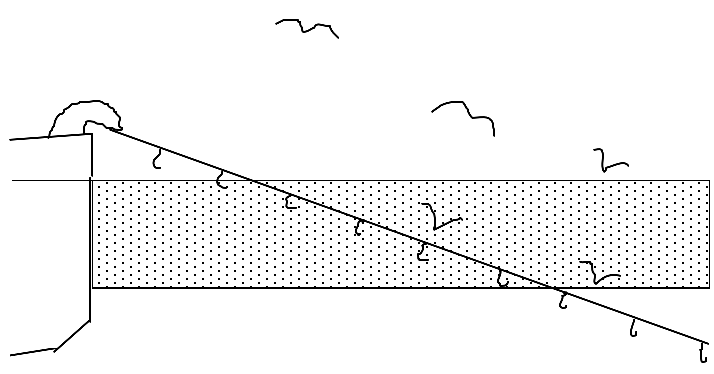

**Figure 1**. Illustration showing longline gear deployment from the stern of a longline fishing vessel. Shaded area represents the "vulnerable zone" within which seabirds can access baited hooks.

few seconds before sinking as a result of anchors attached (about 20 kg) at the beginning of the set, and sometimes additional weights (0.5-2 kg) on the groundline. The groundline will sink at various rates depending on vessel speed, groundline weighting, and weather.

Bird mortality from longlines occurs in three steps. First, birds must land in the vicinity of the longline gear. Second, birds must then attack the bait before it sinks out of range. Third, birds must take the hook, get caught, dragged underwater and drown. Each of these steps offers an opportunity to decrease the vulnerability of birds to longline mortality.

Conversations with fishermen indicate that the bait and groundline sink below seabird attack range within about 25-30 m (about one boat length) after the line enters the water, and that birds will only attack bait when they are within 3-6 m laterally of the groundline. In windy conditions, birds land only on the down wind side of the groundline, as the birds must fly into the wind to land.

Techniques have been developed by fishery managers around the world to minimize seabird bycatch in longline fisheries. These range from very inexpensive measures (attaching weights to the groundline or flying tori lines over the groundline) to moderately expensive measures (refitting vessels with tubes that permit underwater deployment of the line). Studies have shown that some measures significantly reduce bait loss/seabird mortality; for example bait loss was reduced by up to 69% with the use of a tori line (see Appendix E for definitions of terms) during a study on a Japanese longline vessel off the Tasmanian coast (Brothers 1991).

In Southern Oceans, use of specific deterrent methods is required by regulation; in other fisheries, the use of deterrent devices has been promoted by outreach and education efforts that emphasize the reduction in bait loss resulting from correctly deployed deterrent devices and methods.

Seabird bycatch occurs in Alaska's longline fisheries: mortalities have been documented by fishery observers in the groundfish fishery, and are also likely to occur in the halibut fishery due to similarity in fishing gear, techniques and areas. The magnitude of seabird bycatch in the Pacific halibut fishery is unknown because most of the fishing effort is currently unobserved. Preliminary estimates by the U.S. Fish and Wildlife Service (USFWS; R. Stehn, pers. comm.) for groundfish observer data collected and summarized by the NMFS Observer Training Center indicate that the rate of take may be close to one bird mortality for every 10,000 hooks set. Given that approximately 15 million hooks are set annually in the halibut fishery and approximately 201 million hooks are set annually in the groundfish fishery in Alaska (excluding halibut), the number of seabirds potentially killed as bycatch of longline fishing in Alaska could be significant at the population level for species at low abundance or species facing significant threats. Analyses are currently being conducted by the USFWS to estimate numbers of birds, by species, that have been taken annually in Alaska's groundfish fisheries. Once these analyses are complete, this information may be used in developing or refining methodology for the test program.

In recognition of the seabird bycatch problem in Alaska, the National Marine Fisheries Service (NMFS) recently issued regulations that require operators of groundfish longline vessels in Alaska to employ seabird bycatch avoidance gear and methods intended to reduce seabird bycatch and incidental seabird mortality. Promulgation of these regulations was expedited in Alaska by the need to reduce the likelihood of "take" of the endangered short-tailed albatross (*Phoebastria albatrus*), but reducing mortality of other unlisted seabirds is also a recognized goal. The regulations were based on a request from longline fishermen to the North Pacific Fishery Management Council, who recognized that seabird bycatch, especially of the endangered short-tailed albatross, could have negative implications for the future of the fishery if unaddressed. In March 1998, the requirements for seabird avoidance measures were expanded to include vessels in the Pacific halibut fishery.

To reduce the incidental take of seabirds in the Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA) groundfish longline fisheries and the Pacific halibut fishery, vessels are required to:

(1) Use hooks that when baited, sink as soon as they are put into the water.

(2) Discharge offal from vessels in a manner that distracts seabirds, to the extent practicable, from baited hooks while gear is being set or hauled. The discharge site on board a vessel must either be aft of the hauling station or on the opposite side of the vessel from the hauling station.

(3) Make every reasonable effort to ensure that birds brought on board alive are released alive and that wherever possible, hooks are removed without jeopardizing the life of the birds.

(4) Employ one or more of the following seabird avoidance measures:
   - (a) Tow streamer line or lines during deployment of gear to prevent birds from taking hooks;
   - (b) Tow a buoy, board, stick or other device during deployment of gear, at a distance appropriate to prevent birds from taking hooks. Multiple devices may be employed;
   - (c) Deploy hooks underwater through a lining tube at a depth sufficient to prevent birds from settling on hooks during deployment of gear; or
   - (d) Deploy gear only during specified hours of darkness, using only the minimum vessel lights necessary for safety.

Vessels less than 26 feet length overall are exempt from the requirements under number (4) above.

Critics of these regulations have argued that the more stringent measures required by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR 1996) in southern oceans (Appendix A) should be adopted in Alaska's fisheries. Although similar to NMFS regulations in many ways, CCAMLR regulations are more stringent in that they require vessels to set longlines only at night, and to deploy tori lines at all times during fishing operations. However, there are currently no data on the effectiveness of any deterrent measures in Alaska's fisheries. The appropriateness of the CCAMLR measures for the conditions of the Gulf of Alaska and Bering Sea is therefore unknown. NMFS and USFWS agreed to endorse more flexible requirements initially for Alaska to allow fishermen, managers and scientists to experiment with devices and determine their effectiveness. Testing the effectiveness of seabird bycatch avoidance measures will allow NMFS to better ascertain if they are effective in the Alaskan fisheries. Once measures have been tested, NMFS will be better able to revise regulations to maximize their effectiveness. This may include specific performance standards for the seabird avoidance measures, if appropriate.

Studies in southern oceans have indicated that restricting longline sets to hours of darkness can significantly reduce bait loss and therefore reduce seabird mortalities (Brothers 1991). However, before such a measure could be employed in Alaska's fisheries, a careful evaluation of the feasibility of conducting all sets during darkness must be undertaken. In the Bering Sea for example, a requirement for setting during hours of darkness could prohibit fishing during summer months. If other methods are available to effectively reduce seabird mortalities during the times of year and in areas where there is little or no darkness, those methods should be employed first. Additionally, the potential affect on night-foraging seabird species in this oceanic region would also need to be evaluated.

Under the Endangered Species Act of 1973, as amended (ESA), the short-tailed albatross is afforded certain protections. Under section 7(a)(2) of the ESA, any agency that authorizes, funds or carries out an activity that may affect a listed species must ensure that the action is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. Compliance with section 7(a)(2) for endangered or threatened seabirds is accomplished through interagency consultation with the USFWS.

Biological Opinions prepared by USFWS on the effects of the groundfish and halibut fisheries on the endangered short-tailed albatross determined that the fisheries are not likely to jeopardize the continued survival and recovery of the species. The accompanying incidental take statements authorize incidental take of up to 4 short-tailed albatrosses (as reported by fishery observers) every 2 years in the groundfish fishery, and up to 2 short-tailed albatrosses every 2 years in the halibut fishery. Included in these authorizations, however, are mandatory "reasonable and prudent measures" which NMFS is required to undertake to minimize mortality of short-tailed albatrosses in the fisheries. These direct NMFS to : 1) require the use of seabird deterrent devices, 2) develop a plan to test the effectiveness of the required seabird bycatch avoidance gear and methods, and 3) implement the test plan. The ESA also requires, under section 7(a)(2) that federal agencies utilize their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of listed species. This research plan has been prepared in compliance with section 7 of the ESA.

## Biology of Affected Species in the Gulf of Alaska and Bering Sea/Aleutian Islands

In Alaska's longline fisheries, which occur in the GOA and BSAI areas, mortalities have been reported for the following species of seabirds at levels which cause concern: short-tailed albatrosses, black-footed albatrosses (*Diomedea nigripes*), Laysan albatrosses (*Diomedea immutabilis*), northern fulmars (*Fulmarus glacialis*), shearwaters, and gulls. Preliminary analyses of groundfish fishery observer data on seabird mortalities conducted by USFWS indicate that norther fulmars are the species most frequently caught on Alaska groundfish fishery longlines with an estimated annual take of 8,450 northern fulmars in the GOA and BSAI annually between 1993 and 1996. The preliminary estimates for annual mortalities for short-tailed, black-footed and Laysan albatrosses during the same period were 1 bird, 538 birds, and 938 birds respectively. The preliminary estimate for total annual bird mortalities was 13,042 birds including fulmars, gulls, shearwaters and albatrosses. The following summaries provide some information on population status and distribution of the affected species.

Short-tailed albatross

Short-tailed albatrosses were once considered the most common albatross ranging over the United States continental shelf (Sherburne 1993). Reports of the species in the late 1800s and early 1900s characterized the species as “more or less numerous” in the vicinity of the Aleutian Islands (Yesner 1976), abundant around Cape Newenham in western Alaska (Turner in DeGange 1981), and abundant near the Pribilof Islands (Ventaiminov in DeGange 1981). Remains of short-tailed albatrosses found in middens suggest that hunters in kayaks had access to an abundant nearshore supply of the species from California north to St. Lawrence Island (Howard and Dodson 1933, Murie 1959, Yesner and Aigner 1976).

Historically, short-tailed albatrosses nested on numerous Japanese islands in the Western Pacific Islands but the breeding range for the world’s population is now restricted to two islands: the main colony on Torishima Island and a very small colony on Minami-Kojima Island. The ownership of Minami-kojima is disputed between Japan, the Peoples Republic of China, and the Nationalist Republic of China (Sherburne 1993). These two islands are remnant populations of the numerous historic breeding sites known during the 1800s. The species is a Special National Monument in Japan, and Torishima Island is a Japanese Nature Reserve National Monument (Hiroshi Hasegawa, Toho Univ. 1997, pers. comm.)

Short-tailed albatross are thought to have historically numbered in the low millions (Hasegawa and DeGange 1982). Over 5 million short-tailed albatrosses were harvested between 1885 and 1903 from breeding colonies in Japan (Sherburne 1993) for down (used in pillows and quilts), feathers (used for writing quills), and for use in fertilizer and other products (Yamashina in Austin 1949). In addition, the largest colony at Torishima Island in Japan, was inundated by volcanic lava and ash in 1903 and 1939; this colony, also heavily harvested, was reduced to less than 50 birds, which apparently represented the world population of short-tailed albatrosses at that time (Tickell 1975). The population on Torishima Island had increased to at least 100 birds by 1951 (Environment Agency 1980).

Over the past several decades, significant efforts by Japanese scientists and the Japanese government have resulted in a steady increase in the number of short-tailed albatrosses on Torishima Island. The adverse effects of mudflows have been somewhat mitigated by habitat restoration work on the island. Current population enhancement efforts are focused on attracting breeders to an alternate breeding site on Torishima that is less likely to be decimated by mudflows.

The population of short-tailed albatrosses on Torishima Island continues to grow. Nevertheless, the world population remains perilously low; the breeding population is currently fewer than 400 individuals, and the total world population numbers fewer than 1000 birds.

Short-tailed albatrosses are listed under the ESA as endangered outside the United States (listing within the U.S. was excluded due to an administrative oversight, but the USFWS is currently preparing a proposal to apply the endangered status throughout the range of the species). This species is considered by the IUCN to be endangered (80% decline in the past 10 years or three generations, whichever is longer), with criteria C1 (number of mature individuals <250 with a decline of 25% in the past three years or 1 generation, whichever is longer; World Conservation Monitoring Centre 1998).

The USFWS short-tailed albatross observation database documents the location of short-tailed albatrosses opportunistically observed at sea in the GOA and BSAI since the late 1940s (Figure 2). Many of these observations came from observers or fishermen on fishing vessels; distribution information may therefore be biased towards locations where vessels fish. The temporal distribution of short-tailed albatross observations by fishery observers in Alaskan waters since 1990, corrected for variation in observer coverage in each month (called the abundance index; Stehn, pers. comm., USFWS 1998), shows a definite seasonality to the species presence in Alaskan waters (Figure 3). These data suggest that short-tailed albatrosses are far more abundant in waters off Alaska between May and September, their nonbreeding season.

Five short-tailed albatrosses are known to have been taken by longline fisheries in Alaska from 1983-1996. It is likely that additional birds have been taken but were either not reported, fell off the hook before haul, or were not correctly identified by observers or crew. Although the world population of short-tailed albatrosses is slowly increasing despite take associated with longline fishing, the population is vulnerable to catastrophic losses from monsoon rains, volcanic activity, oil spills or other factors. If the recovery of the species were slowed due to catastrophic events or other factors, actions required for conservation of this species could adversely affect the fishing industry. The best defense against this possibility is to ensure that bycatch of seabirds is reduced as much as possible through aggressive and consistent use of deterrent measures during longline fishing.

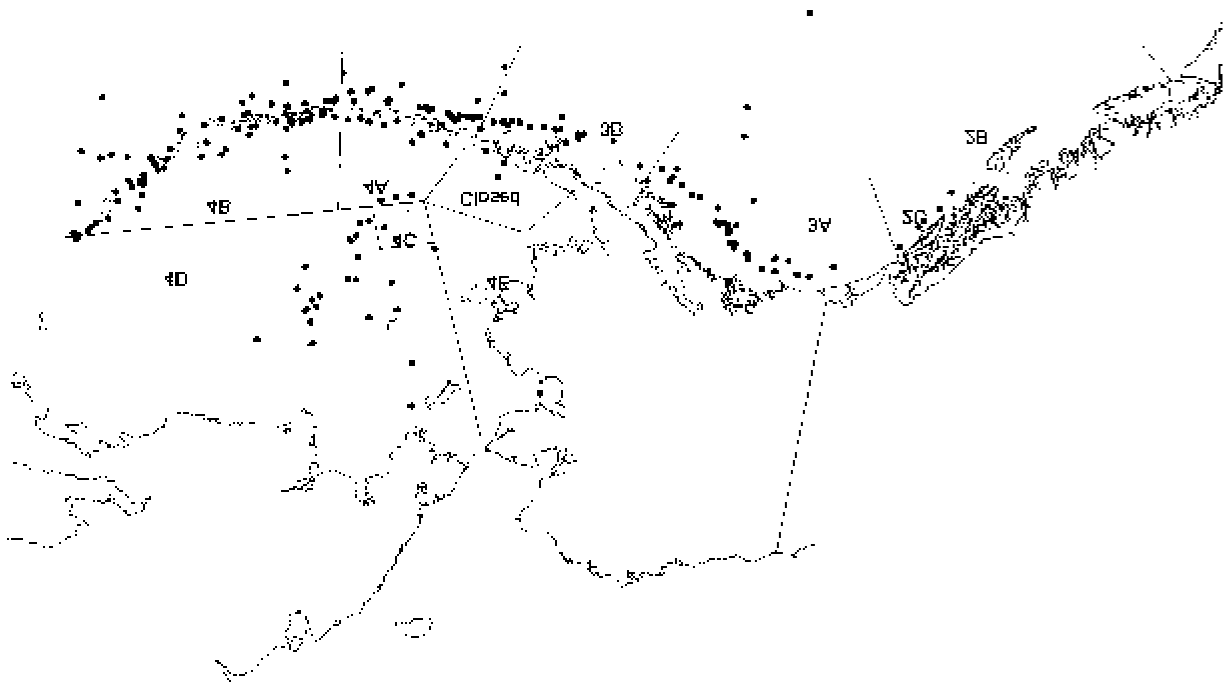

**Figure 2.** Location of short-tailed albatross sightings in the U.S. Fish and Wildlife Service short-tailed albatross database. Points are overlaid on a map of IPHC regulatory zones. Locations may partially represent distribution of groundfish and research vessels within the albatross' range.

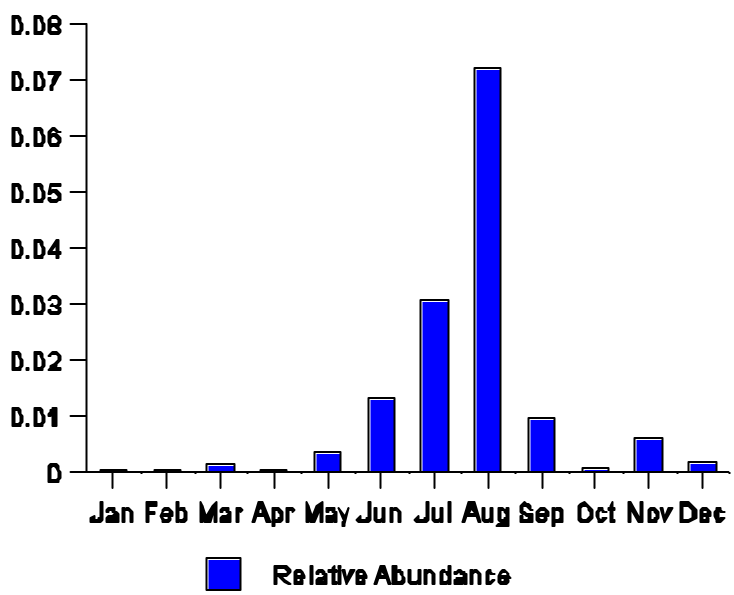

**Figure 3**. Abundance index for short-tailed albatross in waters off Alaska. Generated from groundfish observer data adjusted for observer effort.

Black-footed albatross

Black-footed albatrosses breed in numerous colonies on islands in the Hawaiian chain, and in several small colonies on islands south of Japan. They range throughout the North Pacific north into the Bering Sea (McDermond and Morgan 1993). As a result of surveys conducted between 1979 and 1982, the world's breeding population of black-footed albatrosses was estimated at 50,000 pairs with an estimated total population of 200,000 birds (McDermond and Morgan 1993).

Black-footed albatrosses are regular non-breeding visitors to the Gulf of Alaska, but are uncommon in the Bering Sea (Gould et al. 1982). In Eastern Pacific waters, black-footed albatrosses outnumber Laysan albatrosses, but Laysan albatrosses tend to outnumber black-footed albatrosses in the Western Pacific and Bering Sea (Gould et al. 1982). During shipboard and aerial surveys in the 1970s, black-footed albatrosses were observed from March through November over the deeper waters of the GOA; monthly frequency and relative abundance were high from June through October, and peaked in September (Gould *et al.* 1982). Black-footed albatrosses were uncommon in the Bering Sea and were restricted to deep waters near the Aleutian Islands (Gabrielson and Lincoln 1959); sightings in the Bering Sea occurred between July and October (Gould et al. 1982, Schneider and Shuntov 1993). Black-footed albatrosses are surface feeders, feed both day and night, and their diet includes squid, crustaceans, and offal (Shuntov in Schneider and Shuntov 1993).

Laysan albatross

Laysan albatrosses breed in numerous colonies on the Hawaiian Islands, in two small colonies off Baja California, and in one small colony on Torishima Island south of Japan (Gould and Hobbs 1993, McDermond and Morgan 1993). Surveys between 1979 and 1982 indicated a total breeding population of 380,000 breeding pairs and a world population of approximately 2.5 million birds (Fefer et al. in McDermond and Morgan 1993). Comparison with historical numbers appears to indicate an increasing trend in the population, but differences in census techniques could account for this difference (McDermond and Morgan 1993).

Laysan albatrosses are more abundant in the Bering Sea than in the Gulf of Alaska (Gould *et al.* 1982). In the Bering Sea, they outnumber and occur farther north than black-footed albatrosses (Gould et al. 1982). In winter, distribution is restricted to more southern locations in the Bering Sea (Schneider and Shuntov 1993). In the Gulf of Alaska, observations were recorded from March through November throughout deeper waters during shipboard and aerial surveys in the 1970s; monthly frequency and relative abundance were highest in September and October in the Gulf (Gould et al. 1982). Most sightings in the Gulf of Alaska were near s waters in the western half of the area (Gould et al. 1982). Laysan albatrosses are surface feeders and feed both day and night (Schneider and Shuntov 1993).

Northern Fulmar

Northern fulmars breed on offshore islands in the Bering Sea and eastern GOA, and are found year round throughout the Bering Sea and along the coast as far south as southeast Alaska. They are crepuscular surface feeders with a diet concentrated on fish and invertebrates that rise to the surface at night, but they also feed offal from factory ships (Schneider and Shuntov 1993; Schneider et al. 1986, Hunt et al. 1988). In the Bering Sea, they are uncommon over waters greater than 50m deep except along the 200m isobath between Unimak Pass and the Pribilof Islands (Gould et al. 1982). Northern fulmars are also resident throughout the Gulf of Alaska with numbers at sea highest in or near s habitats (Gould et al. 1982).

Northern fulmars are “strongly attracted” to ships which they will “follow for extended periods of time feeding on garbage or offal thrown overboard” (Gould et al. 1982).

<u>Shearwaters</u>

Shearwater species most common in the North Pacific and therefore most likely to be caught on longline hooks in Alaska’s fisheries are sooty shearwaters (*Puffinus griseus*) and short-tailed shearwaters (*Puffinus tenuirostris).* Sooty and short-tailed shearwaters occur in the Bering Sea and GOA during the summer and fall (Gould et al. 1982). Diets of these shallow-diving feeders includes fish and zooplankton. Other shearwaters that may be caught on longlines includes flesh-footed shearwaters (*Puffinus carneipes*) and pink-footed shearwaters (*Puffinus creatopus*).

<u>Gulls</u>

Gull species most common in pelagic waters of the GOA and BSAI, and therefore most likely to be caught on longline hooks in Alaska’s fisheries are glaucous gulls (*Larus hyperboreus*) and glaucous-winged gulls (*Larus glaucescens*). In the Bering Sea, both species are found over s habitats between the eastern Aleutian and Pribilof Islands; glaucous-winged gulls are also common over bay and continental shelf habitats in the same area (Gould et al. 1982).

## OBJECTIVES

The objectives of this test plan are to:

1. Obtain high quality information on the effectiveness of seabird deterrent devices in North Pacific waters on which to base future amendments to the regulations requiring the use of seabird deterrent devices in Alaska’s longline fisheries;

2. Minimize the bycatch of seabirds in Alaska’s longline fishery;

3. Ensure that the fisheries and the agencies are in compliance with the Endangered Species Act and the Migratory Bird Treaty Act;

4. Minimize future risk to the groundfish and halibut fishery by maximizing the effectiveness of seabird deterrent devices and reducing the likelihood of short-tailed albatross mortalities.

5. Continue to use a partnership approach with industry, the resource agencies, and others to

address the issue of seabird bycatch.

## IMPLEMENTATION SCHEDULE

This Plan outlines a process by which mitigation measures for Alaska's longline fisheries will be evaluated. An effective program of evaluation cannot be based on one approach; information must be collected and evaluated through a variety of mechanisms. The elements of the plan have been outlined for implementation in phases. This will allow for incorporation of results from tasks in phase I to be incorporated in subsequent phases, and will allow for some flexibility in timing of implementation to accommodate resource constraints. Further changes in scheduling may be required if the resources to implement the plan on the identified schedule are not obtained, or if unanticipated resources become available. The implementation schedule is as follows:

**Phase I** (1998-2000)

A. Comprehensive Literature Review: complete a report analyzing existing information, both domestic and international, on the effectiveness of seabird deterrent devices on longline fishing vessels globally.

B. Report on Night Fishing: complete a report analyzing existing information on the potential conservation benefits for seabirds, and feasibility of implementing, a requirement for night setting for longline fishing in the GOA and BSAI areas. If the report indicates that implementation of night fishing should be considered, experimental tests of the effectiveness of night fishing in reducing seabird bycatch should be planned.

C. Methodology Development: develop methodologies for: 1) designed experiments to test effectiveness of specific deterrent measures and, 2) data collection by observers on the effectiveness of deterrent measures used aboard observed vessels.

D. Fishing Industry Input/Data: continue to solicit and gather information from fishermen on effectiveness of seabird deterrent measures they have used. Conduct public meetings and attend association meetings to solicit input on specific measures, and compile input into annual reports.

**Phase II** (1999-2000)

A. Experimental Testing: conduct designed experiments to evaluate, as a minimum, the effectiveness of tori lines and bird buoys in deterring seabirds from baited longlines. Complete a report on the results of the experimental testing and make recommendations for: 1) any changes needed to the existing regulations on seabird deterrent measures, 2) need for further testing, and 3) any changes in methodology for future testing.

B. Special Project Seabird Observers: deploy a limited number of fishery observers in both the groundfish and halibut fisheries (approximately five 3-week observer trips in each fishery) for a special project to observe and record information on deterrent devices and seabirds. Complete a report on the results of the observer project and make recommendations for: 1) any changes needed to the existing regulations on seabird deterrent measures, 2) need for further testing, and 3) any changes in methodology for future testing.

C. Fishing Industry Input/Data: continue to solicit and gather information from fishermen on what seabird deterrent measures are effective. Conduct public meetings and attend association meetings to solicit input on specific measures, and compile input into annual reports.

**Phase III** (2000-2002)

As recommended by reports, or determined necessary, conduct additional experiments, continue deployment of special project observers, and continue to solicit and compile input from industry.

Specific objectives, materials and methods, and reporting plans will be organized by the implementation schedule outline for the remainder of this document.

## PHASE I

### A. Comprehensive literature review

Limited information exists on the effectiveness of seabird deterrent devices worldwide, and no scientifically collected information exists to evaluate the use of specific deterrent devices in the North Pacific. The first step of the test plan is to compile all available information, from both scientific reports, education and outreach materials, anecdotal reports, and any other source into a report. Much of this information has recently been compiled by several authors into reports for the Food and Agriculture Organization's international consultation on the global seabird bycatch problem. Once these reports become available outside the FAO seabird bycatch technical committee, the information should be synthesized into a literature review.

### B. Report on Night Fishing

Information from other fisheries globally indicates that night fishing may be one of the most effective ways to reduce seabird bycatch on longlines. Night fishing is required in CCAMLR regulations, but was included only as one option in Alaska's regulations. Critics of Alaska's regulations have argued that night fishing should be more stringently required in Alaska. However, it is unclear whether night fishing would be an effective seabird deterrent measure in Alaska. Laysan albatrosses and northern fulmars are known to feed at night in the North Pacific. In addition, at least in certain areas during summer months, there is little or no darkness available. Therefore, a report should be prepared which analyzes the potential benefits and the potential problems that are associated with night setting in Alaska's fisheries.

**C. Methodology development for experiments and observers**

The NMFS Auke Bay Laboratory, in cooperation with the Juneau Sustainable Fisheries Division, developed a proposed protocol (hereafter referred to as the Auke Bay protocol) for the seabird test plan (Appendix B). Sections of the Auke Bay protocol have been incorporated into this Plan; the remainder of the Auke Bay protocol can be used as a helpful reference in developing the specific methodologies for the test plan.

The goal of the methodology development phase of the project is to develop protocols for both research cruises and for dedicated seabird observer projects. The effectiveness of seabird deterrent devices is difficult to measure because of the many factors that contribute to the number of seabirds that are attracted to baited hooks or hooked during a given longline set. Therefore, sampling protocols must be developed carefully, and with adequate input from experts in sampling design for fisheries/seabird interactions. This document does not outline specific protocols, but rather provides guidance for development and implementation. A contract should be issued to an appropriate contractor to develop methodologies for hypothesis testing, data gathering and analyses. Methodology development will include at-sea testing of proposed protocol; opportunity will be provided for agency and industry personnel to participate in one or more days of the at-sea tests.

Contractors for design and implementation of the experiments should include individuals with substantial experience and skills in the following areas: 1) design and implementation of quantitative seabird surveys at sea, 2) identification and censusing of seabirds from a shipboard platform, 3) quantifying and distinguishing seabird behaviors, 3) sampling design for field experiments, 4) quantitative analyses of survey results, 5) commercial longlining techniques.

Experiments should be designed to yield statistically sound sample sizes given the specifics of the conditions in which they will be conducted.

Before experiments are implemented, application should be made to USFWS (Greg Balogh, USFWS, Anchorage Field Office, 907-271-2778) for an endangered species research or incidental take permit to authorize any incidental take of short-tailed albatrosses during the study. Application must also be made to USFWS (Karen Laing, USFWS, Migratory Bird Management, 907-786-3459) and the State of Alaska for collecting permits.

**D. Fishing Industry Data**

The use of information from fishermen about the effectiveness of deterrent devices is critical to the success of the evaluation program in improving the effectiveness of seabird deterrent measures. The current regulations incorporate some flexibility to allow fishermen to experiment with different methods and determine what works under their specific fishing conditions. Some individuals are devoting considerable effort to developing the most effective methods possible on their vessels; their methods and successes should be recorded. This information can be used by other fishermen to improve their bycatch reduction, and by the agencies in evaluating potential changes to the regulations.

Input from the fishing community must be actively sought by NMFS through public meetings, and through other opportunities to meet with fishing associations or groups. Public meetings will be held once or twice a year by NMFS representatives to solicit input on all available methods. Announcements for public meetings should be published in the Federal Register and planned at a time of year when fishermen are available. NMFS representatives should attend Fish Expo and Comm Fish meetings annually and either co-host or host a seabird bycatch booth and a seminar on seabird bycatch to solicit input.

All input received from meetings, seminars or other sources should be compiled into an annual report.

## PHASE II

### A. Experimental Testing

The first year of experimental testing will be conducted to obtain information on the effectiveness of at least two specific methods used to discourage or prevent seabirds from accessing baited hooks including tori lines and bird buoys. If resources allow, the effectiveness of weighting lines, other gear modifications, or changes to fishing procedures such as offal dumping techniques should also be evaluated. Once these experiments are complete, the results of all elements of phases I and II of the plan should be evaluated to determine if additional experimental testing of these or other measures is warranted (Phase III). Important considerations for methodology are discussed here, and some specific approaches are outlined in the Auke Bay protocol (Appendix B) which can be used as a reference for methodology development. Contractors or individuals to implement the experimental phase of the Plan should have the same qualifications outlined under Phase IC.

Factors that can be used to evaluate the effectiveness of deterrent devices will be evaluated during methodology development and include:

1. Number of seabirds, by species, in the vicinity of the vessel at set intervals during line setting;
2. Number of seabirds within the zone where the line is accessible to them (the "vulnerable zone") during set intervals during line setting;
3. Number of seabird feeding attempts on baited hooks during line setting;
4. Number of seabirds observed hooked during setting;
5. Number of seabirds retrieved dead on hooks during line hauling.

Risk to a seabird occurs any time a bird can access a baited hook. Bait can be accessed by a bird any time it is between the stern of the vessel and the point where it sinks beyond the diving depth of the bird. This area can be called the "vulnerable zone". If the vulnerable zone can be identified, the effectiveness of a seabird deterrent measure could be evaluated based on numbers of birds inside or outside the vulnerable zone. The zone may be defined using instruments such as time-depth recorders, through observations from a skiff behind the vessel, from behavioral observations of seabirds following the vessel, or through other methods. For example, at a constant speed, the rollers in the wake occur at a fixed distance behind the vessel. Using laser range finders, calibrated tow lines or other measures, roller characteristics (first trough, second peak, etc.) could be converted into distance, and used to identify the boundaries of the vulnerable zone.

The size and distance astern of the vulnerable zone depends on a number of factors including gear type, vessel, weather, sea state, the weight of the groundline and amount of weight added to the groundline. Gear configuration (except deterrent device) should be standardized for all treatments including line weights, length of line, number of hooks, hook spacing, anchoring, and speed of set.

The most direct measure of effectiveness of a seabird deterrent device is the number of seabird mortalities resulting with or without the use of that device. This approach has been used in several studies in other fisheries (Murray et al. 1993, Duckworth 1995). However, captures usually are rare (preliminary estimates for mortality rates in Alaska's groundfish fishery is 1 bird per 10,000 hooks), requiring large sample sizes for experiments with enough power to differentiate treatments. Based on an initial study, Melvin et al. (1997) estimated that at least 150 sets would be required per gear treatment to detect significant differences in bird entanglement rates among factors.

Alternatively, or in addition to number of mortalities, the level of risk to seabirds can be assessed by the proportion or number of seabirds who can access the baited hooks (those who are in the vulnerable zone), or by the number of attempts made by seabirds to take bait from hooks. These approaches have been used in other studies of seabird incidental take (Brothers 1991, Cherel et al. 1996) and should require smaller sample sizes. Numbers of birds or numbers of feeding attempts can be compared between treatments and control sets to compare mortality risk with or without seabird deterrent measures.

Indexing the numbers and species of birds during each treatment likely will be important for evaluating results of the experiments. The number of birds following a specific longline vessel in Alaska's fisheries is likely to range from several to hundreds of individuals. Accurate censusing and identification of seabirds during deployment is likely to be challenging because birds following a vessel are constantly moving, may move in and out of view behind ocean swells, and may occur in large numbers within a small area behind the vessel. Brothers (1991) visually counted albatrosses during deployment at half-hour intervals. Cherel et al. (1996) found that it was not possible to count total numbers during deployment because most birds were very active; counts were made following deployment when seabirds were relatively quiet. Censusing methods for this project must be carefully evaluated, and may include scanning surveys to estimate total abundance and abundance in the vulnerable zone, or focal animal surveys to track behavior of individual birds. Census counts and bait attack counts may be conducted simultaneously if two observers are used, or may be alternated by skates during a set.

Data recording can be accomplished in a number of ways; manual recording, direct entry of data into laptop computers, the use of a global positioning system, and audio recording of data on portable tape recorders should all be evaluated. The Auke Bay protocol specified use of video to record numbers of seabirds and seabird interactions behind the vessel. There is contention by some experts that video may not be a viable data recording method for this project. The practicality and efficacy of using video should be evaluated during the research cruise.

Environmental factors, time of day and year, vessel configuration, geographic location, condition and number of seabirds following the vessels and other factors can affect the level of risk to seabirds and the performance of seabird deterrent devices. These factors should be standardized in the experimental design so that the only factor varying is the presence or absence and type of deterrent device. Standardization of these factors through analysis is difficult due to the number of factors and the interaction of the factors' effects; an alternate approach is to pair all treatments in the field experiment. An experimental replicate would consist of a longline deployment of treatment A, the longline would be hauled, followed by longline deployment of treatment B, the longline would be hauled, etc., until all treatments have been deployed. A second experimental replicate would consist of the same treatments with treatment order systematically re-ordered. Although field conditions may differ between replicates, field conditions will tend to be the same through the course of a single replicate, thus separating the field condition effects from treatment effects (removing their effect from each replicate). The location and timing of replicates should be determined solely by the experimental design of this project.

Specific information to be collected during each set, and any analyses that might be conducted with this information, should be established during the methodology development project. Information collected by observers and during test experiments may include: time of day, hours from sun rise, geographic location, vessel name, vessel size, observer name(s), weather, wind velocity and direction, sea state, seabird abundance, seabird species composition, characteristics of the set (hook spacing, hook size, length of line, length of gangions ), method of line baiting and deployment, deterrent measures employed, and duration of setting.

Comparing the magnitude of risk to seabirds with or without seabird deterrent devices by conducting trials with or without the measures employed could represent significant risk of seabird mortality. During the methodology development project, the option of using hooks without tips should be explored. If tipless hooks can be created in such a way as to hold bait as securely as hooks with tips, then they should be considered. This approach would remove the option of using number of seabirds hooked as a measure of effectiveness, but sample sizes required for statistically valid comparisons of mortality between sets with or without deterrent devices may have already precluded the use of mortality as a measure of effectiveness. All possible precautionary measures should be taken to minimize any seabird bycatch except where necessary for adequate scientific evaluation of measures. Before experiments are implemented, application should be made to USFWS for an endangered species research or incidental take permit to authorize any incidental take of short-tailed albatrosses during the study.

The sampling protocol is likely to include a requirement for observers and researchers to estimate distances. The methodology development project should include testing and/or recommendations for types of equipment to use for estimating distances, and recommendations for training and standardizing estimations of distances. For example, if observers record the number of birds within a given distance of the groundline, the method with which they will identify that distance during each observation, and the method with which they will practice estimation of that distance against some objective measure, should be determined during the methodology development cruise. Potential tools for distance estimation may include: 1) laser range finder, 2) calibrated tori line, and 3)vessel wake, 4) military binoculars with range finding graticules.

A report will be prepared which summarizes the results of the experimental tests performed.

**B. Special Project Seabird Observers**

Special observers will collect quantitative data on seabird numbers, seabird feeding attempts, and incidental take of seabirds during commercial longline fishing. All variables that may affect incidental take will be recorded for each set, including location, target species of the fishery, type of gear, speed of setting, type of deterrent and manner in which it is deployed, weather and ocean conditions, and any discharge of offal.

Special observers will be deployed in selected areas chosen to represent the full range of conditions in each fishery. The exception is that special observers will be assigned to times and areas where seabird numbers are relatively high. In the first year of the special seabird observer project, ten three-week observer trips will be completed (five in the groundfish fishery and five in the halibut fishery).

The goals of the seabird observer project are to:

1. Collect data on the effectiveness of deterrent measures over a longer or different period and a wider or different area than will be covered by the experiments;
2. Provide opportunity to collect data on the effectiveness of deterrent measures for a wider range of gear types and deterrent types than will be covered by the experiment;
3. Look for variables that may increase or decrease the incidental take of seabirds (e.g. size
4. Provide data on the variance of important variables that may affect incidental take of seabirds.

Methods may be similar to those used for data gathering during designed experiments, but will emphasize recording as much information as possible on the methods used, and the number of seabird interactions with the bait. Whereas the first part of the study tests the effectiveness of measures in a relatively controlled experimental setting, this portion of the study would provide some ground truthing as to the practical applications of the seabird avoidance measures and their effectiveness in commercial fishing operations.

Specific methodology for seabird observers will be determined during the methodology development phase; information collected will be similar in scope and content to that collected in the experimental study. The data recording sheet developed by Vivian Mendenhall of the USFWS can be used as a starting point in developing data sheets for the special observers (Appendix C). Vessel participation may be on a volunteer basis or by charter. If adequate vessel time is not available with these arrangements, a requirement for observer coverage for observing the effectiveness of seabird deterrent measures will need to be considered. Early indications are that there will be an adequate number of vessels willing to participate in the test program. Seabird observer deployments should be scheduled to stratify coverage by fishery and season so that as many as possible are covered (e.g. sablefish and halibut -spring, summer, and fall; Pacific cod- winter and fall, Greenland turbot-spring etc.).

Methodology will include specific plans for training of observers prior to deployments. Videos of longline setting operations, available at Auke Bay Laboratory or other sources (an excellent video is available from Mark Lundsten, Seattle), can be used for informational or observer training purposes (See Mike Sigler and John Karinen for access to ABL for videos.)

## PHASE III

Additional experiments, continued deployment of special project observers, and continued compiling of input from industry should be planned if recommended in the reports produced during Phase II of the test plan.

## REFERENCES


Austin, O.L. Jr. 1949. The status of the Steller's albatross. Pacific Sci. 3: 269-279.

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

CCAMLR, 1996. Fish the Sea Not the Sky: How to avoid by-catch of seabirds when fishing with bottom longlines. CCAMLR Hobart, Tasmania, Australia, 46 pp.

.

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

DeGange, A.R. 1981. The short-tailed albatross, *Diomedea albatrus*, its status, distribution and natural history. Unpubl. rep. U.S. Fish and Wildlife Service, Migratory Bird Section, Office of Endangered Species, Anchorage, AK. 36 p.

Duckworth, K. 1995. Analyses of factors which influence seabird bycatch in Japanese southern

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ishery in New Zealand waters, 1989-93. New Zeala ndFisheriesAssessmentResearchDocument95/2

Environment Agency, 1980. The birds and terrestrial mammals of Japan. Environment Agency, Tokyo, Japan. 100 p.

Gabrielson, I.N. and F.C. Lincoln. 1959. *The Birds of Alaska.* Washington, D.C.: Wildlife Management Institute.

Gould, P.J., D.J. Forsell, and C.J. Lensink. 1982. Pelagic Distribution and Abundance of Seabirds in the Gulf of Alaska and Eastern Bering Sea. U.S. Fish and Wildlife Service Report. Anchorage, Alaska.

Gould, P.J., and R. Hobbs. 1993. Population dynamics of the Laysan and other albatrosses in the North Pacific. Int. North Pac. Fish. Comm. Bull. No. 53(3): 485-497.

Hasegawa, H. and A.R. DeGange. 1982. The short-tailed albatross, *Diomedea albatrus*: its status, distribution and natural history. Amer. Birds 6(5): 806-814.

Howard, H. and L.M. Dodson. 1933. Birds' remains from an indian shell mound near Point Mugu, California. Condor XXXV: 235.

Hunt, G.L.Jr., N.M. Harrison, W.M. Hammer, and B.S. Obst. 1988. Observations of a mixed-species flock of birds foraging on euphausids near St. Matthew Island, Bering Sea. Auk 105: 345-349.

Lokkeborg, S. 1996. Seabird bycatch and bait loss in longlining using different setting methods.

96/6.

McDermond, K. and K.H. Morgan. 1993. Status and conservation of North Pacific albatrosses. *In*: Vermeer, K.; Briggs, K.T., Morgan, K.H., Siegel-Causey, D. (eds.). The status, ecology, and conservation of marine birds of the North Pacific. Can. Wildl. Serv. Spec. Publ., Ottawa.

Melvin, E. F., L. L. Conquest and J. K. Parrish. 1997. Seabird bycatch reduction: new tools for Puget Sound drift gillnet salmon fisheries. Washington Sea Grant Program.

Murie, O.J. 1959. *Diomedea albatrus*: short-tailed albatross. Pp. 36-39. In: Murie, O.J. and V.B. Scheffer (eds.). Fauna of the Aleutian Islands and Alaska Peninsula. North American Fauna. Vol. 61.

Murray, T. E., J. A. Bartle, S. R. Kalish and P. R. Taylor. 1993. Bird Conservation International 3:181-210.

Schneider, D.C., V.P. Shuntov. 1993. The trophic organization of the marine bird community in the Bering Sea. Review in Fisheries Science 1: 311-335.

Schneider, D.C., G.L. Hunt Jr., and N.M. Harrison. 1986. Mass and energy transfer to pelagic birds in the southeastern Bering Sea. Cont. Shelf Res. 5: 241-257.

Sherburne, J. 1993. Status report on the short-tailed albatross (*Diomedea albatrus*). Unpubl. report, U.S. Fish and Wildlife Service, Anchorage Field Office, Anchorage, Alaska. 33 p.

Stehn, R. U.S. Fish and Wildlife Service January 6, 1998 Memorandum to Kent Wohl and Pat Gould. Subject: Seabird bycatch estimates from the Alaska longline groundfish fisheries.

Tickell, W.L.N. 1975. Observations on the status of Steller's albatross (*Diomedea albatrus*) 1973. Sea Swallow 23: 1-3.

Yesner, D.R. 1976. Aleutian Island albatrosses: a population history. Auk 93: 263-280.

Yesner, D.R. and J.S. Aigner. 1976. Comparative biomass estimates and prehistoric cultural ecology of the southwest Umnak region, Aleutian Islands. Arctic Anthropol. XIII(2): 91-112.

## BUDGET

The budget figures below represent preliminary estimates for total costs for each portion of the test plan. After completion of the methodology development phase, budget figures may change based on recommended changes in the protocol, need for or scope of contracts, sample sizes, number of observers deployed, the length of cruises or deployments, administrative approaches used (i.e. administered by agency staff or administered by an independent contractor), or other factors. Therefore, these figures should be considered preliminary. Budget projections have been made for phases I and II only; if phase III is recommended following completion of phases I and II, a budget will be outlined at that time.

### PHASE I

| | | $ Amount (1000s) |
|---|---|---|
| **A. Comprehensive literature review** | | |
| Contract cost for report | | **5** |
| **B. Night Fishing Report** | | |
| Contract cost for report | | **3** |
| **C. Methodology Development** | | |
| Contract salary, travel and overhead | 15 | |
| Equipment and supplies | 3 | |
| Vessel charter | 10 | |
| TOTAL for Methodology Development | | **28** |
| **D. Fishing Industry Data** | | |
| Travel for agency representatives to attend public meetings | | **10** |

**TOTAL for PHASE I** **46**

PHASE II

**A. Experimental Testing**

| | $Amount (1000's) |
|---|---|
| Administrative costs and travel to implement test plan, procure and administer contract, and consult with contract scientists. | 25 |
| Contract or salary for principle investigator and cooperators | 50 |
| University or firm overhead | 15 |
| Chartered longliner and crew to conduct setting experiments<br>Estimate 4K/day for 20 days | 80 |
| Equipment and supplies<br>Binoculars, cameras, video, avoidance gear, supplies | 25 |
| TOTAL for experimental tests | **190** |

**B. Special Project Seabird Observers**

The following budget is estimated for a total of 10 observer trips (5 on a groundfish vessel and 5 on a halibut vessel) during the first year of the special seabird observer project. Duration of each trip is estimated at 2-3 weeks. Vessel cost has not been factored in based on the assumption that vessel time will be provided on a voluntary basis by vessel owners or captains.

| | $ Amount (1000s) |
|---|---|
| Observer salary, insurance, and overhead (30 weeks @ 1000.00) | 30 |
| Observer Travel (10 RT tickets Seattle to ports @ 1500.00) | 15 |
| Equipment and supplies | 13 |
| Travel for agency staff | 5 |
| Contract/administrative cost for project leader/report writer | 15 |
| Total for Special Seabird Observers: | **78** |

**C. Fishing Industry Input/Data**

| | |
|---|---|
| Travel for agency representatives to attend public meetings | **10** |
| **TOTAL for PHASE II** | **278** |

## APPENDICES

## APPENDIX A

Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) Regulations

Conservation Measure 29/XV[1,2]

Minimisation of the Incidental Mortality of Seabirds in the Course of Longline Fishing or Longline Fishing Research in the Convention Area

The Commission,

Noting the need to reduce the incidental mortality of seabirds during longline fishing by minimising their attraction to fishing vessels and by preventing them from attempting to seize baited hooks, particularly during the period when the lines are set,

Adopts the following measures to reduce the possibility of incidental mortality of seabirds during longline fishing.

6. Fishing operations shall be conducted in such a way that the baited hooks sink as soon as possible after they are put in the water[3].

7. Longlines shall be set at night only (i.e. during the hours of darkness between the times of nautical twilight[4])[5]. During longline fishing at night, only the minimum ship's lights necessary for safety shall be used.

8. The dumping of offal shall be avoided as far as possible while longlines are being set or hauled; if discharge of offal is unavoidable, this discharge shall take place on the opposite side of the vessel to that where longlines are set or hauled.

9. Every effort should be made to ensure that birds captured alive during longlining are released alive and that wherever possible, hooks are removed without jeopardising the life of the bird concerned.

10. A streamer line designed to discourage birds from settling on baits during deployment of longlines shall be towed. Specification of streamer line and its method of deployment is given in the Appendix to this Measure. Details of the construction relating to the number and placement of swivels may be varied so long as the effective sea surface covered by the streamers is no less than that covered by the currently specified design. Details of the device dragged in the water in order to create tension in the line may also be varied.

11. Other variations in the design of streamer lines may be tested on vessels carrying two observers,

at least one appointed in accordance with the CCAMLR Scheme of International Scientific Observations, providing that all other elements of this Conservation Measure are complied with[6].

Footnotes:

1 Except for waters adjacent to the Kerguelen and Crozet Islands.

2 Except for waters adjacent to the Prince Edwards Islands.

3 For vessels using the Spanish method of longline fishing, weights should be released before line tension occurs; wherever possible, weights of at least 6 kg mass should be used, spaced at 20m intervals.

4 The exact times of nautical twilight are set forth in the Nautical Almanac tables for the relevant latitude, local time, and date. All times whether for ship operations or observer reporting shall be referenced to GMT.

5 Wherever possible, setting of lines should be completed at least three hours before sunrise (to reduce loss of bait/catches of white-chinned petrels).

6 The streamer lines under test should be constructed and operated taking full account of the principles set out in WG-IMALF-94/19 (available from the CCAMLR Secretariat); testing should be carried out independently of actual commercial fishing and in a manner consistent with the spirit of Conservation Measure 65/XII.

## APPENDIX B

Draft National Marine Fisheries Service Auke Bay Protocol
January 1998 Draft (document and attachments A and B).
Prepared by Mike Sigler and John Karinen

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Research Plan to Evaluate Effectiveness of Required Seabird Avoidance Measures in the Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA) Hook-and-Line Groundfish Fisheries

Prepared by: National Marine Fisheries Service
Alaska Fisheries Science Center, Auke Bay Laboratory
Sustainable Fisheries Division, RO
Observer Program Office, AFSC

INTRODUCTION

PURPOSE OF RESEARCH PLAN

The seabird bycatch problem in longline fisheries has reached a heightened awareness worldwide. NMFS has issued regulations that require operators of groundfish longline vessels in Alaska to employ seabird bycatch avoidance gear and methods intended to reduce seabird bycatch and incidental seabird mortality.

Pursuant to the Endangered Species Act (ESA), the short-tailed albatross is afforded certain protections that are outlined in the section 7 consultation NMFS undertakes with the U.S. Fish & Wildlife Service (USFWS) regarding the Alaskan groundfish fisheries. Recently, the USFWS amended its Biological Opinion on the impacts of the groundfish fisheries on the endangered short-tailed albatross and now has required that NMFS develop a research plan outlining specific plans for testing the effectiveness of the required seabird bycatch avoidance gear and methods by January 1, 1998.

Testing the effectiveness of seabird bycatch avoidance gear and methods that historically have been used in southern hemisphere fisheries will allow NMFS to better ascertain if these measures are effective in the Alaskan fisheries.

The current regulations are of a flexible nature that would allow fishermen certain options when using required seabird avoidance measures. Once measures have been tested for effectiveness, NMFS will be better able to revise regulations to include specific performance standards for the seabird avoidance measures, if appropriate. Currently, no scientific data exists regarding the effectiveness of these measures in Alaskan fisheries.

The development of a research plan outlining specific plans for testing the effectiveness of the required seabird bycatch avoidance gear and methods will include:

A. Identification of qualitative and quantitative data sources.
B. Design of statistically valid experiments to test the effectiveness of the required gear and methods.

C. Identification of resources necessary to carry out the research plan.

CURRENT REGULATIONS FOR BSAI AND GOA GROUNDFISH LONGLINE FISHERIES

To reduce the incidental take of seabirds in the BSAI and GOA groundfish longline fisheries, the vessels are required to:

(1) Use hooks that when baited, sink as soon as they are put into the water.

(2) Any discharge of offal from a vessel must occur in a manner that distracts seabirds, to the extent practicable, from baited hooks while gear is being set or hauled. The discharge site on board a vessel must either be aft of the hauling station or on the opposite side of the vessel from the hauling station.

(3) Make every reasonable effort to ensure that birds brought on board alive are released alive and that wherever possible, hooks are removed without jeopardizing the life of the birds.

(4) Employ one or more of the following seabird avoidance measures:
   (a) Tow streamer line or lines during deployment of gear to prevent birds from taking hooks;
   (b) Tow a buoy, board, stick or other device during deployment of gear, at a distance appropriate to prevent birds from taking hooks. Multiple devices may be employed;
   (c) Deploy hooks underwater through a lining tube at a depth sufficient to prevent birds from settling on hooks during deployment of gear; or
   (d) Deploy gear only during specified hours of darkness, using only the minimum vessel lights necessary for safety.

RESEARCH PLAN

A. Identification of Data Sources.

The USFWS Biological Opinion provided under the section 7 consultation process of the ESA requires that NMFS evaluate the effectiveness of seabird bycatch avoidance measures required in the BSAI and GOA groundfish longline fisheries. The obvious data sources are from: (1) designed experiments performed by qualified scientists, (2) special seabird observers aboard fishing vessels deploying the required gear, (3) fleetwide groundfish observer data, and (4) observations volunteered by industry on the use of required deterrents or other methods they may use to reduce the incidental catch of seabirds.

Seabird Data Collected by NMFS Groundfish Observers

At this time, the general consensus is that the available seabird data collected by NMFS groundfish observers probably will be of minimal value in evaluating the effectiveness of seabird avoidance measures used in the past by BSAI and GOA groundfish longline vessels. Information on avoidance measures has not been routinely collected until late 1997. The evaluation of the past observer data indicates that some reports by observers have useful information on bird behavior; but generally, the data collected during normal observer activities has only minimal application to the present plan. Therefore, further detailed evaluation of fleetwide seabird observations would not be productive for the purposes of this plan. In late 1997, observers will be required to collect data on which types of seabird avoidance measures are being used on the vessels. These data could be used in recommendations for future gear testing or desirable and necessary observer data collections. NMFS recognizes that the groundfish observers are fully utilized at this time and requiring additional seabird data collection would necessitate eliminating other essential duties that they perform. NMFS does not recommend this approach at this time.

B. Scope and Design of Experiments to Test the Effectiveness of the Required Gear and Methods.

Given that resource constraints and necessary periodic analyses of initial test results will require some flexibility in the plan design, the plan will be for a multi-year period. The plan and the measures tested will require evaluation as research results are obtained, therefore a first-year Pilot Study seems appropriate. Subsequent years of the plan are expected to be of similar scale as the Pilot Study. Measures that are known to be used in the Alaskan fisheries and that have a low impact on cost and operations of the fishing vessels will be examined first. More impacting measures could be examined in the future if low impact measures are not effective. NMFS recommends that the contractor for the first-year Pilot Study be responsible for evaluation of the experimental results and development of a recommended plan for the following year. This plan would be reviewed and approved by NMFS staff.

The scope of the plan is: (1) Test the effectiveness of some of the currently required seabird avoidance measures the first year and (2) Collect information on behavioral responses of birds to the gear. This would require determinations of: What data is collected, how the data is collected, how much data must be collected to provide valid statistical results, how the data is analyzed, and how the analysis is used. Plans to test other required methods or others that are easily and economically applied or test other more costly methods showing promise may be developed and tested in future years.

Suggested experiments and data collection for the first-year Pilot Study are:

(1) Conduct gear-setting experiments to determine necessary performance criteria for the following required measures:
   (a) Sinking baited hooks (i.e. how far and fast do baited hooks have to sink to prevent birds from reaching the baited hooks?), and
   (b) Towing of streamer lines or buoys (i.e. how effective are the streamer lines and buoys at preventing birds from stealing the bait?) (see Scientific Operations Plan- Attachment A).

(2) Conduct a separate experiment for observing bird behavior during setting of gear. Using commercial longline vessels and selected seabird observers, we recommend that a series of observations be conducted to gather data on bird behavior and bird deterrent effectiveness during longline setting operations aboard commercial vessels. In preparation for these evaluations, a review of available videos of longline setting operations is recommended. (See Observations of Bird Behavior- Attachment B)

C. Identification of Resources Necessary to Carry out the Research Plan

| Item | | $Amount (1000's) |
|---|---|---|
| 1. Experimental Tests of Effectiveness of Seabird Avoidance Measures - contract University or Research Firm (see Attachment A for itemized budget details) | Subtotal | 235 |
| 2. Special seabird observers to observe bird behavior during setting of gear (see Attachment B for itemized budget details) | Subtotal | 64 |
| BUDGET COSTS FOR ATTACHMENTS A & B ( NO TENSION TAGS) | TOTAL | 299 |
| Tension/depth tags | | 150 |
| TOTAL ESTIMATED COST FOR FIRST-YEAR PILOT STUDY | | 449 |

EVALUATION OF EXPERIMENTS AND COMPLETION OF RESEARCH PLAN

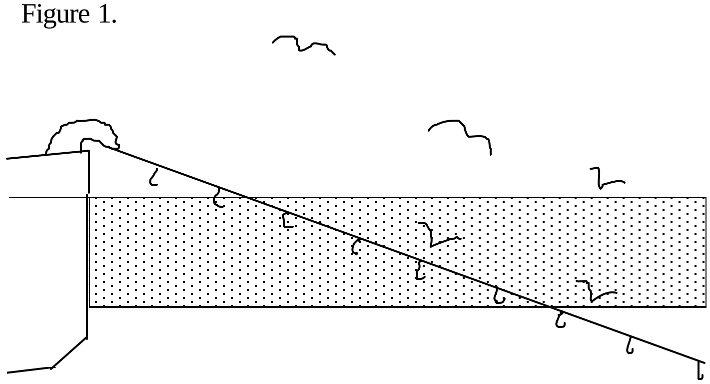
As stated previously, NMFS recommends that the contractor for the first-year Pilot Study be responsible for evaluation of the experimental results and development of a recommended plan for the following year. This plan would be reviewed and approved by NMFS staff. See Attachments A and B for specific experimental evaluation methods. Initial results from the Pilot Study could determine what studies may be necessary for subsequent years. Research Plan results may indicate that revisions to the current seabird avoidance measures are appropriate.

Attachment A.
SCIENTIFIC OPERATIONS PLAN TO TEST THE EFFECTIVENESS OF REQUIRED SEABIRD AVOIDANCE MEASURES USED IN THE BSAI AND GOA LONGLINE FISHERIES

PURPOSE

Test the effectiveness of two methods, streamer lines and buoys, at reducing the incidental take of seabirds in BSAI and GOA longline fisheries.

Figure 1.



OBJECTIVES

1. Determine the zone where seabirds are vulnerable to capture by longline.
2. Determine the effectiveness of streamer lines and buoys to prevent seabird feeding attempts in this zone.

RATIONALE FOR EXPERIMENTAL APPROACH

The experiment's purpose is to test methods to reduce seabird incidental take by longline, as measured by seabird feeding attempts at the baited hooks. The usual experimental approach is to test several streamer line, buoy and line weighting configurations. This approach is time-consuming if more than a few treatments are tested. For example, Brothers (1991) conducted a 17-day cruise to test one configuration of streamer line; Cherel et al. (1996) conducted a 13-day cruise to test the effectiveness of offal dumping. Lokkeborg (1996) conducted a 12-day cruise to test one configuration of streamer line and a setting funnel. This approach also limits conclusions to only the tested designs. An alternate approach is to determine where seabirds are vulnerable to longline capture and to test methods to prevent seabird feeding attempts in this zone. To address the first objective, the longline will be deployed with no streamer line or buoy in place. The depth of the longline during deployment will be measured with time-depth recorders. Seabird feeding attempts will be recorded relative to longline position to locate the zone where seabirds are vulnerable to capture (Figure 1). To address the second objective, a streamer line or buoy will be placed over the vulnerable zone to determine if it effectively prevents seabird feeding attempts in this zone.

This approach should remove the need to test multiple lengths of streamer line and buoy line. This approach will provide a performance-based criteria (e.g. that the streamer line must prevent seabird feeding attempts in areas where the longline is less than 4 m from the water surface). In this way, the desired performance of preventing seabird feeding attempts is measured and what methods are effective is determined. Specific information on the device's length or other configuration charteristics given different fishing practices (e.g. line weighting frequency, vessel setting speed, number or length of streamers) can then be determined by the vessel operator or through further experimentation, although the latter is not explicitly required with this approach except to provide guidance on deterrent construction and deployment to vessel operators.

The usual data collected is the number of seabird captures, particularly for observations from commercial fishing (Murray et al. 1993, Duckworth 1995). Captures usually are rare, requiring large sample sizes for experiments with enough power to differentiate treatments. Based on an initial study, Melvin et al. (1997) estimated that at least 150 sets would be required per gear treatment to detect significant differences in bird entanglement rates among factors. An alternate approach is to record a more common seabird behavior. Seabird feeding attempts are commonly observed during longline deployment in the northeast Pacific and are a reasonable measure of seabird susceptibility to longline capture. Collecting data on seabird feeding attempts should require smaller sample sizes. Seabird feeding attempts were recorded in other studies of seabird incidental take (Brothers 1991, Cherel et al. 1996).

The ocean is a variable place where sea and wind conditions can change. Factors such as wind strength and direction and sea condition (Brothers 1991) and setting across heavy winds (Lokkeborg 1996) may affect the seabird incidental take by longline. The number and species composition of the birds following the vessel may increase over the course of a day, perhaps even decreasing later as birds become satiated with food. These factors should be accounted for in any field experiment such as proposed here. Accounting for these factors by analysis is difficult due to the number of factors and the interaction of the factors' effects. An alternate approach is to pair all treatments in the field experiment. An experimental replicate would consist of a longline deployment of treatment A, the longline would be hauled, followed by longline deployment of treatment B, the longline would be hauled, etc., until all treatments have been deployed. A second experimental replicate would consist of the same treatments with treatment order systematically re-ordered. Although field conditions may differ between replicates, field conditions will tend to be the same through the course of a single replicate, thus separating the field condition effects from treatment effects (removing their effect from each replicate).

## EXPERIMENTAL DESIGN

Two experiments will be conducted. The first experiment will measure the zone where seabirds are vulnerable to capture by longline. The second experiment will rely on the results of the first experiment. The second experiment will evaluate streamer line and buoy effectiveness to prevent seabird feeding attempts in that zone.

Seventeen charter days are necessary for both experiments, one day each for loading and unloading the vessel, three days at-sea for measuring the zone where seabirds are vulnerable to longline capture, nine days at-sea for testing streamer line and buoy effectiveness, and three days for foul weather (Table 1). Weather days may be necessary if there is to be a weather limit on data collection or the charter vessel is small.

Table 1.

| Day | Purpose | Design |
|---|---|---|
| 1 | Load vessel | |
| 2-4 | Measure the zone where seabirds are vulnerable to longline capture. | Deploy longline about 9 times per day for 3 days. |
| 5-13 | Determine the effectiveness of streamer line and buoy for deterring seabirds from the zone where they are vulnerable to longline capture. | Deploy longline about 9 times per day for 9 days, alternating no deterrent, streamer line and buoy each set. |
| 14-16 | Weather days | |
| 17 | Unload vessel | |

The remainder of this plan is organized as follows: brief description of the two experiments, details on vessel and fishing gear, experimental gear, and data collection and analysis.

<u>Experiment 1: Measure vulnerable zone</u>

The objective of Experiment 1 is to determine the zone where seabirds are vulnerable to capture by longline. The longline will be deployed with no streamer line or buoy in place. The number of seabird feeding attempts will be counted and it’s position relative to the longline measured. Brothers (CCAMLR, 1996) stated that most seabird feeding attempts occur where the longline is up to 4 m deep and 50 m astern.

A longline will be deployed, then immediately retrieved. Longline setting will last about 10 minutes, retrieval about 45 minutes. Allowing time to return to the setting start and for vessel maneuvering, one replicate for Experiment 1 will last about 75 minutes for about nine replicates per 12 hour workday. Each deployment will be separated by 1 km to provide some similarity in the independence of the deployments. The longline will be deployed approximately 27 times during experiment 1, approximately 3 days will be necessary to complete Experiment 1 (Table 1).

ice of sample size is relatively arbitrary. Some considerations were the standard rule-of-thumb of twenty for a sample size and in Experiment 2, trying to set sample size each day at some multiple of 3, the number of treatments tested in Experiment 2 (no deterrent, streamer line and buoy). Given that the first year is a pilot study, we expect that the results will be used to determine sample size requirements for future years' testing.

Experiment 2: Evaluate streamer line and buoy effectiveness

The results of Experiment 1 (identification of the zone where seabirds are vulnerable to longline capture) will be needed to conduct Experiment 2 . The approximate distance astern where seabirds are vulnerable to longline capture will be identified in Experiment 1 and this information used in applying treatments in Experiment 2. The objective of Experiment 2 is to determine the effectiveness of streamer lines and buoys to prevent seabird feeding attempts in this zone. The longline will be deployed using 3 treatments: no deterrent, a streamer line, and a buoy. The number of seabird feeding attempts will be counted and it's position relative to the longline and deterrent measured.

All treatments will be paired to remove effects of time of day, weather, etc. Melvin et al. (1997) also paired gear treatments in a study of experimental gillnets to reduce seabird bycatch. In one experimental replicate, a longline will be set with treatment A, the longline will be hauled, then the longline will be set with treatment B, the longline will be hauled, etc., until all of the treatments are deployed. A second experimental replicate will consist of the same treatments with treatment order systematically re-ordered. Order of treatment (A=no deterrent, B=streamer line, C=buoy) is systematically reordered (group 1: A, B, C; group 2: B, C, A; group 3: C, A, B; etc.).

The longline will be deployed about 27 times with no deterrent, about 27 times with streamer line and about 27 times with a buoy. Each group is geographically separated from other groups by 1 km.

VESSEL AND FISHING GEAR

Scientific operations will be conducted using a chartered U.S. longline vessel. The vessel will carry standard longline setting and hauling gear. The standard sablefish longline survey gear consists of a groundline with 2 m spacing of circle hooks baited with squid (Sigler and Zenger, 1994). This gear is suggested as an experiment standard. It probably is not necessary to follow exactly this standard for the experiment, but certainly the gear should be standardized within the experiment. Skates of gear are 100 m (55 fm) long and contain forty-five size 13/0 Mustad[1] circle hooks. Hooks are attached to 38 cm (15 in, tied length; untied length 74 cm [29 in]) gangions secured to 46 cm (18 in) beckets tied into the groundline at 2 m (6.5 ft) intervals. Gangion eyes are 10 cm (4 in). Hooks are hung by inserting the tied end of the gangion through the eye face closest to the hook tip (the inside of the hook). The groundline of each skate is marked with bright-colored flagging and red ink at the first and last beckets, and with red ink at the remaining beckets. Five meters (16 ft) of groundline are left bare on each end. Gangion, becket, and groundline materials are medium lay #60 thread, medium lay # 72 thread, and soft medium lay 9.5 mm (3/8 in) American Line SSR 100[1] (or equivalent nylon line), respectively.

Hook tips will be removed to minimize seabird captures during the experiment. The part of the hook between the tip and the barb will be removed. The barb will be left intact to help hold the bait on the hook. Three mm of material past the barb will be left intact and the cut end will be left dull.

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Citation of the above brand names does not constitute U.S. government endorsement.

Each end of a set starts with a flag and buoy array, followed by a buoyline made of 92 m (50 fm) of American Line and 92 m (50 fm) of 9.5 mm (3/8 in) polypropylene line, a 27 kg (60 lb) halibut anchor, 366 m (200 fm) American Line, and finally the groundline with hooks. A set contains 540 hooks, 1.2 km (656 fm) long.

Anchors at each end of the groundline sink the line. Additional weights often are attached to the longline at several intermediate points to ensure that the line stays in one spot after reaching bottom and also falls in to any nooks and crannies on rough bottom. These weights also increase sinking rate, especially for any part of the groundline not near the anchor. The likelihood of successful feeding attempts and subsequent hooking should decrease with increased sinking rate, particularly if the baits sink below the depth accessible to seabirds within the area astern that is protected by a streamer line (Brothers et al. 1995). However, the geometry of the longline is complicated by the use of intermediate weights and therefore more difficult to measure due to the irregular slope of the longline (a series of inverted U's when weights are attached). Therefore, no intermediate weights will be used in the experiment to simplify measurement of the position of the longline during deployment. This does not mean that intermediate weights should not be used during commercial fishing, but that for purposes of the experiment, it will be easier to estimate the depth of the vulnerable zone if the longline geometry is simple to measure.

Each hook is hand baited with chopped herring. The head will not be used for bait, only the body. This is not standard commercial practice, but is recommended for this experiment to standardize bait shape. Also, bait loss will be used as a measure of deterrent effectiveness and the head is harder to remove. For baiting, the herring body should be cut into pieces each 4-5 cm (1.5-2 in) long.

The gear will be maintained to the following standard. If the groundline is worn, the line will be replaced by splicing such that the replacement line maintains hook spacing of 2 m. A splice will consist of 3 tucks for each line end.

The vessel owners will supply all longline gear including flags, buoys, radio beacons, buoylines, running lines, floating lines, and anchors. In addition, the vessel owners will supply the bait.

## EXPERIMENTAL GEAR

A streamer line and a buoy will be tested. The configuration of the streamer line is described in 62 FR 10016, March 5, 1997.

NMFS revised the guidelines on streamer line construction published in the preamble to the March 5, 1997 proposed rule based on information that indicates streamer line construction should account for variable vessel sizes and gear deployment speeds (New Zealand Department of Conservation, 1997). Large vessels equal to or greater than 125 ft (38.1 m) length overall (LOA) deploying gear at approximately 5 knots may require a thicker dimension of streamer line (e.g., 8 millimeters (mm)), compared to smaller vessels less than 125 ft (38.1 m) LOA deploying gear at faster speeds of 7 to 8 knots that may require streamer lines constructed of material only 5 mm in diameter. The key characteristics of an effective streamer line are:

1. All materials used to construct the streamer line and to hold the streamer line in place are strong enough to withstand all weather conditions in which hook-and-line fishing activity is likely to be undertaken;

2. The streamer line is attached to a pole at the stern of the vessel and positioned such that it will be directly above the baited hooks as they are deployed;
3. The height of the streamer line at the point of attachment is 4 to 8 m above sea level;
4. The streamer line for all vessel sizes is constructed of material that is between 5 and 8 mm in diameter;
5. Length of streamer line is a minimum of 150 to 175 m for all vessel sizes;
6. Number of streamers attached to a streamer line is 6 to 10 pairs;
7. Streamers made of a heavy, flexible material that will allow the streamers to move freely and flop unpredictably (for example, streamer cord inserted inside a red polyurethane tubing);
8. Streamer pairs attached to the bird streamer line using a 3-way swivel or an adjustable snap;
9. Streamers should just skim above the water's surface over the baited hooks.

The key characteristics of an effective buoy are not described in the literature. As a starting point, the streamer line recommendations are modified for the experimental buoy and are:

1. All materials used to construct the buoy line and to hold the buoy line in place are strong enough to withstand all weather conditions in which hook-and-line fishing activity is likely to be undertaken;
2. The buoy line is attached to a pole at the stern of the vessel and positioned such that it will be directly above the baited hooks as they are deployed;
3. The height of the buoy line at the point of attachment is 4 to 8 m above sea level;
4. The buoy line for all vessel sizes is constructed of material that is 9.5 mm (3/8") in diameter;
5. Length of buoy line is a minimum of 150 to 175 m for all vessel sizes.

## DATA COLLECTION

### Measuring the Vulnerable Zone

The vulnerable zone will be estimated from seabird surface activity relative to longline position and depth. Seabird feeding attempts are evidence that seabirds are vulnerable to capture by the longline. Longline depth where seabirds are attempting to feed will be used as a proxy for the depth of the vulnerable zone. The assumption is that seabirds will not attempt to feed unless the baited longline is visible and there is some probability of feeding success greater than zero. Two approaches are described to measure the area where seabirds are vulnerable to capture by longline.

Approach A--Time-depth recorders: Time-depth recorders attached to the longline every 300 m will measure longline depth. Combined with data on vessel speed, longline position and depth will be estimated.

Approach B--Data storage tags, an alternate method: Data storage tags attached to individual fish have been used to record temperature and depth (Metcalfe and Arnold 1997). It is possible to develop a data storage tag which records tension and depth (Keith, Lotek, pers. comm.). Tension-depth data storage tags attached at the base of each gangion will document seabird attacks by a direct method. Some seabird feeding attempts missed by visual sightings from the stern of the vessel will be recorded, for example those hidden by a wave. Conversely, some seabird feeding attempts may not result in attacks on baited hooks when a seabird tries to reach a visible bait below the bird's diving depth or when the bird takes a bait which has been lost from a hook. Comparing the empty hooks when the line is retrieved with observed diving attempts and the tension record for each hook will allow an estimate to be made of numbers of baits lost during setting. The depth of the vulnerable zone will be accurately estimated since only bait attacks will be recorded. Attempts will be made to differentiate between bait attacks by albatross and smaller bird species (fulmars and shearwaters). However, interactions of species may affect the numbers of bait stealing attempts by albatross, therefore it is important to record the composition and numbers of all species. For example, large numbers of fulmars may cause reduced attempts by albatross, compared to when the same numbers of albatross are present with fewer fulmars. The approximate price for design and production of 100 tension-depth data storage tags is $150,000 (Keith, Lotek, pers. comm.).

Measuring Effectiveness of Seabird Avoidance Measures via Seabird Observations

The effectiveness of the tested seabird avoidance measures at reducing incidental take of seabirds will be measured using two seabird observation approaches: (1) Quantifying seabird feeding attempts as it relates to the seabird's ability to access the vulnerable zone, i.e. the bait, and (2) Quantifying the amount of bait loss, i.e. how successful seabirds were at entering the vulnerable zone and taking bait.

Seabird Feeding Attempts: Seabird feeding attempts will be recorded by voice onto a video camera facing aft during longline deployment. The seabird feeding attempts will be confirmed by video playback. During video playback, distance astern and lateral distance from the streamer or buoy line of seabird feeding attempts will be computed. Distance astern will be measured by comparing bird position to marks on the buoy line or streamer line. Lateral distance will be measured using a lateral range finder within the field of view of the camera and accounting for the seabird's distance astern.

Indexing the numbers and species of birds during each treatment likely will be important for evaluating the experiment, but accurate, live counts of seabirds during deployment are difficult to make. Brothers (1991) visually counted albatross during deployment at half-hour intervals, but mean daily counts per voyage averaged only 8-14 albatross. Cherel et al. (1996) found that it was not possible to count total numbers during deployment because most birds were very active; counts were made following deployment when seabirds were relatively quiet, averaging 323. Albatross counts in the northeast Pacific will range from dozens to hundreds. One problem with Cherel's approach is that the fraction of satiated or uninterested seabirds following deployment may vary by deployment and thus not be a good index of seabirds vulnerable to capture during deployment. An alternate approach, instead of live counts during deployment, is counts from the video tape of the deployment period at one-minute intervals.

The video camera will be mounted on a stand with gimbals or hand-held to compensate for the ship's motion so that the camera's field of view will continuously record the zone where seabirds are vulnerable to capture. If the camera is hand-held, two people will be needed during longline deployment, one to hold the camera, the other to spot and call out seabird feeding attempts.

The video tapes will be played back aboard ship the same day as recorded. The number of seabird feeding attempts will be recorded electronically during playback to track experiment progress and to check data collection quality. Further analysis of the video tapes will be completed on land.

Bait Loss: Whether or not a deterrent is effective also will be estimated from observed bait loss. The choice of bait type is important for this approach. Lokkeborg (1996) tested two baits, mackerel and squid. Mackerel bait loss was 13.1% with a deterrent and 19.5% without. Squid bait loss was 21.1% with a deterrent and 17.2% without. The lesser difference in squid bait retention was probably due to squid being a tough bait which is difficult for seabirds to remove from the hook. In contrast, there were differences in bait retention for mackerel, probably because, unlike squid, it is less tough and easier to remove from the hook. Squid and herring are common longline baits in the northeast Pacific. Herring seems suitable for this experiment because it is easy to tear off when used. Use frozen herring. Bait the hooks with bait that is partially thawed; the semi-frozen bait is firmer and makes baiting the gear easier. Wait to set the gear until the bait is fully thawed. Fully thawed bait is softer and more easily lost. Don't salt the herring, as is sometimes done, because this toughens the bait.

DEFINITIONS AND CATEGORIES OF SEABIRD FEEDING ATTEMPTS

This section needs input from a seabird biologist to define "seabird feeding attempt" and the different types of "seabird feeding attempts". For example, a "seabird feeding attempt" could be classified as "head underwater", "diving", etc.

SPECIFIC DATA TO RECORD

During longline deployment:

1. Record to video tape the species and approximate distance astern seabird feeding attempts;
2. Record sea height and direction and wind speed and direction relative to vessel setting speed and direction;
3. Record weather conditions.

During video analysis at sea:

1. Count the number of seabird feeding attempts and determine their approximate maximum distance astern.
2. Check the quality of the video record of the deployment.

During video analysis on land:

1. Verify the number and species of seabird feeding attempts and measure and record their distance astern of the vessel and lateral distance from the streamer line or buoy line;
2. Record the number and species composition of seabirds within visual range and astern of the vessel.

SEABIRD OBSERVATION PRIORITIES

Recording albatross feeding attempts is the first priority during longline deployment because the endangered status of short-tailed albatross prompted this study.

ANALYSIS OF DATA

The analysis will be based on the number of seabird feeding attempts and bait loss. Seabird feeding attempts will be compared to longline depth and streamer line and buoy line position. Measuring performance based on relative position of the streamer line to the longline should eliminate the need to test various lengths of streamer line. The number of seabird feeding attempts and bait loss will be compared with and without a deterrent.

Measurement of a Vulnerable Zone: Compute the cumulative number of seabird feeding attempts as a function of longline depth.
Effectiveness of Seabird Avoidance Measures: Compare the number of seabird feeding attempts with and without a streamer line or buoy by a statistical test based on paired differences. To compute a paired difference, compute difference between seabird feeding attempts for streamer line and no deterrent and for buoy and no deterrent. Test for differences significantly different from zero by, for example, analysis of variance.

ESTIMATED COSTS

| Item | | $Amount |
|---|---|---|
| 1. Experimental Tests of Effectiveness of Seabird Avoidance Measures - contract University or Research Firm | (1000's) | |
| A. Government costs to develop a work plan, procure and administer contract, and evaluate contract performance | | |
| COTR staff time and travel | | 25 |
| Time and travel of gov't scientists to consult with contract scientists. | | 5 |
| B. Contract Cost | | |
| Contract or salary for project leader/analyst/report writer | | 50 |
| Chartered longliner and crew to conduct setting experiments @5K/day, 17 days | 85 | |
| Processing of video recordings (technician's time) | | 10 |
| Seabird expert for ID, and behavioral observations during experiment - contract or provided by FWS. | | 10 |
| Travel and Overtime | | 10 |
| Equipment - dataloggers, binoculars, cameras, video processor | | 15 |
| Supplies, avoidance gear, longline gear and bait | | 10 |
| University or firm overhead | | 15 |
| | Subtotal | 235 |

REFERENCES

Brothers, N. 1991. Albatross mortality and associated bait loss in the Japanese longline fishery in the Southern Ocean. Biological Conservation 55: 255-268.
Brothers, N. 1995. The influence of bait quality on the sink rate of bait used in the Japanese longline tuna fishing industry: an experimental approach. CCAMLR Science 2:123-129.
CCAMLR, 1996. Fish the Sea Not the Sky: How to avoid by-catch of seabirds when fishing with bottom longlines. CCAMLR Hobart, Tasmania, Australia, 46 pp.
Cherel, Y., H. Weimerskirch and G. Duhamel. 1996. Interactions between longline vessels andseabirds in Kerguelen waters and a method to reduce seabird mortality. Biological Conservation 75: 63-70.
Duckworth, K. 1995. Analyses of factors which influence seabird bycatch in Japanese southern

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luefintuna longlinefisheryinNewZealandwat ers, 1989-93. New Zealand Fisheries Assessment

Research Document 95/26. CCAMLR WG-FSA-96/6

Lokkeborg, S. 1996. Seabird bycatch and bait loss in longlining using different setting methods.

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Melvin, E. F., L. L. Conquest and J. K. Parrish. 1997. Seabird bycatch reduction: new tools for Puget Sound drift gillnet salmon fisheries. Washington Sea Grant Program.

Metcalfe, J. D. and Arnold, g. P. 1997. Tracking fish with electronic tags. Nature, London, 387, 665-666.

Murray, T. E., J. A. Bartle, S. R. Kalish and P. R. Taylor. 1993. Bird Conservation International 3:181-210.

Sigler, M. F. and H. H. Zenger. 1994. Relative abundance of sablefish and other groundfish in the Gulf of Alaska based on the domestic longline survey, 1989. NOAA Technical Memorandum NMFS-AFSC-40. 79p.

Attachment B.

OBSERVATIONS OF SEABIRD BEHAVIOR DURING LONGLINE OPERATIONS

We recommend conducting a separate experiment to observe bird behavior during the deployment of gear during commercial operations using various seabird avoidance measures. Selected seabird observers (in addition to any required groundfish observer) on commercial longline vessels would gather data on bird behavior and ascertain the effectiveness of seabird avoidance measures using the same or similar methods as used in the the first part of the pilot study (see Attachment A). Whereas the first part of the study tests the effectiveness of measures in a relatively controlled experimental setting, this portion of the study would provide some groundtruthing as to the practical applications of the seabird avoidance measures and their effectiveness in commercial fishing operations. Vessels would volunteer to assist in the study, but selection would be stratified by fishery and season so that all are covered (e.g sablefish and halibut -spring, summer, and fall; Pacific cod- winter and fall, Greenland turbot-spring etc.).

Objectives:

(1) Preliminary evaluation of effectiveness of current practices used to reduce the incidental take of seabirds.

(2) Look for important variables which may increase or decrease the incidental take of seabirds (e.g. Size and speed of vessel, rate gear is set, bird species and relative numbers, type of deterrent and dimensions, effects of offal discharge on bird numbers near gear, etc).

(3) Determine the effectiveness of the deterrent method for various fishing vessel sizes and types, and fishing practices.

(4) Provide a database necessary for the expansion of the experimental data (Attachment A) to the fishery.

Methods: Use a handheld video camera off the stern of the vessel to record seabird activity during longline setting, similar to the procedure used in the scientific experiment. Record:

(1) Number, species composition, and behavior of seabirds in the vicinity,

(2) Number, distance astern and relative position of species making bait catching attempts during setting of the gear,

(3) Number, species, and distance astern of the vessel for seabirds that grab a bait,

(4) Sea height and direction and wind speed and direction relative to vessel setting speed and direction,

(5) Weather conditions,

(6) Line weighting,if any

(7) Type and geometry of deterrent gear deployed, and

(8) Numbers of birds caught on the gear.

Document by voice the bait catching attempts as the video is being recorded. View videos immediately following the set and determine species, numbers and relative position with respect to the groundline at one minute intervals as in the scientific experiment in Attachment A. Take a random sample of the sets; a minimum of 3 sets each for numerous, moderate, and few birds present. Data will be processed as in the scientific experiment. A review of available videos of longline setting operations is recommended during detailed planning for the observation experiments. (See Mike Sigler and John

Karinen at ABL for videos.)

Estimated Costs

| | | | $ Amount (1,000's) |
|---|---|---|---|
| A. | Government costs to develop a work plan, procure a vessel, procure and administer contract, and evaluate contract performance. | | |
| | Vessel cost for 30 days (10 days during 3 periods) | | 6 |
| | Per Diem for observer | 2 | |
| | Travel for observer | | 6 |
| | Equipment for observer-binoculars, camera, video processor | 10 | |
| | COTR staff time and travel | | 15 |
| | Time and travel of gov't scientist to consult with contract observer | | 5 |
| B. Contract Cost | | | |
| | Contract or salary for observer/project leader/report writer | | 10 |
| | Film and Processing of video recordings | | 10 |
| | | Subtotal | 64 |

REFERENCES

Fahy, C. C., 1997. North Pacific longline seabird bycatch deterrent evaluation: Pilot project. Letter to Vivian Mendenhall from C.C. Fahy, May 26, 1997.

Mitchell, Elizabeth, 1997, Draft Report of Seabird Deterrent. Draft sent to John F. Karinen, October 10, 1997.

## APPENDIX C

Data recording sheet designed by Vivian Mendenhall, U.S. Fish and Wildlife Service, Migratory Bird Management, 1011 E. Tudor Road, Anchorage, AK 99503

**NORTH PACIFIC LONGLINE SEABIRD BYCATCH DETERRENT EVALUATION:**
**PILOT PROJECT**

These observations are voluntary and are not an official project of
the U. S. Fish and Wildlife Service. We thank you for your help.

**SHEET 1: Vessel, fishing, and deterrent data. (Fill in one sheet for each set observed.)**

Date [ ] Vessel: Name [ ] Length [ ] Observer [ ]

FISHING INFORMATION

Set time: Start [ ] End [ ] This is set [ ] of [ ] today. Vessel course: [ ]

Set start: Latitude: [ ] Deg. [ ] Min. End: Lat.: [ ] Deg. [ ] Min.

Longitude: [ ] Deg. [ ] Min. [E/W] Long.: [ ] Deg. [ ] Min. [E/W]

Target species [ ] Number of hooks in set [ ]

Baits used [ ] Auto baiter? [Y / N] Bait thrower? [Y / N]

Offal being discharged? [Y / N] Where? [ ]

WEATHER AND SEA DATA

Wind speed (kt) [ ] Direction [ ] Sea state: Wave ht. (ft.) [ ] Swell ht. (ft.) [ ]

Clouds (% cover) [ ] Light: [Day/ Twilight/ Night] Moon: [None/ <1/2 / 1/2 to full]

DETERRENT GEAR USED DURING SET (Check 1 or more heavy boxes and add details)

None [ ] Towed object [ ] : Type [ ]

Weights [ ] : Number of weights [ ] Weight used [ ]

Streamer line [ ] : Number of streamer pairs [ ] Distance between pairs (m) [ ]

Forward end of main line: Ht. above deck (m) [ ] Distance from vessel stern (m) [ ]

Lower ends of streamers should swing near baits; give usual range of:

Distance above water (m) [ ] Horizontal distance from baits (m) [ ]

Other deterrents [ ] : Describe [ ]

COMMENTS [ ]

Record bird observations on Sheet Number 2.
Please return forms to: V.M. Mendenhall, U.S. Fish and Wildlife Service, 1011 E. Tudor Rd., Anchorage, AK 99503-6199. (907) 786-3517.
Comments on observations or design of data protocol are welcomed.

## NORTH PACIFIC LONGLINE SEABIRD BYCATCH DETERRENT EVALUATION: PILOT PROJECT

These observations are voluntary and are not an official project of the U. S. Fish and Wildlife Service. We thank you for your help.

**SHEET 2: Seabird observations.** (Fill in one or more sheets for each set observed. Also fill in Sheet 1 for each set.)

Date [ ] Vessel name [ ] Observer [ ] This is set [ ] of [ ] today

Set time: Start [ ] End [ ] Period observed (if not whole set): Start [ ] End [ ]

**BIRDS IN VICINITY OF LINE DURING SETTING**

Count birds at 15-minute intervals out to 300 m astern and 300 m each side of longline.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Time | | | | | | | |
| Short-tailed Albatross[1] | | | | | | | |
| Laysan Albatross | | | | | | | |
| Black-footed Albatross | | | | | | | |
| Northern Fulmar | | | | | | | |
| Total gulls | | | | | | | |
| Dark shearwaters | | | | | | | |
| | | | | | | | |
| All others | | | | | | | |

**BIRDS ATTEMPTING TO TAKE BAIT.** Record all birds that attack bait during set.

| Species/taxonomic group[1] | Number | Took bait? | Bird caught? | Reaction to deterrents/ notes |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**BYCATCH DURING RETRIEVAL OF SET**

| Species/taxonomic group[1] | Number | Age (STAT) | Where hooked | Band no. | Specimen?[2] |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

[1]Note your criteria for ID's of birds on back of this form, especially for albatrosses.

[2]Label specimen with date, location, vessel, & observer; freeze.

Return forms to V.M. Mendenhall, U.S. Fish and Wildlife Service, 1011 E. Tudor Rd., Anchorage, AK 99503, (907) 786-3517.

## APPENDIX D

### Contacts for the issue of seabird bycatch in Alaska's fisheries

**<u>National Marine Fisheries Service, Alaska Region</u>**
Kim Rivera, Sustainable Fisheries, RO, Juneau
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**<u>North Pacific Longline Association</u>**
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## APPENDIX E

### Definitions of terms

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|---|---|
| Seabird Bycatch: | Incidental mortality of seabirds during fishing operations. |
| Seabird deterrent methods: | Any method used to distract seabirds away from baited longline hooks as they are set, or prevent seabirds from accessing the hooks. Methods include deployment of bird scaring devices such as tori lines and bird buoys, and use of methods such as night fishing or underwater deployment of longlines. Also called: seabird bycatch avoidance methods. |
| Bird Scaring Device: | A device such as a tori line or a bird buoy, deployed behind a vessel during longline setting to keep birds away from the groundline thereby preventing accidental hookings and mortalities. |
| Tori Line: | A line of streamers deployed above the groundline during setting which has numerous streamers attached to it. The streamers are generally constructed of a material which flops and moves unpredictably with the movement of the vessel and wind. When the tori line is constructed and deployed properly, the movement of the streamers keeps seabirds from accessing the baited hooks while the hooks are at or close to the surface of the water. Also called: Streamer Line, Bird Scaring Line. |
| Night setting: | Setting between the hours of nautical twilight to avoid attracting seabird to a longline vessels during setting. |
| Groundline: | The main line set behind a vessels, to which are attached branch lines, or gangions. |
| Gangions: | Branch lines attached to the groundline. Each gangion has a baited hook attached at the end. The length of gangions varies depending on the type of fishing. Gangions in Alaska's longline fisheries are typically relatively short. |