Summary of Seabird Bycatch in Alaskan Groundfish Fisheries, 1993 through 2003.

Updated 8 March 2005

This document provides a summary of seabird bycatch in federal groundfish fisheries in Alaskan waters from 1993 through 2003. Information that describes fisheries, vessel operations, observer sampling methodology, or analytical processes for estimation are available elsewhere. The purpose of this report is to make the estimates of seabird bycatch in federal groundfish fisheries available annually to the public.

Estimates of seabird bycatch from Alaskan groundfish fisheries are completed each year based on data from North Pacific Groundfish Observers and from the Alaska Region Office catch accounting system. Observer methods are detailed in the North Pacific Groundfish Observer Program Documents while a description of the catch accounting process is available at the Alaska Groundfish Catch Accounting System. Groundfish fisheries include fixed gear (pot and demersal longline) and trawl gear in federal waters of the Alaskan EEZ. Fishing takes place in two broad regions – the Bering Sea and Aleutian Islands (BSAI) and the Gulf of Alaska (GOA).

Bycatch summarized here is reported by the species or reporting groups developed in consultation with the U.S. Fish and Wildlife Service Region 7 (Anchorage, Alaska). The definitions for species or group codes used in these tables are:

STAL - Short-tailed albatross
LAAL - Laysan♣s albatross
BFAL - Black-footed albatross
NOFU - Northern fulmar
Gull - Unidentified gulls (herring gulls, glaucous gulls, glaucous-winged gulls)
SHWR - Unidentified shearwaters (unidentified dark shearwaters, sooty shearwaters, short-tailed shearwaters)
Unidentified Tubenose - Unidentified procellariiformes (albatrosses, shearwaters, petrels)
Alcid - Unidentified alcids (guillemots, murres, puffins, murrelets, auklets)
Other - Miscellaneous birds (could include loons, grebes, storm-petrels, cormorants, waterfowl, eiders, shorebirds, phalaropes, jaeger/skuas, red-legged kittiwakes, black-legged kittiwakes, terns)
Unidentified ALB - Unidentified albatrosses (could include short-tailed albatrosses, Layson♣s albatrosses, black-footed albatrosses)

Bycatch in Longline Fisheries: Longline, or hook and line, fisheries in Alaskan waters are demersal sets and target groundfish or halibut. Observer coverage is not required in the halibut fishery, so information reported here are for demersal groundfish longline fisheries only. Longline fisheries in the BSAI are typically undertaken by vessels that are larger, stay at sea longer (up to 30 days), have onboard processing abilities, target Pacific cod (*Gadus macrocephalus*) and Greenland turbot (*Reinhardtius hippoglossoides*), use auto-bait systems, and deploy up to 55,000 hooks per day (Melvin et al. 2001). Conversely, longline vessels in the GOA typically are smaller, have shorter trip lengths (6 days), deliver bled fish on ice to shoreside processing plants, target sablefish (*Anoplopoma fimbria*), use tub or hand bait gear, and deploy up to 10,500 hooks per day (Melvin et al., 2001).

Between 1993 and 2003 the average annual bycatch in the combined BSAI and GOA longline fisheries was 12,619 and 932 seabirds respectively (13,551 total -- Table 1). Over this period the average annual bycatch rates were 0.71 and 0.24 birds per 1,000 hooks in the BSAI and GOA, respectively. Large inter-annual variation in seabird bycatch is common, even with the implementation of the first generation of seabird avoidance regulations in 1997 (Figure 1). Recently, seabird bycatch has trended downward. In 2002 many freezer-longliners fishing in the BSAI adopted the recommendations from studies completed by Melvin et al. (2001). Paired streamer lines meeting specific performance standards had proven to be very effective in reducing seabird bycatch during this study. NMFS completed revisions to seabird avoidance regulations in February 2004. Among other requirements, vessels larger than 55 feet length over all must use paired streamer lines except in certain weather conditions.

Tables 2 and 3 report the estimated bycatch of seabirds in demersal groundfish longline fisheries by the species or species groups identified above. To date, the lowest bycatch of seabirds occurred in 2002. Bycatch rates in the BSAI have been decreasing to current low levels (Table 1, Figure 2). Rates also appear to be averaging lower than previous years in the GOA (Figure 3).

The species composition for seabird bycatch in the BSAI longline fishery is 59 percent fulmars, 20 percent gull species, 12 percent unidentified seabirds, 4 percent albatross species, 3 percent shearwater species, and 2 percent ‘all other’ species (Table 2).

Species composition in the GOA longline fishery is: 46 percent fulmars, 34 percent albatrosses, 12 percent gull species, 5 percent unidentified seabirds, 2 percent shearwater species, and less than 1 percent ‘all other’ species (Table 3).

Pot: Seabird bycatch from groundfish pot fishing has traditionally been very limited. The overall average bycatch in this fishery, 1993 through 2003, is 55 seabirds. That trend continues, with only 10 birds observed taken in 2003, extrapolating up to an estimated 153 total mortalities (Table 4). No albatross have been taken in pot gear.

Trawl: On trawl vessels only, observers use either whole haul, partial haul, or basket sampling to record prohibited species bycatch and determine the species composition of the haul. Observers are often required to use 2 sample types in a single haul, in order to best sample for either of these goals. Observers have been instructed to use the largest sample available when monitoring for seabird bycatch. Unfortunately, that has not always occurred. Observers had not been instructed to record sample sizes when no seabirds were recorded. For these years, it is not known with certainty which sample size was used to monitor for seabird bycatch in these hauls. Thus, it has been necessary to calculate two alternative sets of estimates of seabird bycatch for trawlers based on the largest (alternative1) and smallest (alternative2) sizes of sampling effort recorded for fish species (Table 5, Figure 4). In each of these two alternative calculation methods, a separate ratio estimator was used to bind the results of the catch ratios and variances of data from the three different sample sizes into arbitrary equal samples which were then inflated upwards to the total catch effort of the NMFS blend program. It is not known which of the 2 estimates is more accurate. Seabird bycatch on trawl vessels probably lies somewhere between them. If the majority of observers monitored for seabirds while using their largest sample size, as instructed, then the lower of the two estimates more closely represents bycatch on the trawl fleet.

This issue has been resolved for data collections beginning in the 2004 season, where the sample size used to monitor for seabirds will be noted whether a bird was taken or not. Estimates are only provided for 1998 through 2003 due to the way the commercial catch data were organized prior to that. Northern fulmars are again the most common species taken, constituting more than 53% of the seabird bycatch (Table 5).

Another source of mortality for seabirds on trawl vessels are the cables that run between net monitoring devices and the vessel, or the trawl door cables themselves. To date, only anecdotal information is available, so the extent of the mortality from this cause is uncertain. Special projects were also designed and implemented for observers during 2004 and will be expanded for the 2005 fishing season. We are currently developing estimates on total effort and will use the 2004 and 2005 observer data to better characterize interaction rates and mortalities. A collaborative project has been started between industry, the Alaska Fisheries Science Center, the University of Washington, and the USFWS to determine and test mitigation measures to reduce seabird interactions with trawl sonar transducer cables.

Species Composition: Depending on which trawl estimate is used (see above), longline gear accounted for 94 or 65 percent of the total average annual seabird bycatch while trawl gear accounted for either 6 or 35 percent. Pot gear was less than 1 percent in all cases. The higher percentage of trawl bycatch coincides with the alternate trawl estimation methods as described above (Figure 4). Based on the average annual estimates of seabirds observed taken in groundfish longline fisheries from 1993 to 2002, 93 percent of the longline seabird bycatch was caught in the BSAI, and 7 percent in the GOA. Also of note, the bycatch rates in the BSAI are approximately 3 times higher than in the GOA (Figures 6 and 7).

Seabird trends by species and species groups are reported in the seabird section of the Ecosystem Considerations for 2004 chapter -- Stock Assessment and Fishery Evaluation Report found at http://www.afsc.noaa.gov/refm/docs/2004/BSAIGOA_Ecosystem_2004.pdf These trends address both population and bycatch issues. For additional information on seabird regulations, biological opinions, and other related matters, refer to the Alaska Region Protected Resources Division Alaska Seabird Incidental Take Reduction Program and Longline Gear Seabird Avoidance Measures.

Acknowledgements

Reporting of seabird bycatch numbers would not be possible without the dedication and hard work of the many North Pacific Groundfish Observers deployed each year. Their efforts are here gratefully acknowledged. North Pacific Groundfish Obsever Program staff work to support observers in the field and to ensure that these data are of the highest quality possible. They too deserve credit for their diligence. Michael Perez of the National Marine Mammal Lab conducts

the analysis each year, with financial support from the Alaska Region Protected Resources Division and the Alaska Fisheries Science Center.

Citations

Melvin, E.F., J.K. Parrish, K.S. Dietrich, and O.S. Hamel. 2001. Solutions to seabird bycatch in Alaska's demersal longline fisheries. Washington Sea Grant Program. Project A/FP-7. Available on loan from the National Sea Grant Library, and from publisher. WSG-AS-01-01.

Table 1. Annual estimates, by area, of total fishery effort, total numbers and bycatch rates of seabirds taken in Alaskan groundfish demersal longline fisheries.

Year	Effort (No. of Hooks in 1,000s)	Number of Birds	95% Confidence Bounds	Bycatch Rate (Birds per 1,000 Hooks)	Percent of Hooks Observed
Bering Sea and Aleutian Islands					
1993	123,232	7,975	6,981-8,968	0.065	24.5
1994	134,954	10,637	9,608-11,666	0.079	24.5
1995	141,779	19,214	17,853-20,576	0.136	24.2
1996	141,810	8,526	7,641-9,412	0.060	23.8
1997	176,594	18,063	16,491-19,634	0.102	22.6
1998	175,530	24,602	22,779-26,425	0.140	23.5
1999	157,319	12,418	10,950-13,887	0.079	25.0
2000	192,994	18,191	16,599-19,783	0.094	22.8
2001	226,185	9,992	9,027-10,958	0.044	21.0
2002	216,197	3,835	3,328-4,342	0.018	22.5
2003	276,327	5,351	4,705-5,997	0.019	22.6
BSAI Average Annual Estimates					
1999-2003	213,804	9,958	9,455-10,460	0.047	22.6
1993-2003	178,447	12,619	12,246-12,991	0.071	23.2
Gulf of Alaska					
1993	56,300	1,309	1,056-1,563	0.023	10.2
1994	49,452	532	397-668	0.011	4.9
1995	42,357	1,519	1,302-1,736	0.036	12.7
1996	33,195	1,634	1,206-2,062	0.049	10.8
1997	28,047	514	338-689	0.018	10.0
1998	29,399	1,498	795-2,200	0.051	8.1
1999	31,895	1,093	812-1,375	0.034	8.6
2000	35,345	751	402-1,101	0.021	6.5
2001	34,216	512	311-713	0.015	7.8
2002	37,166	259	114-404	0.007	9.3
2003	53,066	632	268-995	0.012	6.5
GOA Average Annual Estimates					
1999-2003	38,338	649	523-775	0.017	7.6
1993-2003	39,131	932	831-1,033	0.024	8.6

Table 2. Estimated total incidental catch of seabirds by species or species groups in Bering sea and Aleutian islands demersal groundfish longline fisheries, 1993–2003. Values in parentheses are 95% confidence bounds.

Year	Actual No. Taken[a]	STAL	BFAL	LAAL	NOFU	Gull	SHWR	Unid. Tube-noses	Alcid	Other	Unid. ALB	Unid. Seabird	Total
1993	1,942	0	11 (4-21)	617 (458-777)	4,259 (3,416-5,103)	853 (576-1,130)	64 (22-107)	0	15 (4-30)	4 (1-10)	352 (188-517)	1,799 (1,399-2,200)	7,975 (6,981-8,968)
1994	2,700	0	37 (7-66)	311 (218-404)	4,829 (4,188-5,470)	1,734 (1,297-2,172)	675 (487-864)	350 (226-475)	4 (1-13)	4 (1-11)	76 (43-109)	2,615 (1,956-3,274)	10,637 (9,608-11,666)
1995	4,832	0	66 (26-107)	463 (267-660)	9,628 (8,613-10,643)	3,954 (3,274-4,634)	330 (225-434)	475 (253-697)	4 (1-11)	45 (16-74)	38 (19-57)	4,211 (3,489-4,933)	19,214 (17,853-20,576)
1996	2,002	4 (1-13)	20 (5-48)	234 (156-313)	5,677 (4,858-6,496)	1,493 (1,238-1,747)	487 (246-728)	14 (4-26)	46 (9-103)	49 (13-86)	60 (31-90)	442 (326-558)	8,526 (7,641-9,412)
1997	4,123	0	9 (2-22)	343 (252-433)	13,611 (12,109-15,122)	2,755 (2,276-3,234)	300 (154-445)	173 (103-243)	0	7 (2-16)	14 (3-28)	852 (519-1,185)	18,063 (16,491-19,634)
1998	5,850	8 (2-18)	9 (2-21)	1,441 (1,078-1,804)	15,533 (13,873-17,192)	4,413 (3,732-5,093)	1,131 (936-1,326)	21 (5-38)	53 (24-82)	48 (15-81)	4 (1-11)	1,941 (1,584-2,297)	24,602 (22,779-26,425)
1999	3,293	0	18 (4-34)	576 (478-674)	7,843 (6,477-9,209)	2,209 (1,817-2,601)	449 (358-540)	414 (150-679)	4 (1-10)	47 (12-85)	0	859 (551-1,167)	12,418 (10,950-13,887)
2000	3,868	0	16 (5-33)	441 (320-562)	10,941 (9,503-12,378)	4,541 (3,894-5,188)	556 (414-697)	85 (44-125)	5 (1-14)	16 (4-30)	15 (3-30)	1,576 (1,166-1,985)	18,191 (16,599-19,783)
2001	1,987	0	4 (1-12)	425 (304-547)	5,517 (4,701-6,332)	2,459 (2,044-2,873)	457 (337-578)	94 (49-139)	2 (1-6)	33 (6-61)	5 (1-14)	997 (698-1,295)	9,992 (9,027-10,958)

Table 2 continued

Year	Actual No. Taken[a]	STAL	BFAL	LAAL	NOFU	Gull	SHWR	Unid. Tube-noses	Alcid	Other	Unid. ALB	Unid. Seabird	Total
2002	877	0	0	48 (19-77)	701 (582-819)	2,523 (2,040-3,006)	154 (95-213)	17 (5-34)	10 (2-23)	16 (4-32)	5 (1-14)	361 (259-462)	3,835 (3,328-4,342)
2003	1,123	0	10 (2-23)	167 (77-257)	3,204 (2,655-3,754)	1,346 (1,029-1,662)	287 (209-366)	14 (3-38)	11 (3-22)	62 (24-99)	0	250 (177-324)	5,351 (4,705-5,997)
Average Annual Estimate													
1999-2003	na	0	10 (4-16)	331 (287-376)	5,641 (5,197-6,085)	2,616 (2,408-2,823)	381 (335-427)	125 (70-180)	6 (2-11)	35 (22-48)	5 (1-9)	808 (687-930)	9,958 (9,455-10,460)
1993-2003	na	1 (0-3)	18 (12-25)	461 (413-508)	7,431 (7,106-7,756)	2,571 (2,425-2,717)	445 (402-487)	151 (116-186)	14 (7-21)	30 (22-38)	52 (36-68)	1,446 (1,326-1,566)	12,619 (12,246-12,991)

a Actual number taken is the total number of seabirds recorded dead in the observed hauls.

Table 3. Estimated total incidental catch of seabirds by species or species groups in Gulf of Alaska demersal groundfish longline fisheries, 1993–2003. Values in parentheses are 95% confidence bounds.

Year	Actual No. Taken	STAL	BFAL	LAAL	NOFU	Gull	SHWR	Unid. Tube-noses	Alcid	Other	Unid. ALB	Unid. Seabird	Total
1993	318	0	29 (9-50)	125 (62-187)	833 (615-1,052)	45 (12-77)	59 (18-99)	0	0	3 (1-7)	3 (1-9)	213 (107-318)	1,309 (1,056-1,563)
1994	126	0	7 (2-16)	169 (89-250)	258 (165-351)	30 (2-81)	26 (5-54)	0	0	0	8 (2-18)	33 (8-66)	532 (397-668)
1995	374	0	236 (169-304)	67 (35-99)	520 (348-692)	99 (53-145)	39 (9-69)	6 (1-16)	0	3 (2-6)	376 (275-476)	173 (105-240)	1,519 (1,302-1,736)
1996	250	0	658 (455-860)	154 (90-218)	668 (352-985)	121 (6-317)	14 (2-35)	0	0	0	0	19 (3-42)	1,634 (1,206-2,062)
1997	74	0	99 (32-167)	40 (5-109)	307 (164-451)	46 (14-79)	9 (2-21)	0	0	0	0	12 (2-30)	514 (338-689)
1998	184	0	289 (25-596)	217 (56-378)	922 (310-1,533)	53 (14-92)	13 (3-30)	0	0	0	4 (1-12)	0	1,498 (795-2,200)
1999	159	0	183 (70-297)	202 (123-280)	277 (156-399)	358 (136-581)	50 (8-93)	0	0	7 (1-21)	0	16 (4-37)	1,093 (812-1,375)
2000	72	0	148 (62-235)	93 (25-160)	297 (70-524)	179 (15-415)	0	0	0	0	0	34 (2-102)	751 (402-1,101)
2001	45	0	72 (20-124)	67 (6-128)	230 (115-344)	98 (4-244)	20 (1-58)	0	6 (1-18)	0	15 (1-44)	3 (1-9)	512 (311-713)
2002	51	0	33 (10-57)	0	129 (24-238)	83 (17-177)	0	0	0	0	0	14 (3-30)	259 (114-404)
2003	37	0	166 (11-350)	12 (3-23)	260 (81-439)	58 (4-140)	0	0	118 (1-369)	0	0	18 (1-53)	632 (268-995)
Average Annual Estimate													
1999-2003	na	0	121 (72-169)	75 (50-99)	239 (168-309)	155 (80-231)	14 (2-26)	0	25 (0-76)	1 (0-5)	3 (0-9)	17 (2-34)	650 (523-1,033)
1993-2003	na	0	175 (133-216)	104 (81-127)	427 (351-504)	106 (66-146)	21 (13-29)	1 (0-2)	11 (0-35)	1 (0-3)	40 (27-47)	49 (34-63)	932 (831-1,033)

Table 4. Estimated total incidental catch of seabirds by species or species groups in the combined Bering sea and Aleutian Islands and Gulf of Alaska groundfish pot fisheries, 1993–2002. Values in parentheses are 95% confidence bounds.

Year	Actual Number Taken [a]	STAL	BFAL	LAAL	NOFU	Gull	SHWR	Unid. Tubenoses	Alcid	Other	Unid. ALB	Unid. Seabird	Total
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	6	0	0	0	9 (2-23)	3 (1-10)	7 (1-20)	0	19 (2-55)	0	0	0	39 (6-79)
1996	9	0	0	0	80 (7-174)	0	0	2 (1-6)	0	0	0	7 (1-19)	89 (9-183)
1997	4	0	0	0	14 (3-29)	0	0	0	9 (1-26)	0	0	0	23 (4-46)
1998	2	0	0	0	19 (1-54)	15 (1-44)	0	0	0	0	0	0	33 (2-79)
1999	47	0	0	0	166 (71-261)	0	9 (1-26)	14 (5-28)	0	0	0	0	189 (91-286)
2000	1	0	0	0	0	0	0	0	0	0	0	42 (1-122)	42 (1-122)
2001	3	0	0	0	13 (2-33)	3 (1-8)	0	0	0	0	0	0	16 (3-36)
2002	6	0	0	0	18 (5-34)	0	0	0	0	0	0	3 (0-26)	21 (6-38)
2003	10	0	0	0	92 (8-182)	0	2 (1-4)	0	59 (1-171)	0	0	0	153 (10-296)
Average Annual Estimate													
1999-2003	na	0	0	0	58 (31-85)	1 (0-2)	2 (0-6)	3 (1-6)	12 (0-35)	0	0	9 (0-26)	84 (45-123)
1993-2003	na	0	0	0	37 (22-53)	2 (0-5)	2 (0-4)	1 (0-30)	8 (0-19)	0	0	5 (0-13)	55 (34-76)

a Actual number taken is the total number of seabirds recorded dead in the observed hauls.

Table 5. Range of estimates of the total incidental catch of seabirds by species or species groups in the combined Bering Sea and Aleutian Islands and Gulf of Alaska groundfish trawl fisheries, 1998–2003.

Year	Actual Number Taken [a]	Estimate Range	STAL	BFAL	LAAL	NOFU	Gull	SHWR	Unid. Tubenoses	Alcid	Other d	Unid. ALB	Unid. Seabird	Total
1998	45	low	0	0	135	96	1,590	856	1	110	3	0	8	2,798
		high	0	0	343	4,012	708	1,353	163	543	2,494	0	1,110	10,725
1999	154	low	0	0	8	858	0	82	0	664	2	0	17	1,630
		high	0	0	27	8,528	0	1,149	0	791	85	0	1,025	11,604
2000	101	low	0	0	0	298	37	10	2	1	0	0	60	407
		high	0	0	0	10,678	114	3,086	155	333	0	0	603	14,969
2001	141	low	0	0	8	323	4	329	9	1	3	0	65	741
		high	0	0	150	10,022	288	887	1,075	68	297	0	681	13,468
2002	69	low	0	0	1	3,111	4	4	0	5	9	0	59	3,193
		high	0	0	56	6,809	71	595	0	878	124	0	475	9,008
2003	78	low	0	0	186	456	52	1	1	49	0	0	1	746
		high	0	0	253	25,792	242	127	172	551	0	0	528	27,665
Average Annual Estimate														
1999-2003	Na	low	0	0	41	1,009	19	85	2	144	3	0	40	1,343
		high	0	0	97	12,366	143	1,169	280	524	101	0	662	15,343

a Actual number taken is the total number of seabirds recorded dead in the observed hauls.

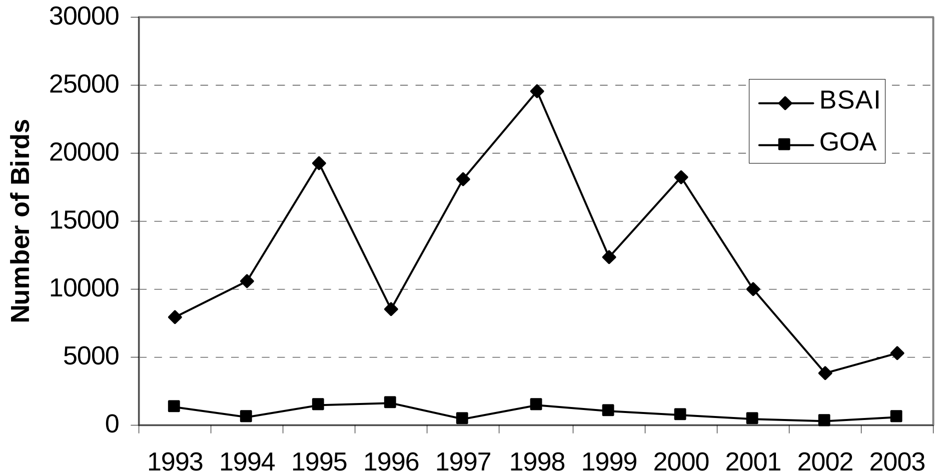

Figure 1. Estimated seabird bycatch in the BSAI and GOA groundfish longline fisheries of the Alaskan EEZ, 1993 to 2003.

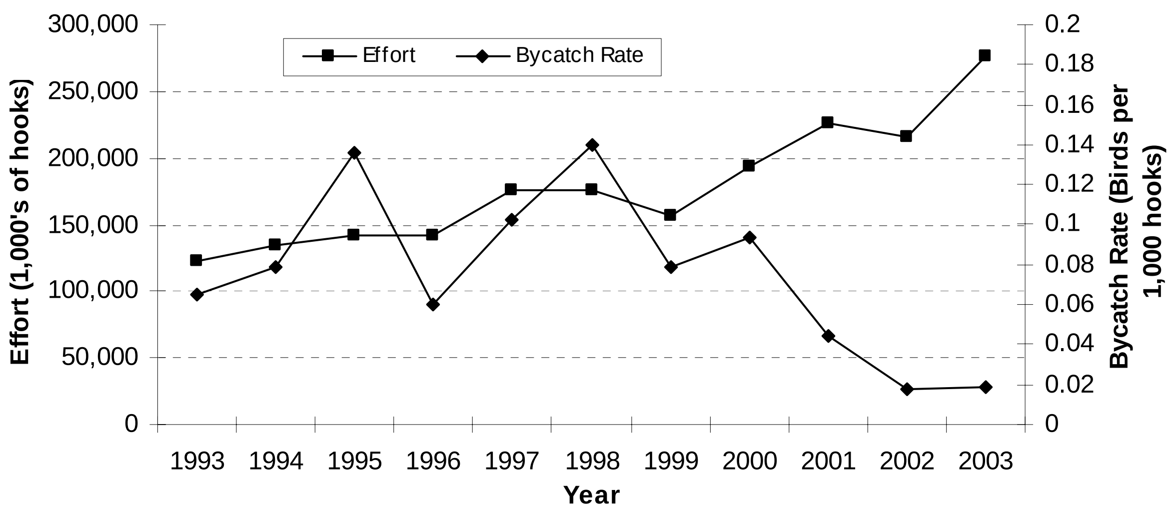

Figure 2. BSAI groundfish longline effort and seabird bycatch rate, 1993 through 2003.

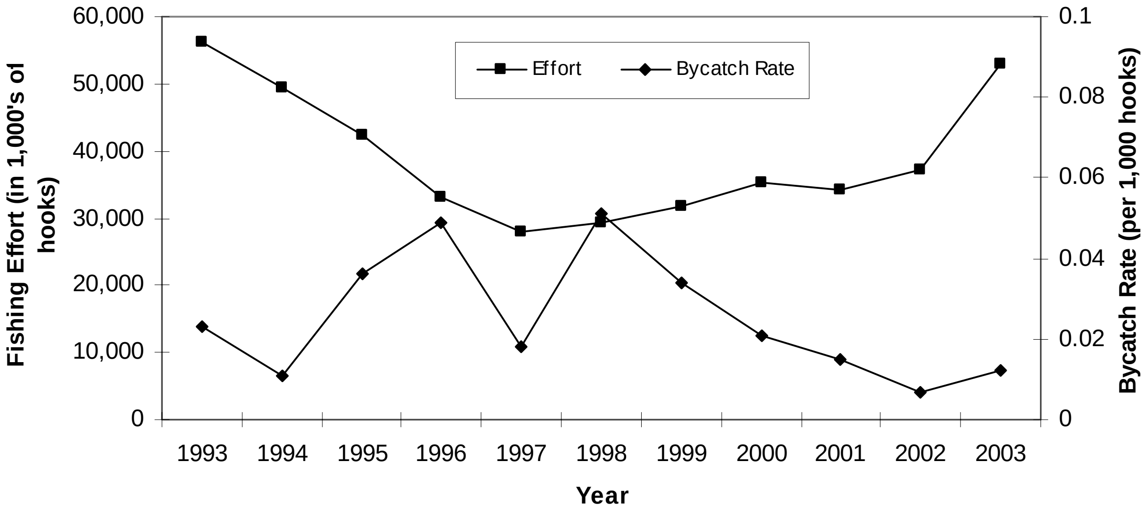

Figure 3. GOA groundfish longline effort and seabird bycatch rate, 1993 through 2003.

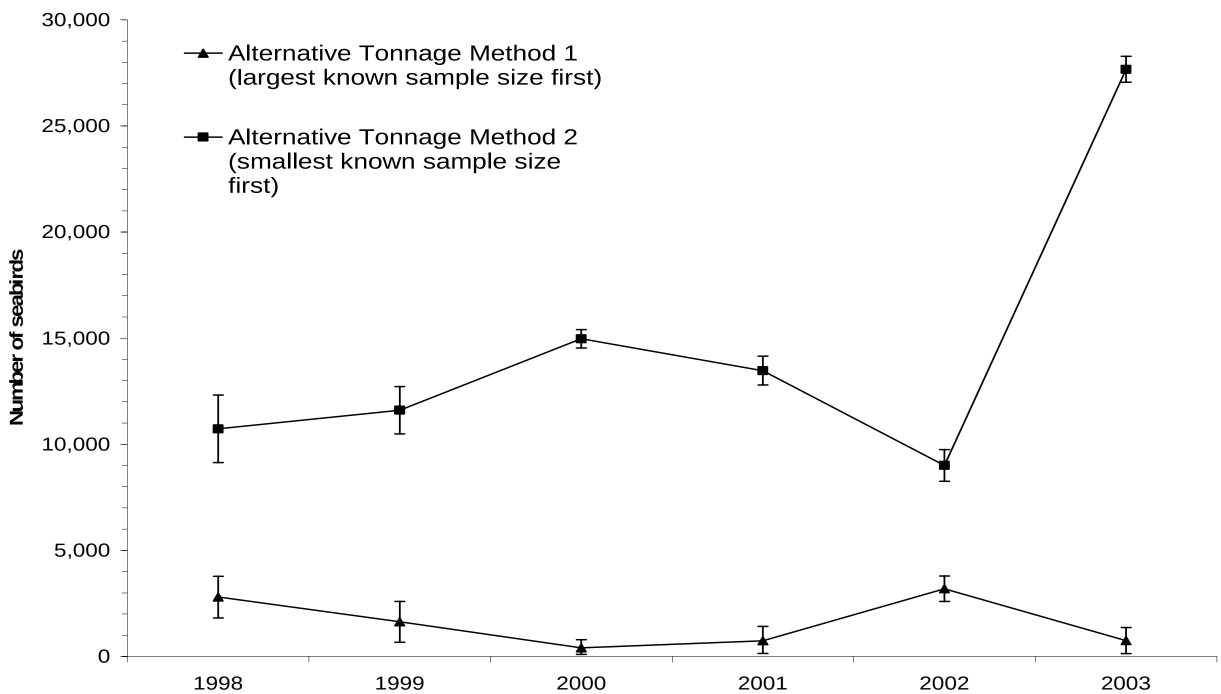

Figure 4. Seabird bycatch in Alaskan groundfish trawl fisheries (combined) using two alternate estimation methods incorporating potential sample sizes used while monitoring for seabirds in observer samples.