U.S. National Bycatch Report
First Edition Update 1

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1. Introduction

1.1 Definition of Bycatch

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSA)[1] defined the term *bycatch* and required that it be minimized to the extent practicable. Bycatch, as defined by the MSA (16 U.S.C. § 1802 (2)), "means fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such a term does not include fish released alive under a recreational catch and release fishery management program."

There currently are no universally accepted definitions for the terms *bycatch* and *discard*, and these terms are often used interchangeably. *Bycatch* for the purposes of this report is defined as: discarded catch of any living marine resource plus unobserved mortality[2] due to a direct encounter with fishing gear. Because information on unobserved mortality of fish is rarely available, it is not included in this report. Unobserved mortality is included in bycatch estimates for protected species where the data permit.

Bycatch for marine mammals is assessed as mortality plus seriously injured animals. *Serious injury* is defined as injuries likely to lead to mortality.

In some fisheries, especially in the Pacific Islands, incidental catch that might otherwise be discarded as bycatch is retained. Retaining this incidental catch can reduce bycatch rates.

1.2 The Problem of Bycatch

Bycatch occurs when fishing methods are not sufficiently selective for the target species (including targeted size range and/or sex), or because incidental take of marine mammals, sea turtles, or seabirds may occur as a result of fishing activities. Bycatch may also occur when regulatory restrictions prohibit retention of particular species, sexes, or size ranges. Therefore, some bycatch occurs in fisheries, and higher rates of bycatch occur in fisheries with less selective fishing methods and practices and/or greater overlap with protected species' ranges.

Bycatch should be examined in the context of biological, ecological, economic, and social impacts to provide a comprehensive evaluation of its overall significance. Biological impacts of bycatch have been demonstrated at the species, population/stock, and ecosystem levels (Hall et al. 2000; Kelleher 2004; Lewison et al. 2004; Read et al. 2006). These impacts include declines in populations, reduced reproductive rates, and less-resilient ecosystems.

Economic impacts may be substantial when current or potential future exploitable finfish or shellfish biomass is not available for harvest (Pascoe 1997; Larson et al. 1998; Patrick and

[1] See Appendix 1 for a complete list of acronyms used in this report.

[2] Unobserved mortality is the mortality of living marine resources due to a direct encounter with fishing gear that does not result in the capture of the species. This includes mortality due to lost or discarded fishing gear, as well as fish and other species that escape from fishing gear before it is retrieved but die due to the stress or injury resulting from the encounter (NMFS 2004).

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Benaka 2013). In addition, when bycatch results in the mortality of protected or otherwise prohibited species, recovery efforts are undermined (for example, see Guy et al. 2013). Other issues arise when mortality of living marine resources results in lost productivity of commercially or recreationally important stocks, or when the public perceives bycatch as a waste (Hall et al. 2000). Costs for monitoring and mitigating bycatch may be high, but monitoring and mitigating bycatch is an important part of sustainable fisheries management today.

Overall fishing mortality can be estimated only if reliable, quantitative information on retained catch and bycatch is available. In some cases, even very low overall bycatch levels (both mortality and interactions) may be of concern, especially if the bycaught species are protected or otherwise prohibited. When reliable bycatch estimates are available, they can be incorporated into stock assessments. Management measures have been implemented in many U.S. fisheries to reduce bycatch; these include regulatory measures that limit bycatch quantities and/or close target fisheries when bycatch limits are reached. In some cases, other mitigation measures such as gear modifications have also been required.

1.3 U.S. Laws and Regulations to Address Bycatch

The primary authorities for monitoring and reducing bycatch are contained in three statutes: the MSA, 16 U.S.C. 1801 et seq.; the Marine Mammal Protection Act (MMPA), 16 U.S.C. 1361 et seq.; and the Endangered Species Act (ESA), 16 U.S.C. 1531 et seq. Under the MSA, all fishery management plans (FMPs) and their implementing regulations must be consistent with 10 "National Standards." National Standard 9 requires that bycatch be avoided to the extent practicable or, where it cannot be avoided, that bycatch mortality be minimized; 16 U.S.C. 1851(a) (9).

The MSA also requires all FMPs to include a Standardized Bycatch Reporting Methodology (SBRM) to assess the amount and type of bycatch in managed fisheries; 16 U.S.C. 1853(a)(11). These reporting methods are intended to improve the collection and estimation of bycatch, and to support the development of effective conservation and management strategies and mitigation measures.

The MMPA's main objective is to maintain marine mammal stocks at optimum sustainable population levels, principally by prohibiting take of marine mammals. The MMPA defines *take* as harassment, hunting, capture, and killing, as well as attempts to harass, hunt, capture, or kill. The MMPA allows limited exceptions to the take prohibition, including one for commercial fishing operations. The MMPA requires that each U.S. commercial fishery be classified on the List of Fisheries according to whether there is frequent (Category I), occasional (Category II), or a remote (Category III) likelihood of incidental mortality and serious injury of marine mammals (see Title 50 Code of Federal Regulations Part 229). It also includes a framework for reducing incidental take through "take reduction teams" (TRTs) that are charged with developing "take-reduction plans" (TRPs) for fisheries with the greatest impact on marine mammal stocks (Categories I and II).

The ESA mandates protection and conservation of threatened and endangered species, as well as conservation of the ecosystems on which these species depend. A species is considered

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endangered if it is in danger of extinction throughout all or a significant portion of its range. A species is considered *threatened* if it is likely to become endangered in the foreseeable future. Similar to the MMPA, the ESA also prohibits take of endangered species and some threatened species. However, some incidental take in Federal fisheries can be authorized through consultations under Section 7 of the ESA. The ESA requires development of recovery plans that identify criteria and actions to recover listed species, some of which may relate to bycatch mortality. Further information on these, as well as other statutes and international agreements pertaining to bycatch, is provided in the first edition of the U.S. National Bycatch Report (NBR; NMFS 2011a).

1.4 Purpose of This Report

In 2011, NOAA's National Marine Fisheries Service (NMFS) published the first edition of the NBR (NMFS 2011a). The first edition of the NBR documented bycatch estimates, using observer data and self-reported logbook data, for all fisheries for which this information was available in 2005. The first edition of the NBR was the first part of a series of updates and comprehensive reports that will strive to document bycatch in additional U.S. fisheries over time, as well as improve consistency in reporting bycatch data.

NMFS developed the NBR because it recognized that reliable and accurate quantitative information about bycatch is essential to the fisheries assessment and living marine resource management processes. The NBR was designed to determine the extent to which reliable quantitative bycatch information exists for federally managed fisheries and for fisheries with relevant Federal data-collection programs. In addition to describing the "state of bycatch reporting and estimation," the NBR was designed as a resource to, along with other information sources, help address and to prioritize sampling and estimation improvements in NMFS observer programs.

At this time, the NBR focuses on commercial fisheries as opposed to recreational fisheries. This focus relates to the MSA definition of bycatch, which excludes fish released alive under a recreational catch-and-release program from its definition of bycatch. The NBR Steering Committee (see Appendix 2) will consider recreational fisheries issues, including post-release mortality estimates, for future editions of the NBR.

The NBR identified a national bycatch ratio of 0.17, which was lower than estimates provided by the Food and Agriculture Organization of the United Nations (Kelleher 2004) and Harrington et al. (2005). The NBR also provided four new monitoring and bycatch tracking tools: (1) Tier Classification System; (2) Key Stocks; (3) Fisheries of Focus; and (4) Bycatch Estimation Improvement Plans. (NMFS 2011a discusses these tools in detail.)

This series of comprehensive NBR reports and updates will provide an ever-expanding national compilation of bycatch estimates in commercial U.S. fisheries, as well as an objective framework for evaluating the quality of bycatch estimates. Future editions of the NBR will include additional bycatch estimates as new fisheries are monitored. In addition, future editions of the NBR may include post-release mortality estimates related to recreational fisheries. Over time, the NBR, along with other information sources, should help improve the ability of NMFS to

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monitor bycatch trends and set fishery monitoring priorities, as well as serve as a useful data tool for NMFS's management partners.

1.5 National Bycatch Report Publication Schedule

Soon after publication of the NBR, NMFS determined that, due to the time and resources required to compile the first comprehensive report, the NBR would be updated in 2013 and 2015 (rather than annually) with a short national overview and regional overviews, including progress on addressing NBR recommendations, as appropriate. The updates would include newly observed fisheries and species and exclude fisheries that are no longer observed, as well as fish or species for which estimates were not available. The updates also would include updated species-specific bycatch estimates for all species included in the first edition of the NBR, as well as updated bycatch estimates for all fisheries in the first edition of the NBR (with some consolidation of fisheries).

On May 9, 2012, the NMFS Office of Science and Technology staff made a presentation on behalf of the NBR Steering Committee to the NMFS Science Board[3], requesting approval for biennial online bycatch updates for the NBR beginning in 2013, with a comprehensive bycatch report every six years beginning in 2017. At that same meeting, the NMFS Science Board agreed to the biennial updates and six-year comprehensive report schedule. Unlike the biennial online updates, the next comprehensive NBR in 2017 will include a national bycatch ratio and regional bycatch ratios; a discussion of the Tier Classification System, Key Stocks, and Fisheries of Focus; and a detailed discussion of bycatch estimation improvement plans. A timeline for NBR updates through 2023 is shown in Table 1.1.

Table 1.1 Timeline for U.S. National Bycatch Reports and updates

Year	Document Type	Data Years Included
2011	Comprehensive Report (first edition)	2005
2013	Online Update (first edition update 1)	2010[4]
2015	Online Update (first edition update 2)	2011-2013
2017	Comprehensive Report (second edition)	2014-2015 + Synthesis of 2010-2015
2019	Online Update (second edition update 1)	2016-2017
2021	Online Update (second edition update 2)	2018-2019
2023	Comprehensive Report (third edition)	2020-2021 + Synthesis of 2016-2021

This 2013 update only includes data for 2010 (with the exception of some rare-event species estimates, where data from a range of years were used). This update does not include fish bycatch estimates from 2006-2009 because inclusion of such estimates in this update would have delayed publication of this update considerably. The next update in 2015 will include data for 2011-2013, which should be more helpful to NMFS and its partners in assessing trends in bycatch levels.

[3] The NMFS Science Board is made up of the NMFS Chief Science Advisor, the Director of the NMFS Office of Science and Technology, and Science Directors from each of the six regional NMFS Fisheries Science Centers.
[4] In some instances, especially for protected, rare-event species, a range of years was used to determine an average estimate across multiple years.

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2. National Overview

2.1 National Bycatch Report Improvements

NMFS has made several improvements between the first edition of the NBR and this update. The first edition of the NBR (NMFS 2011a) included bycatch estimates based on 2005 data, which represented a six-year lag between the presented data and publication date. This report includes bycatch estimates based on 2010 data, which represents a three-year lag between data and publication date.

Late in the process of developing this report, the NBR Steering Committee determined that it should be possible to shorten the reporting time lag to two years. However, this determination was made too late in the process of developing this report to alter this report's data timeframes. NMFS plans to shorten the lag to two years for the next update, which should be published in 2015, with bycatch estimates based on data from 2011-2013. Shortening the time lag to less than two years appears to be very challenging due to the time required to collect and analyze observer data and then generate bycatch estimates nationwide.

Individual regions also contributed notable improvements to this report as compared to the first edition of the NBR. For example, the Northeast Region provided fish bycatch estimates for 29 fisheries in this report, compared to 25 fisheries in the first edition of the NBR. The Alaska Region combined a large number of state fisheries to better reflect management and data collection systems, based on feedback on the first edition of the NBR from the Alaska Department of Fish and Game. The Northwest Region[5] provided bycatch estimates for two additional fisheries—the California halibut trawl and West Coast mid-water trawl for whiting with shoreside processing. The Pacific Islands Region added protected species bycatch estimates for American Samoa. In addition, the Southwest Region contributed fish bycatch estimates to this report, in contrast to the first edition of the NBR, which had no fish bycatch estimates for that region.

2.2 Data Sources for Estimating Bycatch

Data sources vary among regions, as well as among fisheries, primarily due to differences in data-collection goals, objectives, and available resources. Commercial fisheries vary greatly in scale and fishing practice, and these factors impact bycatch data-collection programs. The major sources of data used for the bycatch estimates presented in this update were observer data and self-reported logbook data.

NBR Regional Teams (see Appendix 2) uploaded bycatch estimates and footnotes into an NBR database specially developed by the NMFS Office of Science and Technology. This database, which links to other NMFS database, is not available to the public for queries at this time.

[5] As of October 1, 2013, NMFS merged its Southwest and Northwest Regional Offices into a new West Coast Regional Office. Because bycatch data are still analyzed by the two separate NMFS Southwest and Northwest Fisheries Science Centers, this update refers to Soutwest and Northwest Regions. For more information about the NMFS West Coast Regional Office, see http://www.westcoast.fisheries.noaa.gov/about_us/

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In 2010, NMFS carried out observer programs in each Region, with over 68,000 sea days observed in 45 fisheries nationwide (NMFS 2011b). In 2010, total funding from all sources (including industry funding) for federal fisheries observer programs was approximately $60 million for observer coverage and program infrastructure.

The commercial landings data used in this report were derived from the most recently updated datasets available and have been verified by the NBR Steering Committee. North Carolina, whose landings are split between the Northeast and Southeast Regions, was able to provide spatial information that permitted a direct assignment of landings to the appropriate Region. Landings are split between the Northwest and Southwest Regions by gear type due to coast-wide overlap of fisheries. Although NMFS made every effort to ensure accuracy of landings data, landings data are constantly updated as new information becomes available. Therefore, one should use caution when comparing landings data in this report to the first edition of the NBR or to other landings datasets.

Landings data sources for the various regions are as follows:

- Northeast Region, Maine through North Carolina (North of Cape Hatteras): Atlantic Coastal Cooperative Statistics Program (ACCSP)
- Southeast Region, North Carolina (South of Cape Hatteras) through Texas: ACCSP and NMFS Southeast Fisheries Science Center
- Southwest Region (Gear Groups: Dredge, Miscellaneous, Net, Troll, Non-Fish Pot): Pacific Fisheries Information Network (PacFIN)
- Northwest Region (Gear Groups: Hook-and-Line, Fish Pot, Trawl, and Shrimp Trawl): PacFIN
- Alaska: Alaska Fisheries Information Network
- Hawaii: Western Pacific Fisheries Information Network

Regional divisions used in this report that occur within state boundaries were established with assistance from North Carolina Department of Environment and Natural Resources, ACCSP, and PacFIN staff.

2.3 Bycatch and Landings Summary

Estimated 2010 fish bycatch for the U.S. commercial fisheries considered in this report totaled a little over 607 M lb and about 5.8 M individual fish. Associated landings for these fisheries totaled almost 4.8 B lb and 148,490 individual fish (Table 2.1). Total fish landings in Table 2.1 do not represent total U.S. fish landings, but rather total landings for the 79 fisheries with fish bycatch included in this report. For 2010, NMFS reported that commercial landings (edible and industrial) by U.S. fishermen at ports in the 50 states totaled 8.2 B lb (NMFS 2011c).

This report includes fish bycatch estimates for a total of 573 fish stocks nationwide, an increase from 480 stocks in the first edition of the NBR. ("Stock" is used broadly in this report to include stocks, populations, and species groups.)

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Table 2.1 Total estimated fisheries bycatch and landings for each NMFS region included in this report. Data are from 2010, and weights are rounded to the nearest pound. Data sources are described in Section 2.2 above. N/A = not applicable, i.e., the Region did not estimate bycatch in that particular manner. Landings and bycatch in this table do not represent all Regional fisheries but rather the fisheries for which this report provides bycatch estimates.

Region	Fish Bycatch (lb)	Fish Bycatch (individuals)	Fish Landings (lb)	Fish Landings (individuals)
Northeast	142,323,456	N/A	860,170,967	N/A
Southeast	230,443,265	4,552,234	133,456,741	N/A
Alaska	203,067,275	N/A	3,285,445,619	N/A
Northwest	22,206,543	1,199,931	481,144,943	148,490
Southwest	N/A	31,671	1,133,895	N/A
Pacific Islands[6]	8,983,027	N/A	23,708,268	N/A
Totals	607,023,566	5,783,836	4,785,060,433	148,490

Table 2.2 provides estimated bycatch totals for marine mammals, sea turtles, and seabirds. These estimates are often average estimates across a multi-year period; see subsequent regional overviews and linked tables for specifics on estimation timeframes for marine mammals, sea turtles, and seabirds.

This report includes bycatch estimates for marine mammals, based on numbers of lethal takes and serious injuries, for 23 individual fisheries, as well as 6 fishery groups from the Northeast and Alaska Regions. These 6 fishery groups comprised 12 individual Northeast fisheries (4 groups) and 8 individual Alaska fisheries (2 groups). Estimates were not available for individual fisheries within groups. Marine mammals bycaught in these fisheries totaled 3,319 animals from 67 stocks. In this report, estimates of individual animal bycatch such as marine mammals sometimes appear as "partial animals" (for example, "7.64 individuals"). This report presents estimates in this manner because the estimates are average estimates across a multi-year period.

Table 2.2 Total estimated marine mammal, sea turtle, and seabird bycatch by type for each NMFS region included in this report. See individual tables in Chapters 3-8 for data sources. Estimates are for individuals, rounded to the nearest whole animal.

Region	Marine Mammals	Sea Turtle (live and dead releases)	Sea Turtles (mortalities only)	Seabirds
Northeast	2,747	828	0	1,448
Southeast	108	651	6,199[7]	268
Alaska	33	0	0	4,599
Northwest	48	0	0	40
Southwest	338	0	0	59
Pacific Islands	46	80	0	306
Totals	3,320	1,559	6,199	6,720

[6] Pacific Islands fish bycatch data are derived from the Hawaii-based longline fleet and do not include data from American Samoa.

[7] This value pertains to the Gulf of Mexico shrimp trawl fishery and the Southeastern Atlantic shrimp trawl fishery.

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In addition, this report includes sea turtle bycatch estimates for 11 individual fisheries, as well as 3 Northeast Region fishery groups, which comprised 13 individual fisheries. Sea turtle estimates were not available for individual fisheries within groups. Total turtle bycatch estimates were 1,584 live and dead releases (mortalities) and 1,477 mortalities, for a total bycatch of 3,061 individual animals. The mortalities-only estimate of 1,477 individuals is for the Gulf of Mexico shrimp trawl fishery and the Southeastern Atlantic shrimp trawl fishery. The estimated 1,584 sea turtle bycatch for other Southeast Region fisheries, as well as Northeast Region and Pacific Islands fisheries, included live and dead releases.

This report also provides estimates of seabird bycatch for 20 individual fisheries, as well as and 4 fishery groups from Northeast and Alaska Regions. These four fishery groups comprised six individual Northeast fisheries (2 groups) and eight individual Alaska fisheries (2 groups). Seabird estimates were not available for individual fisheries within groups. Bycatch in these fisheries totaled 6,720 seabirds. Unlike the first edition of the NBR, this report includes bycatch estimates for Northeast and Southwest fisheries.

Figure 2.1 is a summary of the total number of fisheries identified by Region for this report, along with the number of fisheries from that total with fish/shellfish, marine mammal, sea turtle, and seabird estimates for each Region. Although the number of fisheries with bycatch estimates are sometimes only a small portion of the overall number of fisheries in a Region, the amount of landings represented by these fisheries with bycatch estimates in some cases represent well over half of total landings for the total Regional fisheries identified for this report (see Table 2.3).

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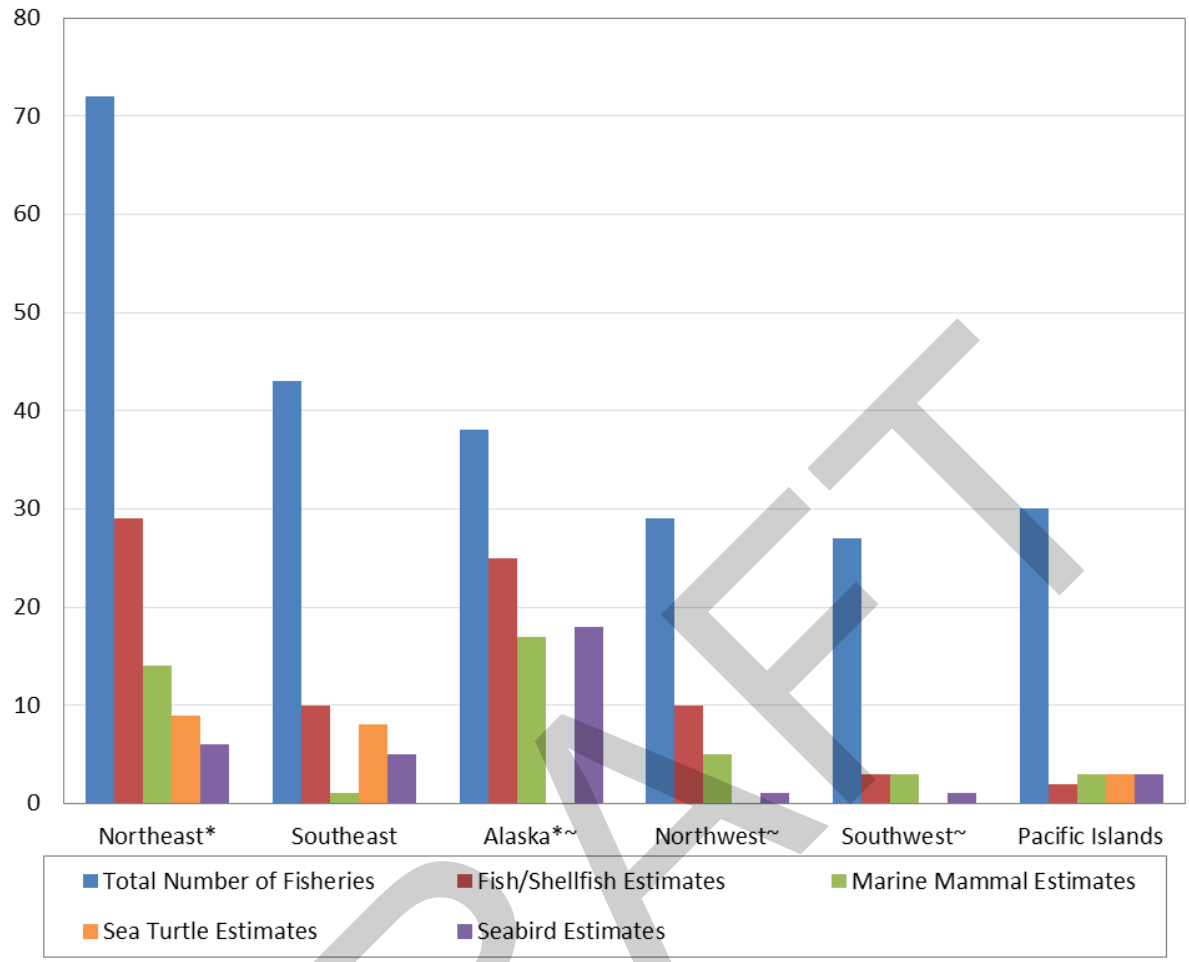

*Some fisheries are grouped in the Northeast and Alaska Regions for the purposes of generating marine mammal, sea turtle, and seabird bycatch estimates. The number of fisheries reported here reflects total numbers of fisheries contained in any groups with estimates. See Appendix 3 and the Regional sections for more information.
~No sea turtles were documented in 2010 for fisheries observed in the Alaska, Northwest, and Southwest Regions.

Table 2.3 Comparison of fish landings for NBR fisheries with fish bycatch estimates to overall U.S. fishery landings (NMFS 2011c)

Region	NBR Fish Landings Thousand (lb)	Total U.S.Fish landings Thousand (lb)	NBR Landings as a % of Total Landings
Northeast	860,171	1,362,914[8]	63%
Southeast	133,457	1,401,954[9]	10%
Alaska	3,285,446	4,347,449	76%
West Coast	482,279	1,070,967	45%
Pacific Islands	23,708	28,069	84%
Totals	4,785,061	8,211,353	58%

[8] This number does not include any landings from North Carolina, a portion of which are included in the NBR fish landings for the Northeast Region.
[9] This total includes 967,025 thousand pounds of Gulf of Mexico menhaden landings. NMFS is unable at this time to estimate bycatch for this fishery due to logistical and confidentiality issues.

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2.4 Expected Improvements in Bycatch Estimates

For the next update in 2015, NMFS plans to continue to expand and improve bycatch estimates. NMFS plans to shorten the data lag for the next NBR update in 2015 to two years. That is, the 2015 report will include bycatch estimates for 2011 to 2013. NMFS also plans to increase consistency regarding how bycatch is reported among Regions. For example, a Region might report one type of bycatch as dead releases (mortalities) only, whereas another Region might report the same type of bycatch as live and dead releases.

The 2015 report should include fish bycatch estimates for American Samoa pelagic longline fishery. In addition, the NMFS Alaska Region will incorporate estimates of seabird mortality from sources outside of those recorded by observer sampling.

The NMFS Southeast Region is carrying out an independent statistical review of the Gulf of Mexico Reef Fish Observer Program that will provide improved methodologies for vessel selection protocols, as well as bycatch estimation techniques for both abundant and rare species. In the NMFS Northeast Region, Research Set-Aside (RSA) programs include several projects focused on developing methods to reduce the catch of flounders and skates in the scallop fishery, and evaluating the discard mortality of summer flounder in Mid-Atlantic fisheries; both efforts may lead to lower bycatch estimates in future editions of the NBR.

Due to anticipated methodology improvements, Northwest Region bycatch estimates in 2015 should include all groundfish and non-groundfish bycatch values for its fisheries, as opposed to just groundfish bycatch and selected non-groundfish species, as is the case for most Northwest Region fisheries in this report. A September 2013 temporary rule for the California drift gillnet fishery (78 FR 54548, September 4, 2013), requiring 100% observer coverage, may also lead to improved bycatch estimates in the Southwest Region.

NMFS has begun to enhance the documentation of deep-sea coral and sponge bycatch–species that can form large, complex structures used by fish and invertebrates as habitats–in the Northeast, Northwest, and Alaska Regions. NMFS is providing training to fishery observers to help them identify corals and sponges, and NMFS is modifying some of its databases to record coral and sponge bycatch at a higher taxonomic resolution than in prior years. These steps are expected to lead to more detailed bycatch estimates in the next NBR update.

The next few years will see increased focus by NMFS and its partners on electronic monitoring to supplement resource-intensive observer programs. Moving electronic monitoring efforts from current pilot programs to implemented programs may help increase the number of bycatch estimates, particularly in difficult-to-observe fisheries.

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3. Northeast Overview

3.1 Summary of Fisheries Included in This Report

Bycatch estimates for fish were provided for 29 Northeast Region commercial fisheries (see Appendix 3), compared to 25 in the first edition of the NBR (NMFS 2011a). One fishery, the Mid-Atlantic general category scallop trawl, was split into two separate fisheries in this update: Mid-Atlantic general category closed area scallop trawl and Mid-Atlantic general category open area scallop trawl. Stratification of fisheries referring to the U.S./Canada Resource Sharing Area (US/CAN) and haddock longline hook sector used in the first edition of the NBR (NMFS 2011a) was relaxed in this analysis because Special Access Programs trips were difficult to identify and were deemed outdated with the onset of groundfish sector-based management in the Northeast Region. The B-day access area category (B-Regular Days At Sea; B-Reg DAS) was discontinued due to minimal occurrence of such trips. The trips associated with the US/CAN access area, B-day category, and other quota-monitoring programs have been grouped by other stratification variables (e.g., gear and mesh size) and have not been partitioned separately. Thus, four fisheries (New England B-Reg DAS large-mesh otter trawl, New England haddock sector longline, New England US/CAN area large-mesh otter trawl, and New England US/CAN area small-mesh otter trawl) do not appear in this update.

The increased, and broader, 2010 observer coverage resulted in seven additional fisheries with bycatch estimates in this update: Mid-Atlantic general category closed area scallop dredge, Mid-Atlantic large-mesh gillnet, Mid-Atlantic small-mesh gillnet, New England fish pots and traps, New England hagfish pots and traps, New England large-mesh haddock separator otter trawl, and New England large-mesh Ruhle otter trawl. Bycatch estimates were not provided for 43 fisheries[10] due to limited or no at-sea observer coverage in 2010.

Fish bycatch estimates ranged from 0 lb in the New England fish pots and traps and New England hagfish pots and traps fisheries to 35.8 M lb in the New England large-mesh otter trawl fishery (Table 3.1). Bycatch ratios ranged from 0.00 in the New England fish pots and traps and New England hagfish pots and traps fisheries to 0.57 in the Mid-Atlantic general category open area scallop trawl fishery (Figure 3.1). Bycatch ratios were less than 0.01 for the New England purse seine and New England mid-water otter trawl fisheries (Figure 3.1). The New England large-mesh haddock separator otter trawl had a much larger bycatch ratio of 0.36; however, this is due to relatively large discards of skates in a fishery with a small amount of total landings. Some other fisheries have a relatively high bycatch ratio but very small amount of total landings, such as the New England large-mesh Ruhle otter trawl (Table 3.1).

[10] Bycatch estimates were not provided for 43 fisheries, including 4 fisheries under federal and international management, 8 fisheries under federal management, 9 fisheries under federal and state management, and 22 fisheries under state management. See Appendix 3 for a complete list of Northeast Region fisheries.

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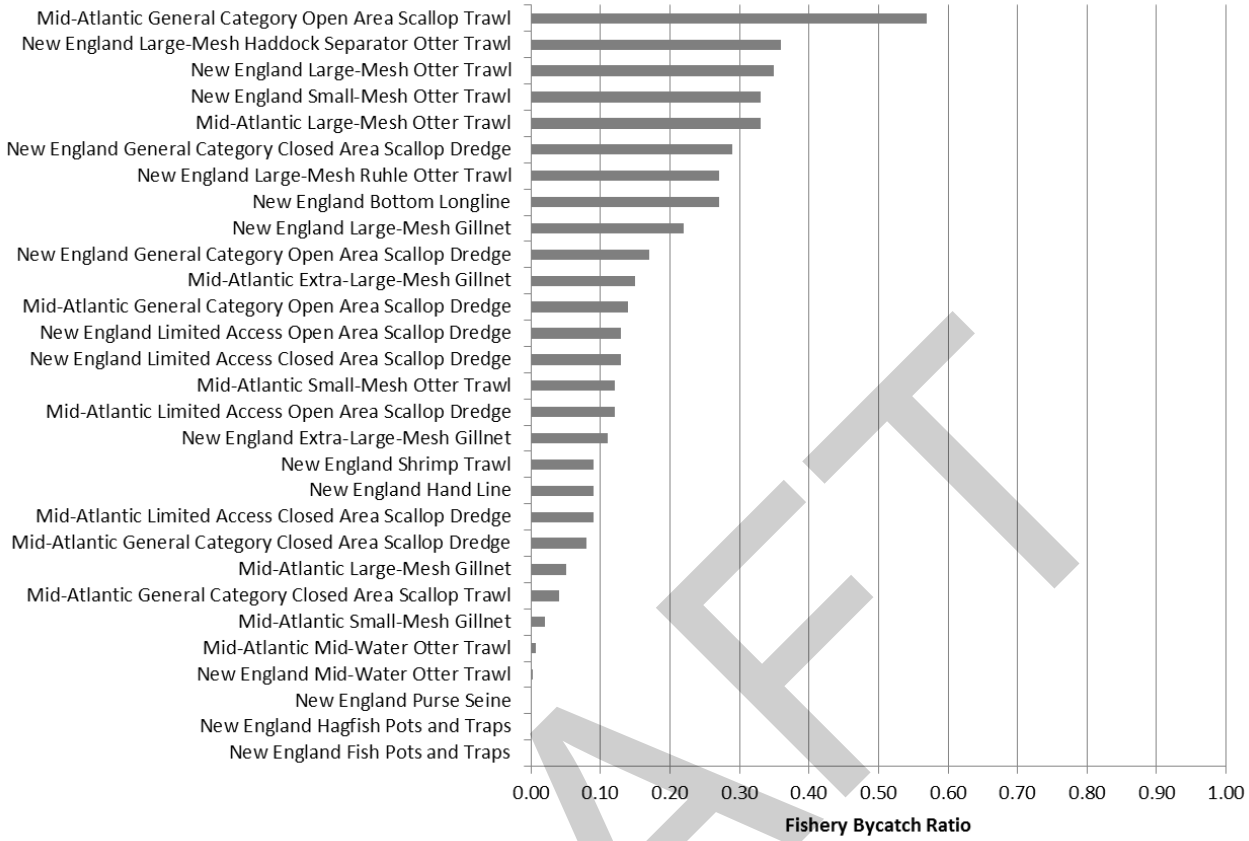

Figure 3.1 Northeast Region Fishery Bycatch Ratios (The fisheries in this figure represent the fisheries for which fish bycatch estimates were available, out of the total number Regional fisheries. Fishery bycatch ratio is the ratio of the total fishery bycatch to total fishery catch.)

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Fish bycatch and bycatch ratios for the eight scallop dredge fisheries were variable (Table 3.1, Figure 3.1); bycatch ranged between 0.4 M lb to 27.3 M lb, and bycatch ratios ranged between 0.08 and 0.29. Bycatch for the five gillnet fisheries ranged between 80,000 lb and 3.8 M lb, with bycatch ratios of 0.02 to 0.22. Bycatch estimates for the four otter trawl fisheries ranged from 9.1 to 35.8 M lb, with bycatch ratios between 0.12 and 0.35. The New England and Mid-Atlantic mid-water otter trawl fisheries had low bycatch and bycatch ratios; bycatch was less than 0.3 M lb, and ratios were less than or equal to 0.01. Readers are encouraged to refer to Blaylock et al. (2013) for further information[11].

This update includes bycatch mortality estimates for 10 new protected species (excluding fish) stocks/populations that were not reported in the first edition NBR. These include harbor, harp and gray seals; common and red-throated loons; minke whales; and four newly designated stocks of coastal bottlenose dolphins. In total, there are 16 species/stocks of marine mammals, sea turtles, and seabirds in the report update.

[11] The combined discard ratio used in Blaylock et al. 2013 is different than the bycatch ratio reported in the NBR documents.

Bycatch estimates for marine mammals, sea turtles and seabirds were provided for 6, 3, and 2 Northeast Region commercial fisheries and/or fishery groups, respectively. This is compared to 6, 4, and 0 commercial fisheries and/or fishery groups for marine mammals, sea turtles and seabirds, respectively, in the first edition of the NBR (NMFS 2011a). In the first edition NBR, sea turtle bycatch estimates were reported separately for Mid-Atlantic otter trawl and Mid-Atlantic scallop trawl fisheries. The updated bycatch estimates for sea turtles did not separate the Mid-Atlantic otter and scallop trawl estimates. As a result, the number of fisheries with reported bycatch estimates for sea turtles was reduced from 4 to 3 fishery groups. In addition, estimates of seabird bycatch have since been published for two fishery groups (New England and Mid-Atlantic gillnet). As in the first edition of the NBR, protected species estimates were not available for individual fisheries within groups.

3.2 Changes to Observer Coverage

Compared to 2005, more commercial fishing trips and commercial fisheries were observed in 2010. For fish bycatch estimation, there were 5,008 trips in 2010 versus 3,565 trips in 2005 (Blaylock et al. 2013, Wigley et al. 2008, respectively). See Section 3.1 for coverage of additional fisheries associated with fish bycatch.

Due to the implementation of sector management in the New England multi-species groundfish fishery May 1, 2010, observer monitoring of the New England gillnet, otter trawl, hook and line, and pot/trap fisheries has increased. For further details visit http://www.nero.noaa.gov/sfd/sfdmultisector.html.

3.3 Changes to Catch and/or Bycatch Estimation Methods

The methods used to estimate fish bycatch in this update were the same as those used in the first edition of the NBR. These methods are described in detail in Wigley et al. 2008, NMFS 2011a, and Blaylock et al. 2013.

Methods used to estimate marine mammal bycatch were the same as those used in the first edition of the NBR. Details pertaining to methods used to estimate marine mammal bycatch in New England and Mid-Atlantic gillnet fisheries are detailed in Orphanides 2010, 2011, and 2013. Sea turtle bycatch estimates were derived using methods described in Murray 2009, Murray 2011, and Warden 2011. Details pertaining to the new seabird bycatch estimates are documented in Warden 2010.

3.4 Progress on Byctatch Estimation Improvement Plans

The first edition of the NBR presented 49 recommendations for fish in the Northeast Region, including four general recommendations and 45 fishery-specific recommendations (see Table 4.1.5 in NMFS 2011a). Between 2005 and 2010, progress has occurred regarding recommendations pertaining to all fisheries. Improvement of industry data and database structure is ongoing, and the Northeast fish and invertebrate analytic approach (i.e., methodology of estimators) has been peer-reviewed. As mentioned above, the extent of observer coverage in

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the Northeast Region has been expanded since 2005 to include more fisheries. Sample size analyses occur annually to support the deployment of observers among fisheries to achieve the precision performance standard of a 30% coefficient of variation (CV) on the total discard estimate. Additionally, the Northeast Cooperative Research Program (NCRP) has continued to support collaborative projects aimed at reducing the bycatch and discard mortality of finfish, as described below.

NCRP-managed RSA programs include several projects focused on developing methods to reduce the catch of flounders and skates in the scallop fishery, and evaluating the discard mortality of summer flounder in Mid-Atlantic fisheries. Additional work is focused on the technology transfer of gear designs to reduce bycatch in the whiting and Northern shrimp fisheries. With the implementation of quota-based catch shares management in the Northeast Multispecies fishery in 2010, managing the bycatch of non-target and undersized fish has become even more critical. Thus, the NCRP has developed extensive network groups of researchers, fishermen, net makers, and managers to help fishermen develop modified gear and fishing strategies to fish more selectively. Some projects are focusing primarily on modifications for trawl and gillnet gear to target species based on fish behavior, body type, and size. Other projects are taking a temporal-spatial approach and studying the environmental and oceanographic variables that influence species distribution. These projects are providing data and mapping tools to help fishermen fish more strategically based on factors such as water temperature and other species-specific habitat markers. Projects to examine methods for reducing bycatch and bycatch mortality of Atlantic sturgeon in fixed gillnet gear have also been funded through the Monkfish RSA program and through NMFS Northeast Fisheries Science Center contracts with monkfish fishermen.

An NCRP network group is piloting a versatile web-based reporting tool for reducing gillnet interactions with harbor porpoise. The tool can provide mapping capabilities with overlays of currents and other oceanographic information to help fishermen determine what factors are likely to influence the presence of harbor porpoise on the fishing grounds. The data can be shared among fishing sectors or smaller groups of fishermen to help decrease the chances of encountering harbor porpoise. This NCRP network group is working with the Harbor Porpoise Take Reduction Team to advance the use of the web-based tool.

The NCRP RSA projects continue to support industry efforts to reduce the bycatch of turtles in the scallop industry. In addition to gear modifications, recent work has focused on recording turtle behavior in the presence of dredge gear and scallop beds, and determining where the turtles are likely to be found in the water column. Further information about the NCRP is available at http://www.nefsc.noaa.gov/coopresearch/ .

3.5 Fish Bycatch

This report includes fish and invertebrate bycatch estimates for 34 Northeast Region stocks (Table 3.2)[12,13]. These stocks are managed under 13 FMPs and represent 63.5% of all Northeast

[12] Bycatch of shortnose sturgeon was not estimated in the first edition of the NBR (i.e., N/A should have been listed instead of 0 for shortnose sturgeon on page 134 of the first edition of the NBR); no estimates are available for this report.

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fish and invertebrate bycatch. Other marine fish and invertebrate species observed in the Northeast Region in 2010 but not under federal management at that time are not included in this report; these included 230 species with a combined bycatch estimate of 81.7 M lb, or 36.5% of all Northeast fish and invertebrate bycatch. In 2010, Atlantic wolffish (*Anarhichas lupus*) was added to the Northeast Multispecies FMP, and hence estimates for this species, which did not appear in the first edition of the NBR (Blaylock et al. 2013, NMFS 2011a), were added to this report.

Stock bycatch estimates ranged up to about 69.3 M lb, with the highest estimated bycatch for the skate complex (Table 3.2). Fish stocks with bycatch ratios of 0.50 or greater (Table 3.2, Figure 3.2) included ocean pout (*Zoarces americanus*; 1.00), windowpane flounder (*Scophthalmus aquosus*; 0.92), Atlantic wolffish (0.86), red hake (*Urophycis chuss*; 0.68), butterfish (*Peprilus triacanthus*; 0.57), spiny dogfish (*Squalus acanthias*; 0.56), and Atlantic halibut (*Hippoglossus hippoglossus*; 0.50). In addition to economic reasons (i.e., no market; Wigley et al. 2012), high bycatch ratios for these species may also be attributed to regulatory reasons. For instance, in 2010, federal regulations prohibited the possession of ocean pout, windowpane, and Atlantic wolffish (Federal Register 2010b), and trip limits were in place for spiny dogfish and Atlantic halibut (Federal Register 2010a, Federal Register 2010b).

Ocean quahog (*Arctica islandica*), Atlantic surfclam (*Spisula solidissima*), Atlantic herring (*Clupea harengus*), and tilefish (*Lopholatilus chamaeleonticeps*) had bycatch ratios of <0.01, and Atlantic mackerel (*Scomber scombrus*), haddock (*Melanogrammus aeglefinus*), longfin inshore squid (*Loligo pealeii*), and pollock (*Pollachius virens*) had bycatch ratios of 0.01 (Table 3.2, Figure 3.2). This report does not present a stock bycatch ratio for the skate complex because it comprises seven stocks, and the bycaught species may be different from the landed stocks.

This report includes a bycatch estimate of 0.0 pounds for Atlantic salmon (*Salmo salar*) in 2010. Retention of Atlantic salmon is prohibited under the ESA. Therefore, this report does not include a bycatch ratio for Atlantic salmon, because both the bycatch estimate and landings are 0.0.

3.6 Marine Mammal Bycatch

This report includes annual average marine mammal bycatch estimates for six Northeast Region commercial gear types (Table 3.3)[14]. No marine mammal bycatch was documented during 2006–2010 for the majority of the other Northeast gear types monitored. In addition, bycatch estimates for seal species from gillnet fisheries were inadvertently left out of the first edition of the NBR but are included in this report.

The Mid-Atlantic mid-water trawl gear type produced an average annual bycatch of 15 animals, and the Mid-Atlantic otter trawl gear type produced an annual average of 153 animals, 103 of which were western North Atlantic short-beaked common dolphins (*Delphinus delphis*). The

[13] Atlantic sturgeon was not an ESA-listed species in 2010; ESA candidate species and species of concern are not within the purview of the NBR at this time, so Atlantic sturgeon is not included in this update.
[14] Fisheries are pooled by gear type for estimating bycatch of protected species (rare events).

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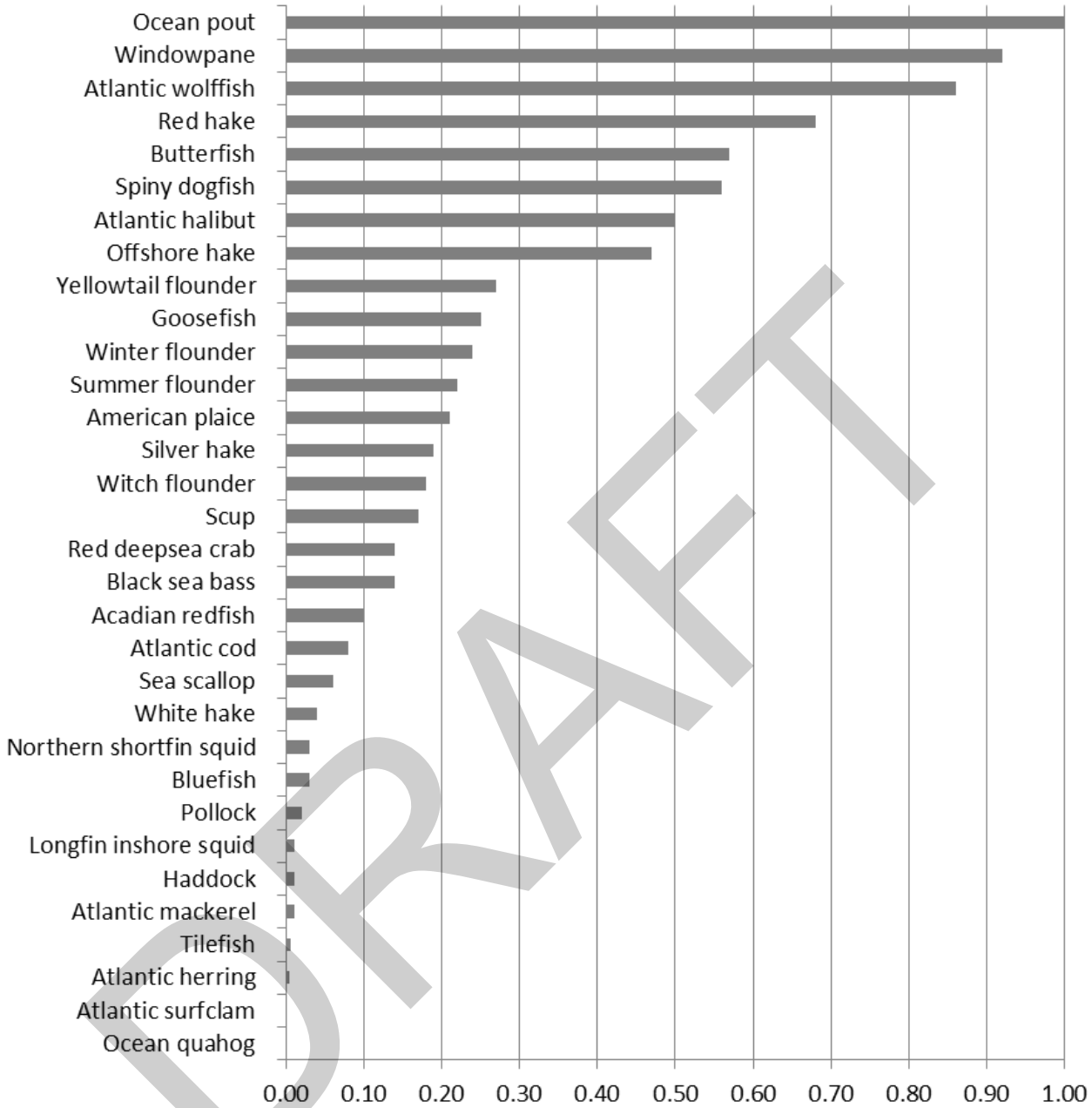

Figure 3.2 Northeast Region Species Bycatch Ratios (Species bycatch ratio is the ratio of bycatch of a single stock to total catch of that stock within a Region.)

Mid-Atlantic and New England gillnet gear types and the New England otter trawl gear type had the highest marine mammal bycatch estimates, with a total average of 2,576 animals per year.

Bycatch in gillnet gear types was mainly harbor porpoises (*Phocoena phocoena*; Gulf of Maine/Bay of Fundy stock) and seals. The annual average estimate of harbor porpoise caught in Mid-Atlantic gillnet gear was 275 and in New England gillnet gear was 511. An annual average of 1,292 seals were caught per year in the New England gillnet gear type, of which an estimated 794 were western North Atlantic gray seals[15] *(Halichoerus grypus).* Western North Atlantic white-sided dolphin (*Lagenorhynchus acutus*) was the most commonly bycaught species in the New England otter trawl gear type, with an annual average of 142 animals.

This report includes annual average marine mammal bycatch estimates for 13 stocks (Table 3.3), compared to the first edition of the NBR, which provided estimates for 6 stocks (NMFS 2011a). The total marine mammal bycatch estimate was 2,747 animals per year (2006–2010 average). The stocks with the highest average annual bycatch estimates included the western North Atlantic gray seal (847), Gulf of Maine/Bay of Fundy stock of harbor porpoise (791 animals), western North Atlantic harbor seal *(Phoca vitulina concolor;* 330 animals), western North Atlantic harp seal (*Pagophilus groelandicus*; 281 animals), western North Atlantic white-sided dolphin (212 animals), and short-beaked common dolphin (162 animals). More information on the status of these stocks can be found in the Marine Mammal Stock Assessment Reports.

3.7 Sea Turtle Bycatch

This report includes sea turtle bycatch estimates for three Northeast Region commercial gear types; the majority of other observed Northeast Region gear types had no documented sea turtle bycatch (Table 3.4). For sea turtles, the term "bycatch" is used synonymously with the definition of "takes" under the ESA[16], and therefore bycatch may include animals that interact with gear below the surface of the ocean but are not actually captured in the gear[17]. Bycatch estimates were only presented for loggerhead (*Caretta caretta*) and/or unidentified hard-shelled turtles, because these were the only species with enough observed interactions to produce robust, model-based estimates. However, other turtles such as leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), and Kemp's ridley (*Lepidochelys kempii*) turtles also are bycaught in these fisheries.

Estimated annual average bycatch for loggerheads in the Northeast Region, across the three gear types, was 353 in Mid-Atlantic bottom trawl (for fish and scallop) fisheries (2005-2008; Warden 2011), 95 in the Mid-Atlantic scallop dredge fishery (26 Sept. 2006- 31 Dec. 2008)[18] (Murray 2011), and 350 in Mid-Atlantic sink gillnet fisheries (1995-2006; Murray 2009). In addition, 30 unidentified hard-shelled turtle were estimated to have been bycaught in the Mid-Atlantic scallop

[15] Bycatch estimates for seal species were not reported in the first edition of the NBR.
[16] The definition of a take under the ESA is "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (ESA 1973) and therefore includes both mortality and non-mortality events.
[17] The distinction between the terms "bycatch" and "takes" applies to estimates reported as "interactions" with trawl or dredge gear. The distinction is made because gear modifications (i.e. turtle excluder devices and chain mats) will prevent turtles from being captured and observed, even though the take still occurred.
[18] Turtle chain mats have been required in the scallop dredge fishery since September 25, 2006 in certain times and areas (71 FR 50361, August 25, 2006). Estimates from 26 Sept. 2006- 31 Dec. 2008 include the number of estimated turtle interactions in gear equipped with chain mats.

dredge fishery during 26 Sept. 2006- 31 Dec. 2008 (Murray 2011). These turtles could not be identified to species, but it is likely that all or most of them are loggerheads.

3.8 Seabird Bycatch

Seabird bycatch estimates were provided for two Northeast Region commercial fisheries (Table 3.5). Since publication of the first edition of the NBR, bycatch estimates for seabirds were completed for common and red-throated loons. An estimated total of 1,374 seabirds were bycaught in the Mid-Atlantic gillnet fisheries (1996-2007), and an estimated 74 seabirds were bycaught in the New England gillnet fisheries (1996-2007). Total estimated common loon bycatch was 551 animals; 477 and 74 animals from the Mid-Atlantic and New England gillnet fisheries, respectively. Total estimated red-throated loon bycatch was 897 animals in Mid-Atlantic gillnet fisheries. Total common and red-throated loon bycatch (1996-2007) was estimated at 1,448 animals.

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4. Southeast Overview

4.1 Summary of Fisheries Included in this Report

A total of 43 commercial fisheries are included in this report for the Southeast Region (Appendix 3). Several changes were made in the fisheries listed in this report compared to those presented in the first edition of the NBR, which was based on 2005 data. Four new fisheries were added, and 10 fisheries were taken off the list either because they are no longer prosecuted, or because they were simply combined with another fishery due to updated name changes.

This report includes fish bycatch estimates for 10 out of 43 Southeast Region commercial fisheries (Table 4.1). This report also includes sea turtle bycatch estimates for an additional two fisheries for which fish bycatch estimates were not available (see Section 4.7).

However, the Gulf of Mexico shrimp trawl fishery and the Atlantic and Gulf of Mexico HMS pelagic longline fishery were the only two fisheries for which both fish bycatch and landings information were available in weight. Bycatch estimates for the other nine fisheries were calculated in number of individuals. Therefore, fish bycatch ratios (i.e., bycatch / total catch) were calculated for only these two fisheries, as in the first edition of the NBR (Figure 4.1). The fish bycatch estimate for the HMS pelagic longline fishery was 1.2 M lb. and landings were about 3.92 M lb., resulting in a ratio of 0.23. (Fish bycatch estimates for the HMS pelagic longline fishery are for dead discards only.) This ratio is the same that was reported in the first edition of the NBR for 2005. Fish bycatch was estimated for the offshore portion of the Gulf of Mexico shrimp trawl fishery at 229.24 M lb. Landings for the Gulf of Mexico shrimp trawl fishery were 129.54 M lb. The resulting bycatch ratio for the fishery was 0.64. This value is lower than the bycatch ratio estimate of 0.76 in the first edition of the NBR (NMFS 2011a).

Southeast Region fisheries reflect the very diverse fauna of the area, with relatively few large fisheries and many small fisheries. Southeast Region fisheries have catches from around 200 stocks of fish and fishery resources, and employ a variety of gear types. Two fisheries economically dominate the region: the menhaden purse seine fishery and the shrimp trawl fishery. Although the menhaden purse seine fishery produces the most landings, the shrimp trawl fishery generates the most revenue regionally. In most years, the Southeast shrimp trawl fishery is among the five most valuable fisheries in the United States (for example, see NMFS 2011c).

4.2 Changes to Observer Coverage

Four primary observer programs operate out of the Southeast Region. These include the Pelagic Longline Observer Program, the Gulf of Mexico Reef Fish Observer Program (Bottom Longline and Vertical Line), the Shark Bottom Longline Observer Program (including the Shark Research Fishery), and the Shrimp Trawl Observer Program. The North Carolina Coastal Gillnet Alternative Sampling Program was discontinued in 2009, and the Shark Gillnet Program was greatly reduced in 2010 compared to 2005 because of the very small size of the fishery.

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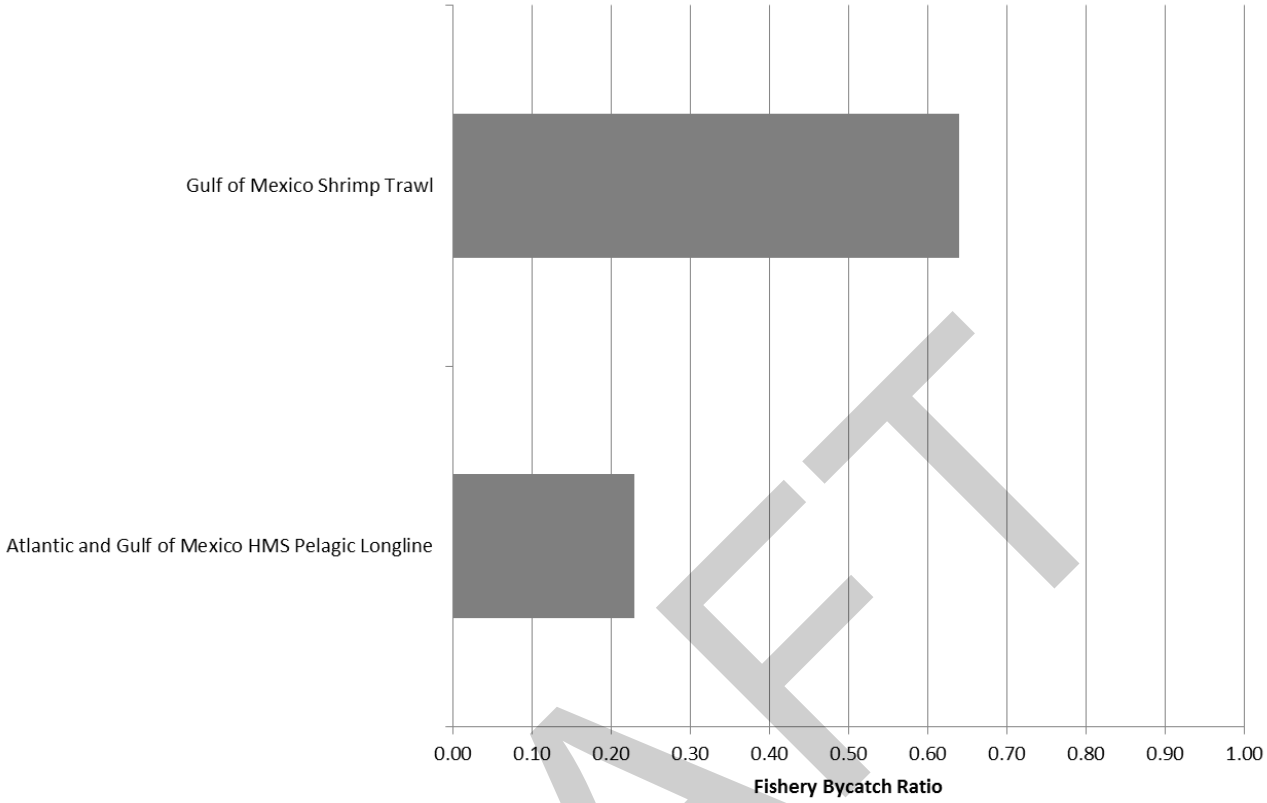

Figure 4.1 Southeast Region Fishery Bycatch Ratios (The fisheries in this figure represent the fisheries for which fish bycatch estimates were available, out of the total number Regional fisheries. Fishery bycatch ratio is the ratio of the total fishery bycatch to total fishery catch.)

However, the reduction in shark gillnet effort has allowed NMFS to expand observer coverage to other gillnet fisheries, and the program has now evolved into the Southeast Coastal Gillnet Observer Program. Observer data from the Gulf of Mexico shrimp skimmer and butterfly net fishery, as well as from the Gulf of Mexico menhaden fishery, were not used in this update because the low levels of observer coverage are not adequate to assess bycatch.

4.3 Changes to Catch and Bycatch Estimation Methods

No substantial changes in Southeast Region fisheries or new bycatch concerns occurred between the development of the first edition of the NBR in 2005 and 2010. The methodologies used to estimate bycatch as outlined in the first edition of the NBR are the same ones employed to produce the estimates for this report. Although NMFS is working to upgrade and improve methodologies and estimation procedures, these new procedures will not be used until NMFS provides the Southeast Region bycatch estimates in the second edition of the NBR in 2017.

4.4 Progress on Bycatch Estimation Improvement Plans

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Over the past few years, progress has been made regarding several of the recommendations outlined in the Bycatch Estimate Improvement Plans in the first edition of the NBR. In the Gulf of Mexico reef fish fisheries (i.e., bottom longline and vertical line), NMFS initiated a mandatory at-sea observer program and increased the number of sea days of observation by the at-sea observer program each year in order to support better estimates of sea turtle bycatch.

NMFS also contracted an independent statistical review of the Gulf of Mexico Reef Fish Observer Program that will provide NMFS with improved methodologies for vessel selection protocols, as well as bycatch estimation techniques for both abundant and rare species. This review should be completed by 2014, and its results will help NMFS with estimates in the future NBR editions.

A couple of pilot projects have been completed to ascertain the feasibility of using electronic video monitoring of bycatch in both the Gulf of Mexico reef fish bottom longline and the vertical line segments of the Gulf of Mexico Reef Fish fisheries. A pilot project has also been conducted to evaluate electronic video monitoring in the vertical line segment of the snapper-grouper fishery. Discussions with fishery groups are currently underway to continue development of this type of electronic bycatch monitoring methodology that would enhance the data collected by the at-sea observer program.

For the shrimp trawl fisheries (i.e., Atlantic and Gulf of Mexico), progress in Bycatch Estimation Improvement Plan recommendations included development of a mandatory at-sea observer program from the voluntary observer program that began in 1992. An electronic logbook program was developed and put into full production, which helped give NMFS excellent estimates of shrimp trawl effort in the offshore areas of the Gulf of Mexico. This in turn has helped to provide better bycatch estimates from this area. A similar program is being developed for the Atlantic portion of this fishery. To better document and improve bycatch estimates for marine mammals in the shrimp trawl fisheries, NMFS developed and implemented a marine mammal observer data form. Development of this observer form will help NMFS estimate marine mammal bycatch in future NBR editions.

4.5 Fish Bycatch

NMFS calculated fish bycatch estimates for 196 Southeast Region fish stocks (Table 4.2). This is less than the 206 fish stocks in the first edition of the NBR. This fluctuation is expected due to the many diverse species that inhabit the Southeast Region. Many minor stocks have very small bycatch values and may not occur in every year. As in the first edition of the NBR, some bycatch values were reported by weight, and others were reported in numbers. Therefore, NMFS could only develop bycatch ratios (pounds of bycatch divided by the total weight of fishery) for a small subset of the Southeast Region species. For the two stocks where stock bycatch ratios were calculated, Gulf of Mexico southern flounder had a ratio of 0.58, and bigeye tuna had a ratio of 0.07 (Figure 4.2).

For the stocks where bycatch ratios could not be developed, species with bycatch estimates of over 20.00 M lb included Atlantic croaker (*Micropogonias undulate*; 33.46 M lb), Gulf of

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Mexico seatrout and weakfish (*Cynoscion* spp.; 23.93 M lb), and non-panaeid shrimp crustaceans (23.67 M lb).

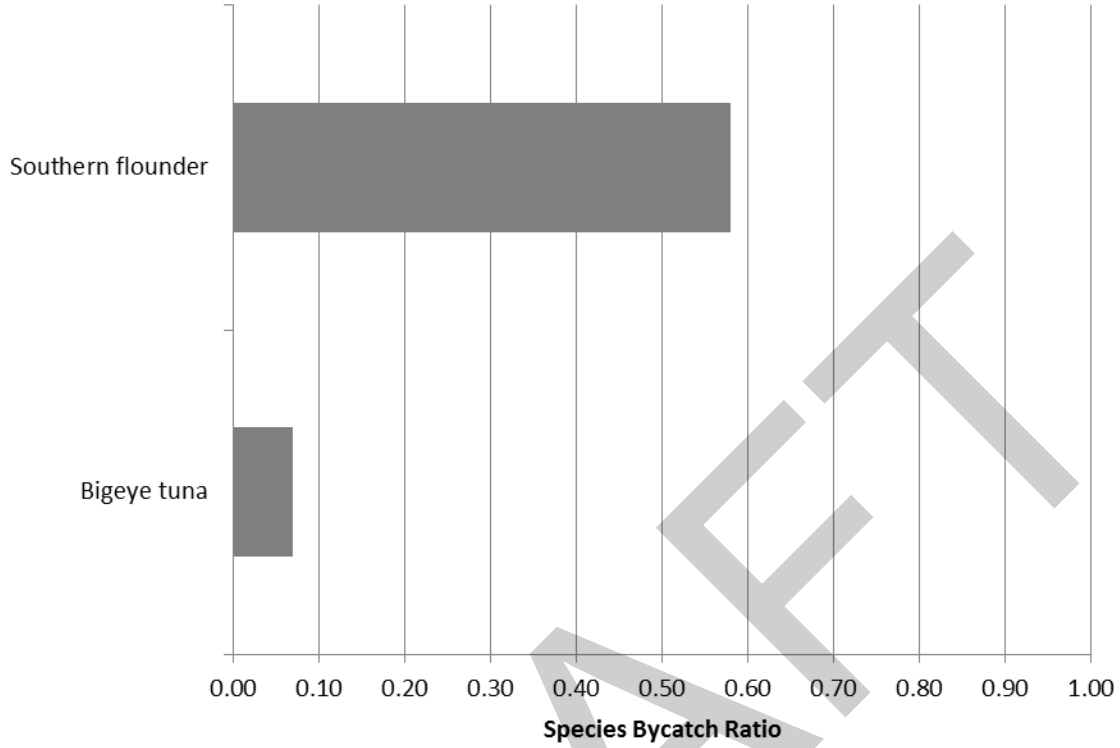

Figure 4.2 Southeast Region Species Bycatch Ratios (Species bycatch ratio is the ratio of bycatch of a single stock to total catch of that stock within a Region.)

Some of the key stocks (as identified in the first edition of the NBR) with bycatch estimates included red snapper (*Lutjanus campechanus*; 1.6 M individuals, plus an additional 0.49 M lb), red grouper (*Epinephelus morio*; 0.5 M individuals), and lane snapper (*Lutjanus synagris*; 0.14 M individuals, plus an additional 0.54 M lb).

4.6 Marine Mammal Bycatch

This report includes annual average bycatch estimates from 2006-2010 for eight marine mammal stocks for one Southeast Region commercial fishery (Atlantic and Gulf of Mexico HMS pelagic longline fishery; Table 4.3). The total bycatch estimate was 109 individuals. The unspecified pilot whale – Western North Atlantic stock had the largest estimate at 92.97 individuals, followed by Risso's dolphin – Western North Atlantic (*Grampus griseus*) at 7.64 individuals, and pantropical spotted dolphin – Northern Gulf of Mexico at 3.20 individuals.

For more information on marine mammal bycatch in Southeast Region fisheries, see Garrison and Stokes 2012. More information on the status of these stocks can be found in the Marine Mammal Stock Assessment Reports. The lack of estimates for other Southeast Region fisheries

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is due to lack of data and should not imply that the HMS pelagic longline fishery is the only fishery with marine mammal issues in the Southeast Region.

4.7 Sea Turtle Bycatch

The Southeast Region encompasses important feeding and breeding habitat for sea turtles, including the second largest nesting aggregation of loggerhead turtles globally. This report includes estimates of sea turtle bycatch for 8 out of 43 Southeast Region commercial fisheries (Table 4.4). Due to data availability, the bycatch estimates encompass a combination of years from 2002-2010, depending on the fishery. The estimated bycatch values presented in the text and tables are for total sea turtle bycatch (live and dead), except for the values presented for the Gulf of Mexico shrimp trawl fishery and the Southeastern Atlantic shrimp trawl fishery, which are sea turtle mortality estimates only.

Green and Kemp's ridley sea turtle bycatch estimates for the shrimp fisheries are from 2002 and were included in this update because no new estimates were available for these species between 2005 and 2010. See Epperly et al. 2002 for further details on methods used for the shrimp trawl estimates. Section 5.1.3.3. of NMFS 2012a describes recent efforts to update trawl bycatch estimates based on new information. Data from this Biological Opinion, which includes analyses from beyond the 2006-2010 timeframe of this report, should be included in the next NBR update in 2015.

Total sea turtle bycatch estimates for 2010 were 6,850 individuals, 6,199 of which were estimated to be mortalities in the two shrimp trawl fisheries (Table 4.4). The Gulf of Mexico shrimp trawl fishery had an estimated bycatch mortality of 5,166 individuals (18 leatherback, 778 loggerhead, 486 green, and 3,884 Kemp's ridley sea turtles). The Southeastern Atlantic shrimp trawl fishery had an estimated bycatch mortality of 1,033 individuals (8 leatherback, 673 loggerhead, 28 green, and 324 Kemp's ridley turtles).

The fishery with the next highest estimated sea turtle bycatch (including both live interactions and mortalities) was the Atlantic and Gulf of Mexico HMS pelagic longline fishery, which interacted with an estimated 517.3 individuals (172.9 leatherback turtles and 334.4 loggerhead turtles).

Five other fisheries had a combined estimated sea turtle bycatch of 133.38 individuals (live and dead): the Gulf of Mexico reef fish bottom longline fishery (26.5 loggerhead turtles), Gulf of Mexico reef fish vertical line fishery (32.9 loggerhead turtles), large coastal and small coastal shark aggregates (drift, strike, and bottom gillnet; 2.95 Kemp's ridley turtles and 8.9 loggerhead turtles), Southeastern Atlantic snapper-grouper vertical line fishery (56.33 green turtles), and the Southeastern Atlantic and Gulf of Mexico shark bottom longline fishery (5.8 loggerhead turtles).

4.8 Seabird Bycatch

This report includes seabird bycatch estimates for five Southeast Region commercial fisheries (Table 4.5). An estimated bycatch total of 131 seabirds were from the Southeastern Atlantic coastal migratory pelagic troll fishery (119 Gannet and 12 unclassified seabirds). The Gulf of

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Mexico reef fish vertical line fishery had an estimated bycatch of 57 seagulls. The Atlantic and Gulf of Mexico HMS pelagic longline fishery (Southeast portion) had an estimated bycatch of 39 unclassified seabirds. The Southeastern Atlantic snapper-grouper vertical line fishery and the Gulf of Mexico reef fish bottom longline fishery had an estimated bycatch of 36 seagulls and 5 unclassified seabirds, respectively. A total of 268 seabirds were estimated as bycatch for the Southeast Region (Table 4.5).

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5. Alaska Overview

5.1. Summary of Fisheries Included in This Report

A total of 38 fisheries are included in this report for Alaska, and this report includes bycatch and landings data for 25 Alaska Region groundfish fisheries with federal management authority (Appendix 3). Landings from Alaska commercial fisheries were valued at approximately $1.893 billion dollars in 2011 (NMFS 2012b). The groundfish fishery is an important segment of Alaska fisheries and was valued at $992 million in 2011 (Fissel et al. 2012).

The first edition of the NBR (NMFS 2011a) evaluated an additional four state-managed fisheries ("Alaska Cook Inlet Salmon Set Gillnet," "Alaska Kodiak Salmon Set Gillnet," "Alaska Southeast Salmon Drift Gillnet," "Alaska Yakutat Salmon Set Gillnet") for marine mammals and other protected species. However, there was no data collection program for these fisheries in 2010, so no data were provided in this report.

This report categorized landings and bycatch as belonging to a fishery by using a combination of area fished, gear, and the predominant retained fish species or species group (i.e., realized catch). NMFS Alaska Regional Team members, working with Alaska state fisheries managers, made substantial changes to the list of 39 fisheries in this report compared to the list of 77 fisheries that were presented in the first edition of the NBR (NMFS 2011a). All of these changes were to state-managed fisheries. Some fisheries were removed from this report because the fisheries are no longer prosecuted. Other fisheries were combined and renamed to simplify the report and better categorize fisheries at a national level. For example, six separate state-managed herring fisheries listed in the first report ("Alaska Food/Bait Herring Trawl," "Alaska Herring Spawn on Kelp Pound Net," "Alaska Roe Herring and Food/Bait Herring Beach Seine," "Alaska Roe Herring and Food/Bait Herring Gillnet," "Alaska Roe Herring and Food/Bait Herring Purse Seine," and "Alaska Roe Herring and Food/Bait Herring Poundnet") were combined into a single fishery called "Alaska Statewide Herring Fisheries" (Appendix 3).

5.2 Changes to Observer Coverage

NMFS and its management partners made some changes to the deployment of observer coverage under the North Pacific Groundfish Observer Program (NPGOP) from 2005 to 2010. NMFS issued a final rule to implement Amendment 80 to the FMP for Groundfish of the Being Sea Aleutian Islands (BSAI) Management area in 2007 (72 FR 52668, September 14, 2007). This rule created a catch share program starting in 2008, which increased observer coverage on 20 trawl catcher/processors from partial or 1 observer to 2 observers on all vessels. Another catch share program starting in 2007, the Gulf of Alaska (GOA) Rockfish Pilot Program, increased observer coverage to 100 percent on 27 trawl catcher vessels and required 2 observers on 8 trawl catch/processors fishing in the Program. In 2010, observers collected data onboard 303 vessels and at 24 processing facilities, for a total of 35,415 observed days at sea in the BSAI and GOA groundfish trawl, longline, and pot fisheries.

In October 2010, the North Pacific Fishery Management Council (NPFMC) approved a motion to restructure the NPGOP for vessels and processors that had been required to use less than

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100% observer coverage in the Federal fisheries, including previously uncovered sectors such as the commercial halibut sector and vessels in the groundfish sector that are less than 60 feet in length. The NPFMC recommended restructuring the program such that NMFS would contract directly with observer companies to deploy observers according to a scientifically valid sampling and deployment plan, and industry would pay a fee equal to 1.25% of the ex-vessel value of the landings included under the program. Because all sectors benefit from the resulting data, the NPFMC chose to apply the same fee percentage to all restructured sectors, in order to develop a fee program that was fair and equitable across all sectors in the restructured program. The regulations governing the new North Pacific Groundfish and Halibut Fisheries Observer Program went into effect in January 2013 (77 FR 70062, November 12, 2012), and therefore related changes to observer coverage will be described in future updates to the NBR.

The Alaska Marine Mammal Observer Program (AMMOP) conducts observer coverage of the state-managed fisheries classified as Category II under the Marine Mammal Protection Act (MMPA) list of fisheries. Of the 14 MMPA Category II fisheries managed by the State of Alaska, AMMOP has observed 8 of them since the establishment of AMMOP in 1990. These AMMOP-observed fisheries include the Prince William Sound drift and set gillnet fisheries (1990-91), the Alaska Peninsula drift gillnet fishery (1990), the Cook Inlet drift and set gillnet fisheries (1999-2000), the Kodiak set gillnet fishery (2002 and 2005), and the Yakutat set gillnet fishery (2007-2009). AMMOP collects data from fisheries on rotational observation periods.

AMMOP did not collect data in 2010 due to lack of funding. AMMOP began to observe fisheries again in 2012 in the Southeast Alaska drift gillnet fishery. Because of the large geographic range of the fishery, AMMOP is observing different management areas individually in different years. Fishing operations in the Alaska Department of Fish and Game (ADF&G) Management Areas 6 and 8 and Anita Bay terminal harvest area for this fishery were monitored together in the 2012 and 2013 fishing seasons. AMMOP will suspend data collection in 2014 until sufficient funds are available to resume operations. As funds allow, AMMOP will monitor Southeast Alaska drift gillnet fishery operations in the remaining ADF&G Management Areas in subsequent years, over a total expected time frame of eight years. A new sampling design approach has also been developed to increase efficiency of data collection and reduce cost. Data collected from this program are important relative to concerns over humpback whale (*Megaptera novaeangliae)* and harbor porpoise (*Phocoena phocoena)* takes.

5.3 Changes to Catch and Bycatch Estimation Methods

The methodologies used to estimate catch and bycatch of fish as described in Section 4.3.4.1 of the first edition of the NBR are the same employed to produce estimates for this report (NMFS 2011a). Total catch estimates in the groundfish fisheries off Alaska are generated using the Catch Accounting System (CAS). Cahalan et al. 2010 describes in detail the catch estimation methods.

Bycatch management measures for groundfish fisheries in the BSAI and GOA have specific means to limit or reduce the incidental catch of species that are harvested by other fisheries. These species are referred to as Prohibited Species and include salmon, Pacific halibut (*Hippoglossus stenolepis*), red king crab (*Paralithodes camtschaticus*), Tanner crab

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(*Chionoecetes bairdi*), and snow crab (*Chionoecetes opilio*). Regulations require that in the groundfish fisheries, Prohibited Species are returned to the sea with minimal injury. Estimation methods for Prohibited Species are the same as described in the first edition of the NBR and by Cahalan et al. 2010. The only variation is that crab and salmon are estimated as numbers of individuals for management and have been estimated in weight for this report using average weights derived from samples taken by observers. For Pacific halibut estimates, discard mortality rates (DMRs) are used to estimate the portion of halibut bycatch that dies. Observer data are used to estimate DMRs in the groundfish fisheries, and these methods have not changed since the first edition of the NBR.

The statistical methods used to derive the marine mammal bycatch estimates are much the same are described in Section 4.3.4.2.1 of the first edition of the NBR and as described by Perez (2006), although the manner in which the data are organized and processed for the bycatch analysis has changed since 2006. A NMFS report currently is in preparation that describes the marine mammal bycatch estimation methods in greater detail (J. Breiwick, personal communication[19]).

The marine mammal bycatch estimates in this report are provided as an average annual estimate of bycatch based on 4 years of data: 2007-2010. The estimates also include bycatch that was observed in unsampled hauls. For these bycatch events, the bycatch is observed, but the fishing effort in the unsampled hauls is unknown and therefore the CV cannot be computed. The following fisheries and bycatch events were observed in unsampled hauls:

- BSAI flatfish trawl fishery: one harbor seal (*Phoca vitulina richardii*) and one humpback (*Megaptera novaengliae*) were observed in unsampled hauls, no animals were observed in sampled hauls; one northern fur seal (*Callorhinus ursinus*) was observed in an unsampled haul, and three were observed in sampled hauls; two Steller sea lions (*Eumetopias jubatus*) were observed in unsampled hauls;
- BSAI Pacific cod longline fishery: one Dall's porpoise (*Phocoenoides dalli*) was observed in an unsampled haul;
- BSAI Pacific cod trawl: two Steller sea lions (*Eumetopias jubatus*) were observed in unsampled hauls;
- BSAI pollock trawl: one bearded seal (*Erignathus barbatus*) observed in an unsampled haul.

Although marine mammal bycatch estimates presented in this report are based on observer data, other sources of data on mortality and serious injury such as stranding databases exist. Estimates derived from such sources cannot routinely be attributed to specific fisheries. In addition, because fishing effort is always unknown in these cases, no extrapolations can be made to estimate bycatch levels based on observed bycatch levels. Due to this complexity, information on marine mammal bycatch from sources other than observer programs is not included in this report. However, those estimates can be found in the marine mammal stock assessment reports (Allen and Angliss 2013).

The methodology to derive the annual estimates of seabird bycatch in the groundfish fisheries has been redesigned (see Fitzgerald 2012). The estimates are derived in the CAS using the same

[19] J. Breiwick. Alaska Fisheries Science Center, 7600 Sand Point Way NE, Seattle, WA 98115.

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methods as other non-target species as described in Cahalan et al. 2010. Estimates of uncertainty are currently not available for fish or seabird bycatch.

5.4 Progress on Bycatch Estimation Improvement Plans

Since the first edition of the NBR, significant progress has been made on the bycatch data collection and estimation improvement plans for the groundfish fisheries. NMFS, the NPFMC, and the fishing industry have made important changes to address longstanding issues related to the structure, scope, and funding for the NPGOP.

The NPFMC took action to restructure the NPGOP in October 2010, and the new North Pacific Groundfish and Halibut Observer Program went into effect on January 1, 2013. The new observer program makes important changes to how observers are deployed, how observer coverage is funded, and the vessels and processors that must have some or all of their operations observed. The new Observer Program:

- Expands coverage to nearly all catcher/processor vessels, the halibut and sablefish Individual Fishing Quota fisheries, and vessels between 40 feet and 60 feet length overall;
- Uses a scientific method to deploy observers; and
- Equitably distributes costs by charging a fixed 1.25% fee on all groundfish and halibut landings in the partial coverage category.

These changes will reduce bias in data collected by the program, address cost inequality among fishery participants, and expand observer coverage to previously unobserved fisheries.

5.5 Fish Bycatch

This report includes bycatch estimates for 75 fish and invertebrate stocks (or species or species groups) in 25 federally managed groundfish fisheries (Table 5.1). Estimated bycatch ranged from less than 100 lb to 38.1 M lb (Table 5.2). Arrowtooth flounder (*Atheresthes stomias*) had the highest estimated bycatch (38.1 M lb), although total catch estimates for this species (landings and bycatch) were still well below the Acceptable Biological Catch in the BSAI and the GOA (Spies et al., 2012; Turnock, 2012). Discards of arrowtooth flounder were the main source of the high bycatch ratios in the GOA rex sole trawl fishery (0.59) and the GOA flathead sole trawl fishery (0.57). Arrowtooth flounder traditionally has not been considered marketable for human consumption and is therefore caught as bycatch in other fisheries and discarded. However, industry has continued to develop markets for the species, and the bycatch ratio for arrowtooth flounder has decreased from what was reported in the first edition of the NBR; the bycatch ratio in 2010 was 0.27 compared to the bycatch ratio of 0.44 in 2005.

Grenadier had the second highest amount of estimated bycatch (24.58 M lb), and the majority (80%) of this bycatch occurred in the BSAI Flatfish Group Trawl fishery, BSAI Greenland turbot longline fishery, and the sablefish longline fisheries in both the BSAI and the GOA. Currently, grenadiers are not managed under Alaska groundfish FMPs. In recognition of the high amount of grenadier bycatch in the groundfish fisheries, the NPFMC is considering moving grenadiers into the FMPs.

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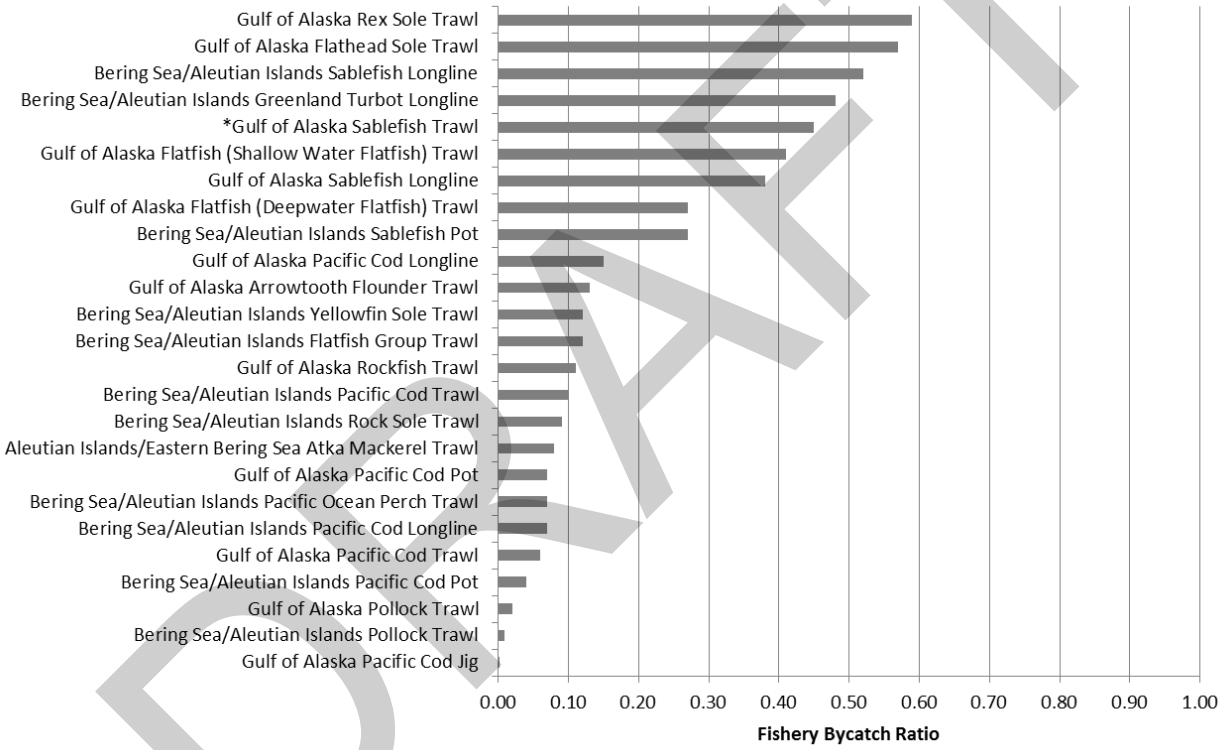
The BSAI flatfish group trawl and BSAI rock sole trawl fisheries had markedly decreased bycatch ratios in 2010 compared to the ratios reported for 2005 in the first edition of the NBR; the bycatch ratio for BSAI flatfish group trawl in 2010 was 0.12 compared to 0.36 in 2005; the bycatch ratio for BSAI rock sole trawl in 2010 was 0.09 compared to 0.34 in 2005. These two fisheries now are managed under a catch share program, which was established by Amendment 80 to the BSAI FMP (72 FR 52668, September 14, 2007). One of the goals of the Amendment 80 program was to improve retention and utilization of fishery resources through a groundfish retention standard, which was designed to encourage fishing practices with lower discard rates and improve the opportunity for increasing the value of harvested species. Alaska Region fishery bycatch ratios are shown in Figure 5.1, and Alaska Region species bycatch ratios are shown in Figure 5.2.



*Vessels participating in the Gulf of Alaska Sablefish Trawl fishery were part of the Gulf of Alaska Rockfish Trawl fishery, but their trips were designated as Sablefish Trawl when sablefish was the predominate retained species.

Figure 5.1 Alaska Region Fishery Bycatch Ratios (The fisheries in this figure represent the fisheries for which fish bycatch estimates were available, out of the total number Regional fisheries. Fishery bycatch ratio is the ratio of the total fishery bycatch to total fishery catch.)

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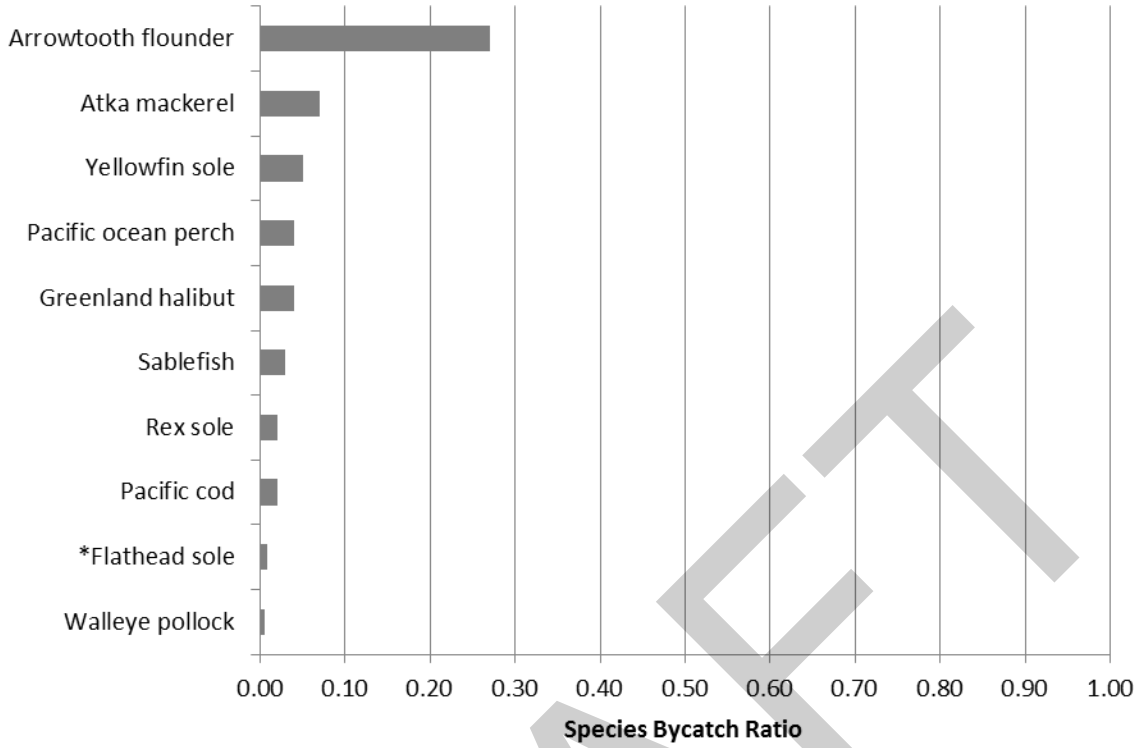

*Flathead sole as currently managed by the NPFMC in the BSAI represents a two-species complex consisting of true flathead sole (*Hippoglossoides elassodon*) and its morphologically-similar congener Bering flounder (*H. robustus*). Therefore, "flathead sole" bycatch from the BSAI are not reflected in this ratio.

Figure 5.2 Alaska Region Species Bycatch Ratios (Species bycatch ratio is the ratio of bycatch of a single stock to total catch of that stock within a Region.)

5.6 Marine Mammal Bycatch

Marine mammal bycatch of 16 stocks (or species) was observed in 9 individual federally managed groundfish fisheries and 2 federally managed groundfish fishery groups (Table 5.3). The two groundfish fishery groups comprised eight individual fisheries. Bycatch estimates of marine mammals in the groundfish fisheries ranged from an annual average of 0.25 to 14.52 animals per year, for total of 33.20 estimated animals (note that the annual estimates are based on a multi-year average, so estimates are fractional). This is almost half of the total annual estimated bycatch in 2005 as reported in the first edition of the NBR (NMFS 2011a). However, as noted in the observer coverage section, data were not collected in 2010 under the AMMOP, so estimates for state-managed fisheries are not provided in this edition of the report. Therefore, this reduction in overall bycatch probably represents a lack of available data, not an overall trend in reduced marine mammal bycatch. In addition, marine mammal interactions may occur in other Alaska fisheries besides the federally managed groundfish fisheries for which data are available for this report.

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Bycatch estimates were numerically very low for the majority of fisheries, although even a small amount of bycatch can be important. Western Steller sea lions (*Eumetopias jubatus)*, which are listed as endangered, had the highest amount of bycatch (almost 44% of the total marine mammal bycatch), followed by northern fur seals (*Callorhinus ursinus*; 17% of the total marine mammal bycatch). The estimated bycatch in the BSAI pollock trawl and BSAI flatfish trawl fisheries accounted for the majority (84%) of the total marine mammal bycatch.

5.7 Sea Turtle Bycatch

No sea turtles were observed caught in 2010 in Alaska Region federally managed groundfish fisheries. As mentioned above, these groundfish fisheries comprise 25 of the 38 Alaska fisheries considered in this report.

5.8 Seabird Bycatch

This report includes seabird bycatch estimates for eight species (or species groups; Table 5.4). Seabird bycatch was observed in 10 individual federally managed groundfish fisheries and 2 federally managed groundfish fishery groups. The two groundfish fishery groups comprised eight individual fisheries. An estimated 4,599 individuals were caught in the groundfish fisheries in 2010. Northern fulmar (*Fulmarus glacialis*) was the most commonly caught seabird species and accounted for almost half of the estimated annual seabird bycatch. Two endangered short-tailed albatross (*Phoebastria albatrus)* were incidentally hooked in the BSAI Pacific cod longline fishery and extrapolated to an estimate of 15 birds caught in the fishery. This was the first observed bycatch of the short-tailed albatross in the groundfish fisheries since 1998.

Alaska Region longline fishery seabird bycatch accounted for 3,712 birds, or 80% of the overall estimated Alaska Region seabird bycatch. The 2010 bycatch in these fisheries is lower than the estimated 6,353 birds caught in the longline fisheries in 2005 as reported in the first edition of the NBR. Bycatch in the longline fisheries has showed a marked decline beginning in 2002 due to the deployment of streamer lines as bird deterrents. Since then, annual bycatch has remained below 10,000 birds.

Bycatch estimates are currently only generated using observations of birds that occur in the observer samples. Information from other trawl fisheries and special project work carried out by observers between 2005 and 2009 provide evidence of seabird mortality from additional causes. Beginning in 2010, observers record these additional mortalities whenever they are observed. There were 112 seabird mortalities associated with trawl vessel gear in 2010, including 6 albatross (4 Laysan, *Phoebastria immutabilis*, and 2 black-footed, *P. nigripes*). NMFS' Alaska Fisheries Science Center is seeking funds to support the development of a viable means of estimating total seabird bycatch from other trawl fisheries so that it can be combined with the CAS estimates.

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6. Northwest Overview

6.1 Summary of Fisheries Included in This Report

A total of 29 commercial fisheries are included in this report for the Northwest Region, and this report includes fishery bycatch estimates for 10 of those fisheries (Appendix 3). Fishing effort from trawls (pelagic and non-pelagic), demersal longlines, pots, trolling, and other hook-and-line gears (i.e., fishing poles) are represented in these fisheries. This report includes two fisheries that were not reported on in the first edition of the NBR: California halibut trawl and West Coast mid-water trawl for whiting with shoreside processing. The California halibut trawl fishery is state-permitted and observed for groundfish bycatch, and the West Coast mid-water trawl fishery with shoreside processing is a sector of the federal groundfish fishery.

Based on total bycatch and fishery landings of individual fish, computed fishery bycatch ratios for two fisheries, the West Coast salmon troll, non-tribal ocean and tribal ocean, were 0.51 and 0.24, respectively (Table 6.1). Based on total bycatch and fishery landing weight, computed bycatch ratios for Northwest commercial fisheries ranged from 0.01 to 0.84 (Figure 6.1). For 6 of the 10 fisheries for which bycatch ratios were determined, protected fish species were excluded from the ratio because they are reported as individuals rather than by weight. The fish excluded from these ratios are described in detail in the footnotes to Table 6.1. The lowest overall fishery bycatch ratios occurred in the West Coast mid-water hake trawl at-sea processing (0.01) and shoreside processing (0.02) fisheries. These fisheries are very large-volume fisheries with high overall retention.

Other West Coast fisheries that fished with bottom trawl gear included the West Coast limited entry bottom trawl fishery, which consists of the groundfish bottom trawl and California halibut trawl fisheries, with bycatch ratios of 0.20 and 0.84 respectively. The high bycatch ratio in the California halibut trawl fishery is primarily driven by high bycatch of Dungeness crab (*Cancer magister*), which is prohibited from being landed. Fishery bycatch ratios in West Coast groundfish fisheries fished with fixed gear ranged from 0.05 to 0.35. The highest ratios were exhibited in the West Coast groundfish non-trawl gear fishery, which includes the non-endorsed fixed gear and limited entry sablefish-endorsed fixed gear fisheries, where the bycatch included those of major target species such as sablefish (*Anoplopoma fimbria*). Target species in these fisheries are discarded for a variety of reasons including economic market factors, size, and regulations. Stock and/or species-level bycatch ratios are shown in Figure 6.2.

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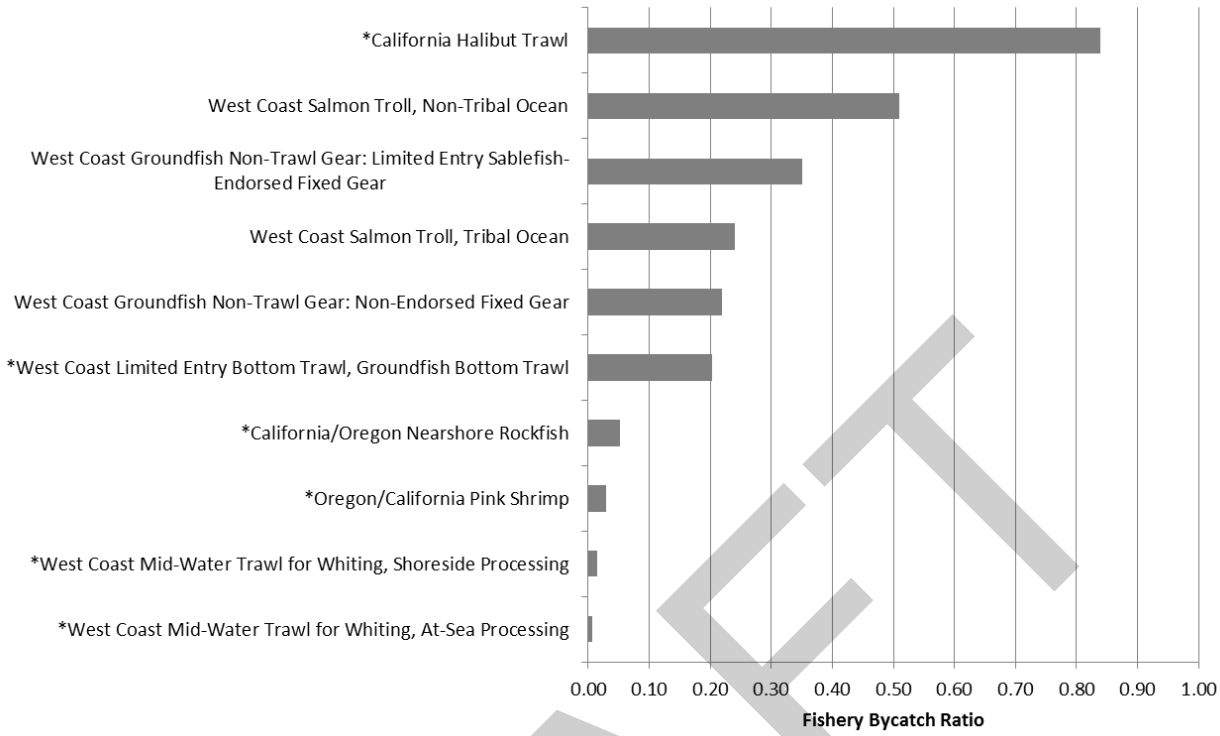

*This fishery's ratio excludes protected fish species that are reported as individuals rather than weight. The fish excluded from these ratios are described in detail in the footnotes to Table 6.1.

Figure 6.1 Northwest Region Fishery Bycatch Ratios (The fisheries in this figure represent the fisheries for which fish bycatch estimates were available, out of the total number Regional fisheries. Fishery bycatch ratio is the ratio of the total fishery bycatch to total fishery catch.)

Fishery-level bycatch in the West Coast mid-water trawl for whiting, at-sea processing fishery is reported in 2010 for all bycatch species. All other Northwest Region fisheries with bycatch ratios based on total bycatch and fishery landing weight report only groundfish bycatch and selected non-groundfish species in this report for 2010. The next NBR update in 2015 will include all groundfish and non-groundfish bycatch values for these fisheries, because additional bycatch estimates will be available due to methodology improvements.

The Northwest Region has collected data regarding bycatch of corals and sponges as part of a Pacific Coast Groundfish Five-Year Review of Essential Fish Habitat (PFMC 2012). However, these data have not been analyzed and expanded in a manner consistent with methods used to develop fleet-wide bycatch estimates in this section. NMFS will examine the feasibility of producing bycatch estimates for corals and sponges for the next NBR update in 2015.

6.2 Changes to Observer Coverage

Observer coverage levels are consistent in the same fisheries represented in both 2005 for the first edition of the NBR (NMFS 2011a) and 2010 for this report, with the exception of coverage

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of the Washington state pink shrimp fishery, which began in 2010. For the Washington state pink shrimp fishery, 9% of landings were observed in 2010[20].

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[20] For more information, see http://www.nwfsc.noaa.gov/research/divisions/fram/observation/data_products/sector_products.cfm

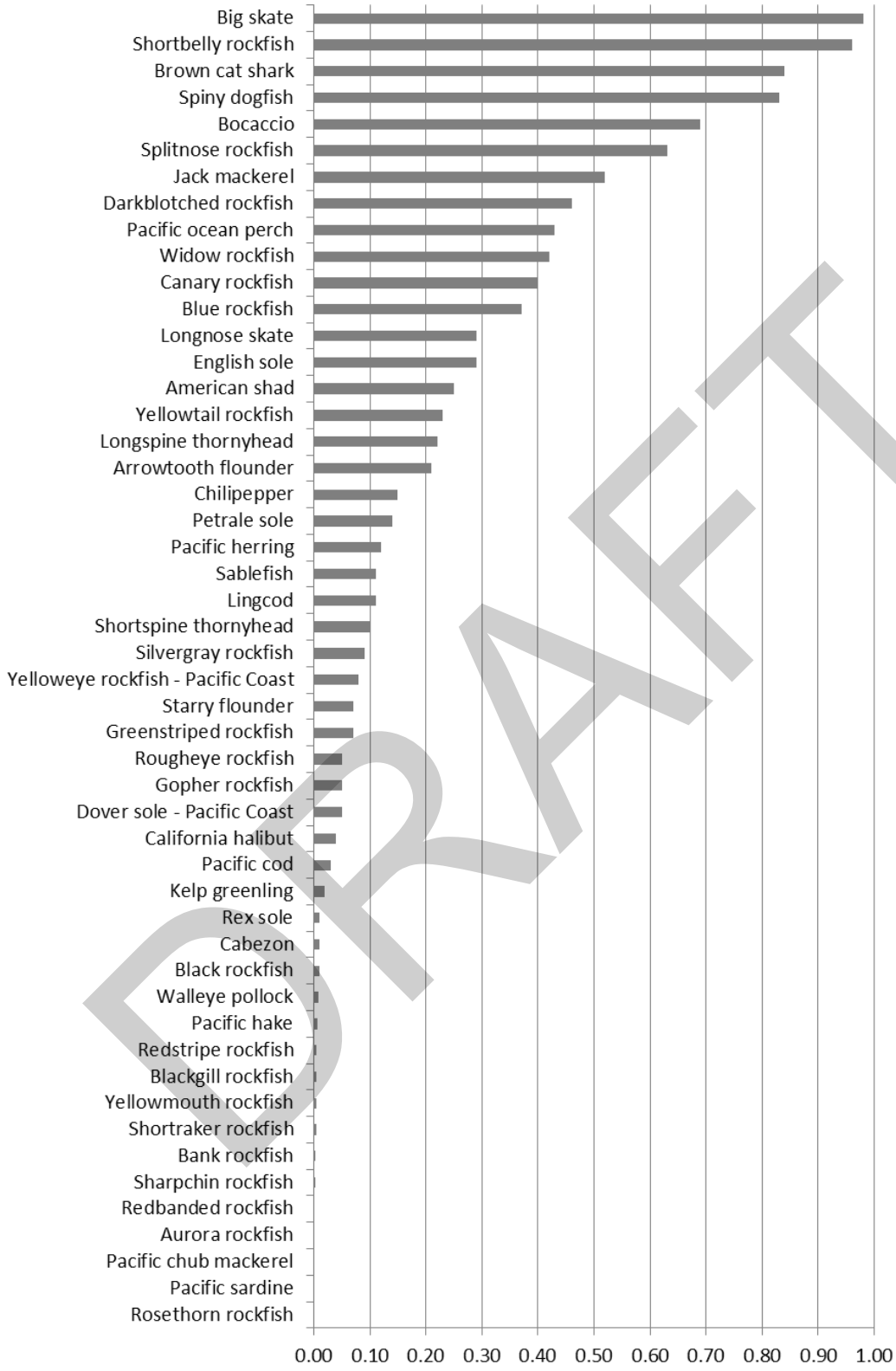

Figure 6.2 Northwest Region Species Bycatch Ratios (Species bycatch ratio is the ratio of bycatch of a single stock to total catch of that stock within a Region.)

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6.3 Changes to Catch and Bycatch Estimation Methods

Substantial changes have been made in estimation methods for marine mammal, seabird, and sea turtle bycatch, as detailed in an updated report by Heery et al. 2010a. A deterministic approach was used to estimate bycatch in all West Coast groundfish fisheries for which observer data were available. Using this approach, the total number of observed takes for each species was stratified temporally and spatially, and then summarized in relation to observed catch. For fishery sectors in which there was less than 100% observer coverage or in which not all observed hauls were monitored for protected resources, observed takes were then expanded to the fleet-wide level based on total fleet catch or landings. Stratification was determined for each marine mammal species based on a qualitative evaluation of life history traits, population structure, and spatial and temporal differences in abundance. A consistent stratification scheme for all seabird species was used, based on findings from aerial and boat surveys synthesized by Tyler et al. 1993.

Bycatch estimates were only provided when the coinciding CV was less than 80%, based on an evaluation of the distribution of estimated CVs for all marine mammal, seabird, and turtle species observed. A sensitivity analysis was conducted to evaluate how bycatch might differ from base estimates if the observed bycatch rate from the observer data was smaller than the actual rate in the unobserved or unmonitored fleet. Results indicated that bycatch of marine mammals and seabirds on unobserved vessels would have to be considerably larger than that on observed vessels (typically by more than 300%) for the actual bycatch amount to fall outside of estimated 90% confidence intervals.

Estimation methods for trawl-caught Pacific halibut bycatch have also been updated in a report by Heery et al. 2010b. Tree-based models (Clark and Pregibon 1992) were used both to confirm previous findings and establish new stratification that could be used consistently across all years of observer data. A generalized linear model was then used to evaluate the significance of each combination of variables with Pacific halibut discard.

6.4 Progress on Bycatch Implementation Improvement Plans

NMFS has made significant progress to address Northwest Region improvement plan recommendations outlined in Section 4.4.8 of the first edition of the NBR (NMFS 2011a). Updates to marine mammal, seabird, and sea turtle bycatch methodologies are a significant step in addressing the NMFS Northwest Region improvement plan recommendation to explore alternative estimation methods for these groups. For fish species bycatch, measures of uncertainty have been added to reporting, such as including standard error values for bycatch ratios and 95% confidence intervals around bycatch estimates. Non-parametric bootstrapping has also been employed to assist in estimating bycatch in strata with fewer than three vessels observed. This technique involves resampling with replacement of all observed hauls within a stratum to produce a representative bycatch ratio for that stratum.

6.5 Fish Bycatch

This report includes bycatch estimates for 10 out of 29 Northwest Region fisheries (Table 6.1). This report also provides bycatch estimates for 113 Northwest Region fish or invertebrate

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species/groups (Table 6.2). Overall, bycatch ratios ranged from <0.01 to 0.98. The highest bycatch estimates were reported for spiny dogfish (*Squalus acanthias*; 2.5 M lb), Pacific hake (*Merluccius productus*; 2.2 M lb), and arrowtooth flounder (*Reinhardtius stomias*; 1.9 M lb). Although the bycatch for Pacific hake was high, the stock bycatch ratio was very low at <0.01. The stock bycatch ratios for spiny dogfish and arrowtooth flounder were 0.83 and 0.21, respectively. Stocks with high bycatch ratios included big skate (*Raja binoculata*; 0.98), shortbelly rockfish (*Sebastes jordani*; 0.96), and brown cat shark (*Apristurus brunneus*; 0.84). Bycatch units for protected fish species under the Endangered Species Act (ESA) are estimated as the number of individual fish, and therefore ratios based on weight are unavailable.

Regional bycatch concerns have increased regarding listed fish species protected under the ESA, namely, North American green sturgeon (*Acipenser medirostris*) and Pacific eulachon (*Thaleichthys pacificus*). Both are listed as threatened for the southern DPSs, which occur in the Northwest Region. The greatest portion of the 190-animal green sturgeon bycatch estimate came from the California halibut trawl fishery. The greatest portion of the 1.1 M-animal eulachon estimate came from the Oregon/California pink shrimp fisheries (Al-Humaidhi et al. 2012).

6.6 Marine Mammal Bycatch

This report includes updated marine mammal bycatch estimates for the stocks/species that were included in the first edition of the NBR, as five-year averages based on marine mammal stock assessment reports (SARs; Allen and Angliss 2013, Carretta et al. 2013). The date range included in the average varied for each species depending on the SAR. This report includes bycatch estimates from five Northwest Region observed commercial fisheries (Table 6.3):

1. West Coast limited entry bottom trawl; groundfish bottom trawl (2.5 Steller sea lion (*Eumetopias jubatus*), 4.3 California sea lion (*Zalophus californianus*)),
2. West Coast mid-water trawl for whiting, at-sea processing (1.6 harbor seal (*Phoca vitulina*), 0.95 California sea lion, 2.5 Steller sea lion),
3. West Coast groundfish non-trawl gear: limited entry sablefish-endorsed fixed gear (2.5 California sea lion),
4. California/Oregon nearshore rockfish (5.4 harbor seal), and
5. California halibut trawl (27.4 California sea lion, 0.74 Steller sea lion).

Fractional values were reported due to the estimation process and calculation of five-year averages. Marine mammal bycatch was estimated at zero in the remaining three observed commercial fisheries. The only key[21] marine mammal stock identified was the Steller sea lion – Eastern U.S. stock.

6.7 Sea Turtle Bycatch

No sea turtles were observed caught in the 10 observed Northwest Region fisheries in 2010.

6.8 Seabird Bycatch

[21]Key stocks were defined in the first edition of the NBR as stocks that have high bycatch levels, have special importance to management, and/or for which there are stock status concerns.

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This report includes bycatch estimates for 7 out of 29 Northwest Region fisheries. One fishery had actual seabird bycatch observations in 2009: the West Coast mid-water trawl for whiting, at-sea processing fishery (2 unidentified auklets and/or murrelets, 32.01 Northern fulmar (*Fulmarus glacialis*), and 6 unidentified tubenoses; Table 6.4). Fractional values were reported due to the estimation process. Seabird bycatch was estimated at zero in the remaining six observed commercial fisheries. None of seabird species with bycatch estimates were considered key seabird stocks. Seabird bycatch of the endangered short-tailed albatross (*Phoebastria albatrus*) remains closely monitored due to a documented mortality in the U.S. West Coast groundfish fishery in 2011.

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7. Southwest Overview

7.1 Summary of Fisheries Included in This Report

A total of 27 commercial fisheries are included in this report for the Southwest Region, and this report includes fishery bycatch estimates for 3 of those fisheries (California (CA) large-mesh drift gillnet, CA small-mesh drift gillnet, and CA set gillnet; Appendix 3 and Table 7.1). The CA deep-set pelagic longline fishery was also observed at 100% coverage from 2007 to 2010, but bycatch estimates are not provided because less than three vessels participate in the fishery. The coastal pelagic species purse seine fishery was included in the first edition of the NBR (NMFS 2011a), but it is not included here because the fishery was last observed in 2008. The CA set gillnet fishery is a new addition to this report and was observed in 2007 and 2010.

7.2 Changes to Observer Coverage

Observer coverage in the CA large-mesh drift gillnet fishery declined annually from 21% in 2005 to 12% in 2010. However, observer coverage rose back to the 20% level in 2011 and 2012.

7.3 Changes to Catch and Bycatch Estimation Methods

Larese and Coan (2008) developed fish and invertebrate bycatch estimation procedures, and these methods were used to produce the estimates included in this report. Bycatch estimates are reported in numbers of individuals. Southwest Region observers do not weigh animals, and length-to-weight conversion factors do not exist for many of the species that observers do measure. This report does not calculate Southwest Region bycatch ratios because bycatch is estimated as individuals and landings are reported as weight.

7.4 Progress on Bycatch Estimation Improvement Plans

NMFS has made substantial improvements in bycatch estimation methods for fish and invertebrate species. These species were not included in the first edition of the NBR because the NMFS Southwest Fisheries Science Center historically had only produced estimates for marine mammals, sea turtles, and seabirds.

7.5 Fish Bycatch

This report includes fish and invertebrate bycatch estimates for 78 Southwest Region species in three fisheries (Table 7.2). Bycatch estimates ranged from 8 to 12,303 individuals. Species with the highest number of discarded animals are Pacific chub mackerel (*Scomber japonicas*; 12,303) and ocean sunfish (*Mola mola*; 5,910). This report does not include bycatch ratios because bycatch is estimated as individuals and landings are reported as weight.

7.6 Marine Mammal Bycatch

This report includes annual average marine mammal bycatch estimates for three Southwest Region commercial fisheries: CA large-mesh drift gillnet, CA small-mesh drift gillnet, and CA

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set gillnet (Table 7.3). Fractional values are reported due to the estimation process. Total annual marine mammal bycatch in the observed Southwest Region fisheries is estimated at 337.7 animals, including California sea lions (*Zalophus californianus*), harbor seals (*Phoca vitulina richardii*), Northern elephant seals (*Mirounga angustirostris*), long-beaked common dolphin (*Delphinus capensis*), short-beaked common dolphin (*Delphinus delphis*), Northern right whale dolphin (*Lissodelphis borealis*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), Risso's dolphin (*Grampus griseus*), and sperm whales (*Physeter macroephalus*).

Regional bycatch concerns have increased in the CA large-mesh drift gillnet fishery. A 2009 self-reported humpback whale (*Megaptera novaeangliae*) entanglement and the observed serious injury/mortality of two sperm whales in this fishery in 2010 exceeded the ESA Incidental Take Statement (ITS) for this fishery. NMFS completed ESA section 7 consultation for the fishery in 2013 and issued a new ITS for humpback, sperm, and fin whales (*Balaenoptera physalus*), as well as leatherback and loggerhead sea turtles.

7.7 Sea Turtle Bycatch

No sea turtles were observed caught in Southwest Region fisheries in 2010.

7.8 Seabird Bycatch

Out of the 27 Southwest Region fisheries, this report includes seabird bycatch estimates for the 2010 CA set gillnet fishery (Table 7.4). In addition, No seabird bycatch was observed in the CA large-mesh drift gillnet fishery and CA small-mesh drift gillnet fishery. Total estimated seabird bycatch in the 2010 Southwest Region observed fisheries is estimated at 59 animals, including Brandt's cormorants (*Phalacrocorax penicillatus*), double-crested cormorants (*Phalacrocorax auritus*), common murres (*Uria aalge*), unidentified gulls, and unidentified birds.

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8. Pacific Islands Overview

8.1 Summary of Fisheries Included in This Report

A total of 30 fisheries are included in the Pacific Islands Region (Appendix 3), and this report includes fish and protected resources bycatch estimates for 2 Pacific Islands Region commercial fisheries: the Hawaii-based shallow-set pelagic longline fishery (which targets swordfish) and the Hawaii-based deep-set pelagic longline fishery (which targets tuna; Table 8.1). Overall fishery bycatch estimates or total discards for these two fisheries were 0.87 M lb and 8.10 M lb, respectively, with fishery bycatch ratios of 0.19 for the shallow-set and 0.29 for the deep-set fishery (Figure 8.1). This report also includes protected resources bycatch estimates for the American Samoa-based longline fishery. Since the first edition of the NBR, the Northwestern Hawaiian Islands bottomfish fishery has been closed and consequently is deleted in this report.

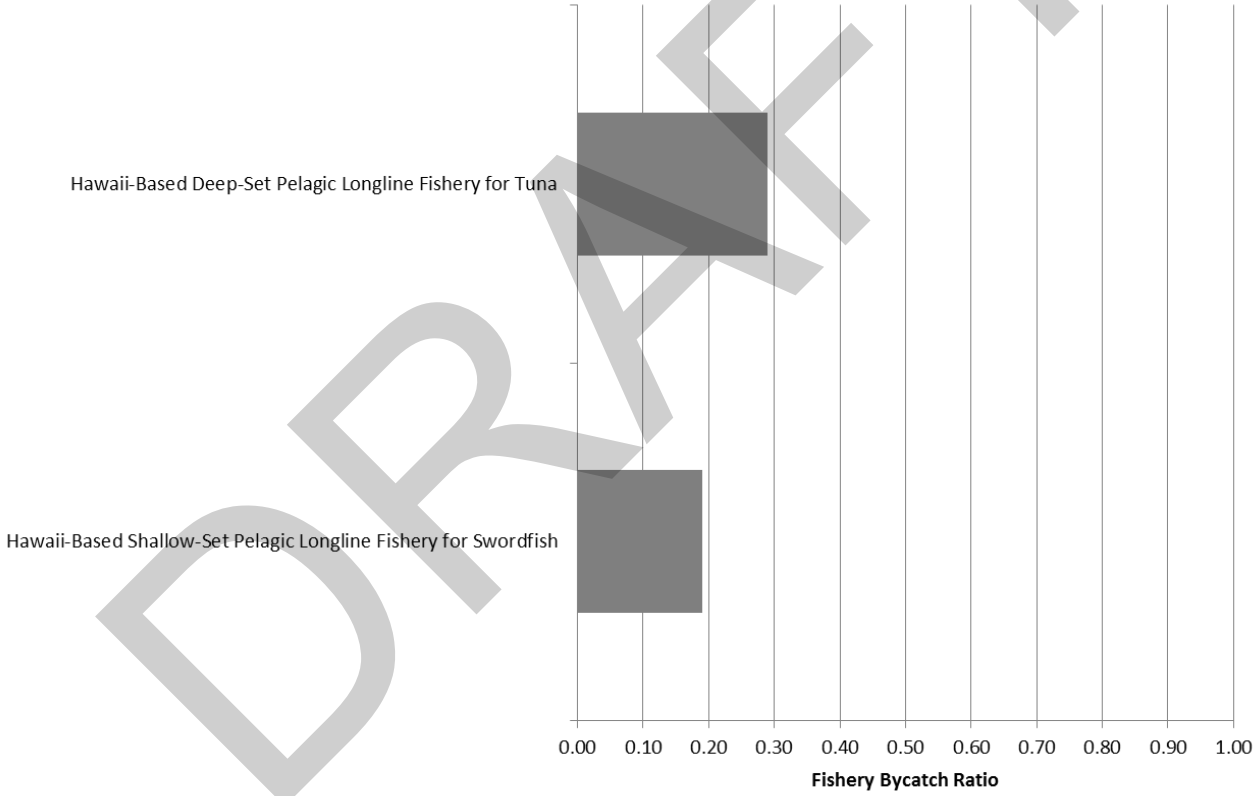

Figure 8.1 Pacific Islands Region Fishery Bycatch Ratios (The fisheries in this figure represent the fisheries for which fish bycatch estimates were available, out of the total number Regional fisheries. Fishery bycatch ratio is the ratio of the total fishery bycatch to total fishery catch.)

The shallow-set pelagic longline fishery had 0.87 M lb of bycatch, and the deep-set pelagic longline fishery had 8.10 M lb of bycatch. Pelagic longline observers recorded the condition of bycatch species upon release from the vessel. If the definition of bycatch used in this report (see

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Section 1.1 of this report) distinguished between alive and dead discarded catch, then the bycatch estimates and ratios for these two fisheries would be lower.

That is, if bycatch was defined as species that are "alive" when discarded, then the shallow-set fishery would have a bycatch estimate of 0.73M lb, corresponding to a fishery bycatch ratio of 0.16. Likewise, the deep-set fishery would have a bycatch estimate of 6.13 M lb of "alive" discards, corresponding to a fishery bycatch ratio of 0.22. If bycatch was defined as species that are "dead" when discarded, then the shallow-set fishery would have a bycatch estimate of 0.14 M lb, corresponding to a fishery bycatch ratio of 0.03. Likewise, the deep-set fishery would have a bycatch estimate of 1.97 M lb of "dead" discards, corresponding to a fishery bycatch ratio of 0.07. This alternate estimation of bycatch and fishery bycatch ratio would require application of best available science regarding post-release mortality rates.

American Samoa-based longline fishery bycatch estimates are not incorporated into in this report. The next update of the NBR in 2015 should include fishery bycatch estimates for this fishery.

8.2 Changes to Observer Coverage

There has been no significant change in observer coverage. Observer coverage exists in the same fisheries represented in both 2005 (the first edition of the NBR) and 2010 (this report). In 2010, the shallow and deep-set fisheries monitored 1,879 (100% coverage) and 3,580 sets (21.1% coverage), respectively. In 2005, shallow and deep-set fisheries coverage was 100% and 26.1%, respectively.

8.3 Changes to Catch and Bycatch Estimation Methods

NMFS has made minor changes in marine mammal estimation methods since the first edition of the NBR. The changes include using the generalized ratio estimator when it appears to be more efficient than the Horvitz-Thompson estimator, and incorporating a proportion of "blackfish" (marine mammals identified to be a false killer whale (*Pseudorca crassidens*) or short-finned pilot whale (*Globicephala macrorhynchus*)) into the bycatch estimates of false killer whales and short-finned pilot whales. These estimation methods and 2010 bycatch estimates are described in detail in McCracken 2011 and 2012. NMFS did not change estimation methods for fish bycatch or other taxa.

8.4 Progress on Bycatch Improvement Plans

The highest NMFS Pacific Islands priority in the first edition of the NBR was to expand the pilot observer program in American Samoa, which had inadequate coverage and funding in 2005. NMFS has made significant progress to address this recommendation, with observers monitoring 798 sets (25.0% coverage) in 2010. Marine mammal, sea turtle, and seabird bycatch estimates are provided for the American Samoa-based longline fishery in this report. NMFS anticipates that fish bycatch estimates for the American Samoa longline fishery will be provided in the next NBR update in 2015.

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8.5 Fish Bycatch

This report includes fish bycatch estimates for a total of 77 Pacific Islands stocks (Table 8.2). Landings were available for 15 of the 77 Pacific Islands stocks, allowing calculation of bycatch ratios. The 15 stocks had bycatch ratios that ranged from 0.0 to 1.0. Fourteen of the fifteen stocks had bycatch ratios of less than 0.13. The highest bycatch ratios occurred for ocean sunfish (*Mola mola*; 1.00), which was landed rarely in relation to the frequency of catch.

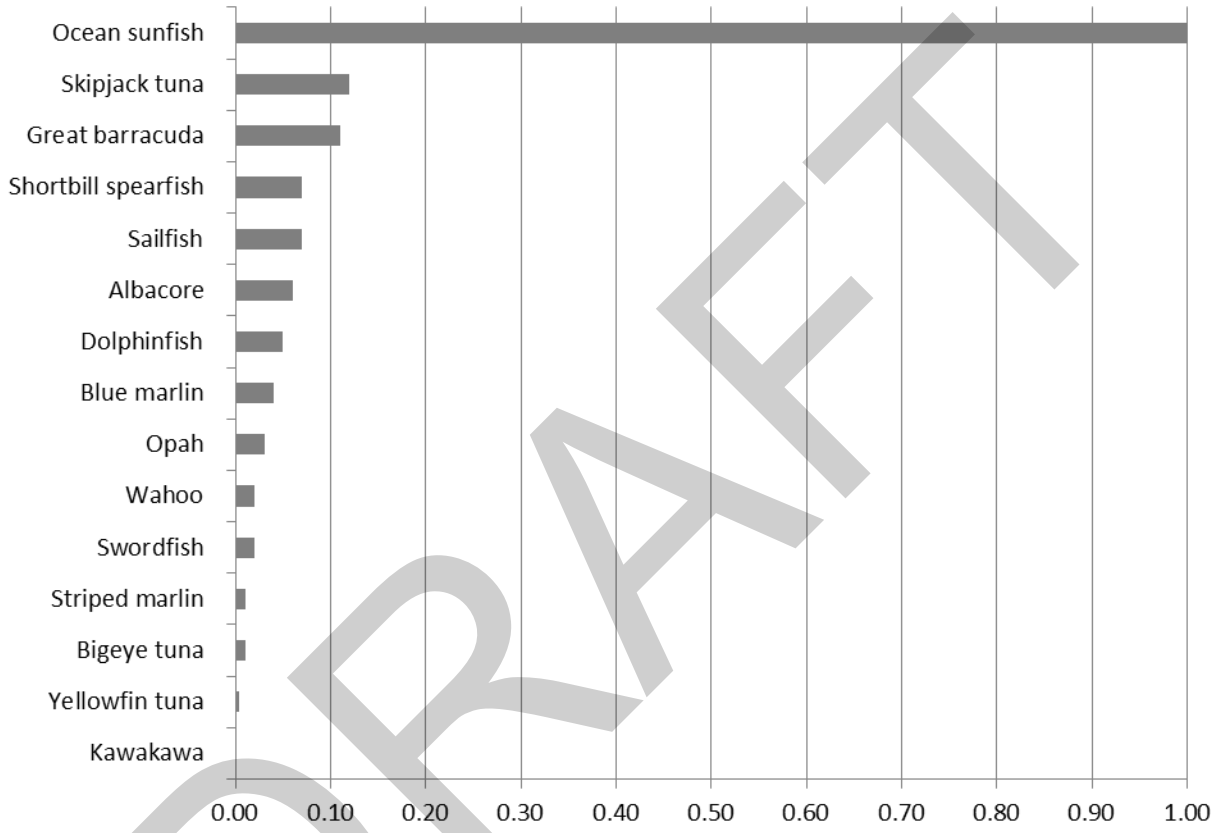

Figure 8.2 Pacific Islands Region Species Bycatch Ratios (Species bycatch ratio is the ratio of bycatch of a single stock to total catch of that stock within a Region.)

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8.6 Marine Mammal Bycatch

This report includes bycatch estimates for a total of 15 marine mammal stocks for the two Hawaii-based longline fisheries. Fractional values were reported due to the estimation process (McCracken 2011). An annual average over five years (2006–2010) of 0.40 and 5.0 marine mammals were caught in the Hawaii-based shallow-set fishery within and outside the U.S. exclusive economic zone (EEZ) around Hawaii (Tables 8.3 and 8.4). The deep-set fishery averaged 17.7 and 22.7 marine mammals per year within and outside the U.S. EEZ around Hawaii, respectively (Tables 8.3 and 8.4). The annual average bycatch per species ranged from 0.0 to 14.2 marine mammals by species in the deep-set fishery, although bycatch for most marine

mammal species (with the exception of false killer whales and all other unidentified cetaceans combined) was equal to or less than 2.0 per year in this fishery. The range was much lower (0.0-3.0) in the shallow-set fishery.

No marine mammal interactions were observed in the American Samoa-based longline fishery. Therefore, the annual estimate was zero for 2010.

8.7 Sea Turtle Bycatch

Sea turtle bycatch was observed in all three longline fisheries (out of the total 30 fisheries in the Pacific Islands Region), and an estimated total of 80 turtles were estimated to have been caught in 2010 (Table 8.5). Fifteen sea turtles (seven loggerheads and eight leatherbacks) were caught in the Hawaii-based shallow-set fishery, which has 100% observer coverage. An estimated 23 sea turtles (6 loggerhead, 1 green (*Chelonia mydas*), 10 olive ridley (*Lepidochelys olivacea*), and 6 leatherback) were caught in the Hawaii-based deep-set fishery. An estimated 42 green sea turtles were caught in the American Samoa-based longline fishery.

8.8 Seabird Bycatch

Seabird bycatch was documented in the two Hawaii-based longline fisheries (out of the total 30 fisheries in the Pacific Islands Region) (Table 8.6). A total of 306 birds were caught in 2010, of which 304 (99%) were albatrosses. The shallow-set fishery caught 79 seabirds, which consisted of 40 Laysan (*Phoebastria immutabilis*) and 38 black-footed (*Phoebastria nigripes*) albatrosses, as well as 1 Northern fulmar (*Fulmarus glacialis*). The deep-set fishery caught 227 seabirds, including 160 Laysan and 66 black-footed albatrosses, as well as 1 shearwater.

No seabird interactions were observed in the American Samoa-based longline fishery. Therefore, the annual estimate was zero for 2010.

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9. References

Al-Humaidhi, A. W., M. A. Bellman, J. Jannot, and J. Majewski. 2012. Observed and estimated total bycatch of green sturgeon and Pacific eulachon in 2002-2010 U.S. west coast fisheries. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

Allen, B. M., and R. P. Angliss. 2013. Alaska marine mammal stock assessments, 2012. U.S. Dep. Commer., NOAA Tech. Memo. NMFSAFSC-245, 282 p. Available online at: http://www.nmfs.noaa.gov/pr/sars/pdf/ak2012.pdf

Blaylock, J., S. E. Wigley, P. J. Rago, M. Mood, and M. C. Palmer. 2013. A brief description of Northeast region fish and invertebrate discard estimation for the 2013 update to the National Bycatch Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 13-05; 38 p. Available online at: http://www.nefsc.noaa.gov/publications/crd/crd1305/

Cahalan, J., J. Mondragon, and J. Gasper. 2010. Catch sampling and estimation in the Federal groundfish fisheries off Alaska. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-205, 42 p. Available online at: http://docs.lib.noaa.gov/noaa_documents/NMFS/AFSC/TM_AFSC/TM_NMFS_AFSC_205.pdf

Carretta, J. V., E. Oleson, D. W. Weller, A. R. Land, K. A. Forney, J. Baker, B. Hanson, K. Martien, M. M. Muto, M. S., Lowry, J. Barlow, D. Lynch, L. Carswell, R. L. Brownell Jr., D. K. Mattila, and M. C. Hill. 2013. U.S. Pacific marine mammal stock assessments, 2012. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SWFSC-504, 378 p. Available online at: http://www.nmfs.noaa.gov/pr/sars/pdf/po2012.pdf

Clark, L. A. and D. Pregibon. 1992. Tree-based models. *In* Chambers, J. M. and J. M. Hastie (eds). Statistical models in S. pp. 317-419. Wadsworth and Brooks, Pacific Grove, California.

Epperly, S., L. Avens, L. Garrison, T. Henwood, W. Hoggard, J. Mitchell, J. Nance, J. Poffenberger, C. Sasso, E. Scott-Denton, and C. Yeung. 2002. Analysis of sea turtle bycatch in the commercial shrimp fisheries of Southeast U.S. waters and the Gulf of Mexico. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SEFSC-490, 88 p. Available online at: http://www.sefsc.noaa.gov/turtles/TM_490_Epperly_etal.pdf

ESA (Endangered Species Act of 1973), 1973. 16 USC Secs. 1531–1544 (available online at http://frwebgate.access.gpo.gov/cgi-bin/usc.cgi?action=browse&title=16uscc35&pdfs=yes).

Federal Register. 2010a. Fisheries of the northeastern United States; 2010 specifications for the spiny dogfish fishery: final rule. Federal Register, 75(121) (24 June 2010): 36012–36014. Available online at: http://www.gpo.gov/fdsys/pkg/FR-2010-06-24/html/2010-15324.htm

Federal Register. 2010b. Magnuson-Stevens Fishery Conservation and Management Act

DRAFT

provisions; fisheries of the northeastern United States; northeast (NE) multispecies fishery; amendment 16; final rule. Federal Register, 75(68) (09 April 2010): 18262–18353. Available online at: http://www.nero.noaa.gov/nero/regs/frdoc/10/10MultiAmend16FR.pdf

Federal Register. 2013. Fisheries off the West Coast of the United States; highly migratory fisheries; California drift gillnet fishery; sperm whale interaction restriction. Federal Register, 78(171) (04 September 2013): 54548-54552. Available online at: http://www.gpo.gov/fdsys/pkg/FR-2013-09-04/pdf/2013-21487.pdf

Fissel, B., M. Dalton, R. Felthoven, B. Garber-Younts, A. Haynie, A. Himes-Cornell, S. Kasperski, J. Lee, D. Lew, L. Pfeiffer, J. Sepez, and C. Seung. 2012. Stock Assessment and Fishery Evaluation Report for the Groundfish Fisheries of the Gulf of Alaska and Bering Sea/Aleutian Islands Area: Economic Status of the Groundfish Fisheries of Alaska, 2011. Available online at: http://www.afsc.noaa.gov/REFM/docs/2012/economic.pdf

Fitzgerald, S., 2012. Seabird Bycatch Estimates for Alaskan Groundfish Fisheries, 1993-2011. In Zador, S. (ed.), 2012. Ecosystem Considerations 2012, Stock Assessment and Fishery Evaluation Report, North Pacific Fisheries Management Council, 605 W 4th Ave, Suite 306, Anchorage, AK 99501. Available online at: http://www.afsc.noaa.gov/REFM/docs/2012/ecosystem.pdf

Garrison, L. P., and L. Stokes. 2012. Estimated bycatch of marine mammals and sea turtles in the U.S. Atlantic pelagic longline fleet during 2010. NOAA Tech Memo NMFS-SEFSC-624, 59 pp. Available online at: http://www.sefsc.noaa.gov/turtles/TM_NMFS_SEFSC_624.pdf

Guy, T. J., S. L. Jennings, R. M. Suryan, E. F. Melvin, M. A. Bellman, L. T. Balance, B. A. Blackie, D. A. Croll, T. Deguchi, T. O. Geernaert, R. W. Henry, M. Hester, K. D. Hyrenbach, J. Jahncke, M. A. Mapes, K. Ozaki, J. Roletto, F. Sato, W. J. Sydeman, and J. E. Zamon. 2013. Overlap of North Pacific albatrosses with the U.S. West Coast groundfish and shrimp fisheries. Fisheries Research 147:222-234.

Hall, M. A., D. L. Alverson, and K. I. Metuzals. 2000. Bycatch: Problems and solutions. Marine Pollution Bulletin 41(1-6):204-19.

Harrington, J. M., M. A. Ransom, and A. A. Rosenberg. 2005. Wasted resources: Bycatch and discards in U.S. fisheries. *In* U.S. atlas of fisheries bycatch, Prepared by MRAG Americas for Oceana, 286 p. Available online at: http://oceana.org/sites/default/files/o/fileadmin/oceana/uploads/Big_Fish_Report/PDF_Bycatch_July28.pdf

Heery, E., M. A. Bellman, and J. Majewski. 2010a. Estimated bycatch of marine mammals, seabirds, and sea turtles in the 2002-2008 U.S. West Coast commercial groundfish fishery. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112. Available online at: http://www.nwfsc.noaa.gov/research/divisions/fram/observation/pdf/mmsbt_report040910.pdf

DRAFT

Heery, E., M. A. Bellman, and J. Majewski. 2010b. Pacific halibut bycatch in the U.S. West Coast groundfish fishery from 2002 through 2009. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

Kelleher, K. 2004. Discards in the world's marine fisheries: an update. Food and Agricultural Organization of the United Nations, Fisheries Technical Paper 470, 134 p. Available online at: http://www.fao.org/docrep/008/y5936e/y5936e00.htm

Larese, J.P. and A.L. Coan. 2008. Fish and Invertebrate Bycatch Estimates for the California Drift Gillnet Fishery Targeting Swordfish and Thresher Shark, 1990-2006. NOAA-TM-NMFS-SWFSC-426.

Larson, D. M., B. W. House, and J. M. Terry. 1998. Toward efficient bycatch management in multispecies fisheries: A nonparametric approach. Marine Resource Economics 11:181-201.

Lewison, R. L., L. B. Crowder, A. J. Read, and S. A. Freeman. 2004. Understanding impacts of fisheries bycatch on marine megafauna. Trends in Ecology and Evolution 19(11).

McCracken, M. L. 2011. Assessment of incidental interactions with marine mammals in the Hawaii longline deep and shallow set fisheries from 2006 through 2010. PIFSC Working Paper WP-11-012. Pacific Islands Fisheries Science Center, National Marine Fisheries Service. 30 p. Available online at: http://www.pifsc.noaa.gov/library/pubs/WP-11-012.pdf

McCracken, M. L. 2012. Estimation of incidental interactions with sea turtles and seabirds in the 2011 Hawaii longline deep set fishery. PIFSC Internal Report IR-12-012. Available online at: http://www.pifsc.noaa.gov/library/pubs/IR-12-012.pdf

Murray, K. T. 2009. Characteristics and magnitude of sea turtle bycatch in U.S. Mid-Atlantic gillnet gear. Endang. Species Res. 8:211–224.

Murray, K. T. 2011. Sea turtle bycatch in the U.S. sea scallop (*Placopecten magellanicus*) dredge fishery, 2001–2008. Fish. Res. 107:137-146.

NMFS. 2002. Endangered Species Act-Section 7: Consultation biological opinion. Shrimp trawling in the southeastern United States, under the sea turtle conservation regulations and as managed by the fishery management plans for shrimp in the South Atlantic and Gulf of Mexico. NMFS Southeast Region, St. Petersburg, FL. Available online at: http://sero.nmfs.noaa.gov/pr/esa/Fishery%20Biops/00992.pdf

NMFS. 2004. Evaluating bycatch: A national approach to standardized bycatch monitoring programs. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-F/SPO-66, 108 p. Available online at: http://www.nmfs.noaa.gov/by_catch/SPO_final_rev_12204.pdf

DRAFT

NMFS. 2009. Estimated takes of loggerhead sea turtles in the vertical line component of the Gulf of Mexico reef fish fishery July 2006 through December 2008 Based on observer and logbook data. NMFS Southeast Fisheries Science Center Contribution PRD-08/09-09, 19 pp.

NMFS. 2011a. U.S. national bycatch report (W. A. Karp, L. L. Desfosse, S. G. Brooke, editors). U.S. Dep. Commer., NOAA Tech Memo NMFS-F/SPO-117E, 508 p. Available online at: http://www.nmfs.noaa.gov/by_catch/bycatch_nationalreport.htm

NMFS. 2011b. National observer program annual report—2010. U.S. Dep. Commer., 33 p. Available online at: http://www.st.nmfs.noaa.gov/Assets/Observer-Program/pdf/FY_2010_NOP_Annual_Report_FINAL.pdf

NMFS. 2011c. Fisheries of the United States 2010. U.S. Dep. Commer., 103 p. Available online at: http://www.st.nmfs.noaa.gov/commercial-fisheries/fus/fus10/index

NMFS. 2011d. 2010 annual report on the implementation of the terms and conditions of the 2009 biological opinion for the Gulf of Mexico reef fish fishery. National Marine Fisheries Service, Miami, Florida, 20 pp.

NMFS. 2012a. Endangered Species Act Section 7: Consultation biological opinion. Continued implementation of the sea turtle conservation regulations, as proposed to be amended, and the continued authorization of the Southeast U.S. shrimp fisheries in federal Waters under the Magnuson-Stevens Act. NMFS Southeast Region, St. Petersburg, FL. Available online at: http://sero.nmfs.noaa.gov/pr/endangered%20species/Shrimp%20Fishery/SoutheastShrimpBiop_Final.pdf

NMFS. 2012b. Fisheries of the United States 2011. U.S. Dep. Commer., 124 p. Available online at: http://www.st.nmfs.noaa.gov/commercial-fisheries/fus/fus11/index

NMFS. 2013. National observer program annual report—FY 2012, U.S. Dep. Commer., NOAA Tech Memo NMFS F/SPO-127, 38 p. Available online at: http://www.st.nmfs.noaa.gov/Assets/Observer-Program/pdf/FY_2012_NOP_Annual_Report_FINAL.pdf

Orphanides, C. D. 2010. Estimates of Cetacean and Pinniped Bycatch in the 2007 and 2008 Northeast Sink Gillnet and Mid-Atlantic Gillnet Fisheries. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 10-10; 45 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://nefsc.noaa.gov/publications/crd/crd1010/.

Orphanides, C. D. 2011. Estimates of Cetacean and Pinniped Bycatch in the 2009 New England Sink Gillnet and Mid-Atlantic Gillnet Fisheries. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 11-08; 28 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://nefsc.noaa.gov/publications/crd/crd1108/.

Orphanides, C. D. 2013. Estimates of cetacean and pinniped bycatch during 2010 and 2011 in the New England sink gillnet fishery, Mid-Atlantic gillnet fishery, and two NMFS gillnet

DRAFT

experiments. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 13-13; 37 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://nefsc.noaa.gov/publications/crd/crd1313/.

Pacific Fishery Management Council (PFMC). 2012. Pacific coast groundfish 5-year review of essential fish habitat. Report to Pacific Fishery Management Council. Phase 1: New information, September 2012. Portland, OR 416 p. Available online at: http://www.pcouncil.org/groundfish/background/document-library/pacific-coast-groundfish-5-year-review-of-efh/

Pascoe, S. 1997. Bycatch management and the economics of discarding. Food and Agricultural Organization of the United Nations Technical Paper 370, 137 p.

Patrick, W. S., and L. R. Benaka. 2013. Estimating the economic impacts of bycatch in U.S. commercial fisheries. Marine Policy 38:470-475.

Perez, M. A. 2006. Analysis of marine mammal bycatch data from the trawl, longline, and pot groundfish fisheries of Alaska,1998-2004,defined by geographic area, gear type, and catch target groundfish species. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-167,194 p. Available online at: http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-167.pdf

Read, A. J., P. Drinker, and S. Northridge. 2006. Bycatch of marine mammals in U.S. and global fisheries. Conservation Biology 20(1):163-9.

Spies, I., T. K. Wilderbuer, D. G. Nichol and K. Aydin. 2012. Chapter 6. Arrowtooth Flounder. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Regions. North Pacific Fishery Management Council. 605 W. 4th Avenue, Suite 306 Anchorage, AK 99301. Available online at: http://www.afsc.noaa.gov/REFM/Docs/2012/BSAIatf.pdf

Turnock, B. J. 2012. Chapter 7. Assessment of the Arrowtooth Flounder Stock in the Gulf of Alaska. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska. North Pacific Fishery Management Council. 605 W. 4th Avenue, Suite 306 Anchorage, AK 99301. Available online at: http://www.afsc.noaa.gov/REFM/Docs/2012/GOAatf.pdf

Tyler, W.B., K.T. Briggs, D.B. Lewis, and R.G. Ford. 1993. Seabird distribution and abundance in relation to oceanographic processes in the California Current system. *In* The status, ecology, and conservation of marine birds in the North Pacific. K. Vermeer, K.T. Briggs, K.H. Morgan, and D. Siegel-Causey (Eds.). Canadian Wildlife Service Special Publication, Ottawa. Pp. 48-60.

Warden M. L. 2010. Bycatch of wintering common and red-throated loons in gillnets off the USA Atlantic coast, 1996-2007. Aquat. Biol. 10: 167-180.

DRAFT

Warden M. L. 2011. Modeling loggerhead sea turtle (Caretta caretta) interactions with US Mid-Atlantic bottom trawl gear for fish and scallops, 2005–2008. Biol. Cons. 144: 2202-2212.

Waring, G. T., E. Josephson, K. Maze-Foley, and P. E. Rosel, editors. 2013. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2012. NOAA Tech Memo NMFS NE 223; 419 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://www.nefsc.noaa.gov/nefsc/publications/

Wigley S. E, J. Blaylock, P. J. Rago, K. T. Murray, T. A. Nies, R. J. Seagraves, D. Potts, and K. Drew. 2012. Standardized Bycatch Reporting Methodology 3-year Review Report 2011 - Part 2. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 12-27; 226 p. Available online at: http://www.nefsc.noaa.gov/publications/crd/crd1227/

Wigley S. E., M. C. Palmer, J. Blaylock, and P. J. Rago. 2008. A brief description of the discard estimation for the National Bycatch Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 08-02; 35 p. Available online at: http://www.nefsc.noaa.gov/publications/crd/crd0802/

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Appendix 1. List of Acronyms Used in This Report

ACCSP	Atlantic Coastal Cooperative Statistics Program
ADF&G	Alaska Department of Fish and Game
AMMOP	Alaska Marine Mammal Observer Program
B-Reg DAS	B-Regular Days at Sea
BSAI	Bering Sea Aleutian Islands
CA	California
CAS	Catch Accounting System
CV	Coefficient of variation
DMR	Discard mortality rate
DPS	Distinct population segment
EEZ	Exclusive economic zone
ESA	Endangered Species Act
FMP	Fishery management plan
GOA	Gulf of Alaska
HMS	Highly migratory species
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NBR	National Bycatch Report
NCRP	Northeast Cooperative Research Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPFMC	North Pacific Fishery Management Council
NPGOP	North Pacific Groundfish Observer Program
PacFIN	Pacific Fisheries Information Network
RSA	Research Set-Aside
SAR	Stock assessment report
SBRM	Standardized Bycatch Reporting Methodology
TRP	Take reduction plan
TRT	Take reduction team
US/CAN	U.S./Canada Resource Sharing Area

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