



June 2024

FEDERAL FISHERIES MANAGEMENT

Efforts to Reduce and Monitor Unintentional Catch and Harm Need Better Tracking

GAO Highlights

Highlights of [GAO-24-106336](#), a report to the Ranking Member, Committee on Natural Resources, House of Representatives

Why GAO Did This Study

Bycatch is a complex issue that can threaten the sustainability of fishing communities and ocean ecosystems. Under the Magnuson-Stevens Fishery Conservation and Management Act, NMFS and the councils are to develop conservation and management measures that, among other things, aim to minimize bycatch and bycatch mortality “to the extent practicable.”

GAO was asked to review efforts to manage bycatch. This report addresses (1) measures used to reduce bycatch, (2) coverage and funding of fisheries observers, (3) how bycatch estimates are developed and reported, and (4) how NMFS tracks its performance towards reducing and monitoring bycatch.

GAO reviewed relevant laws and NMFS policies and documents. GAO interviewed NMFS and council officials and relevant stakeholders, including representatives from the fishing industry and academia. GAO selected five fisheries for a more in-depth review. These fisheries reflect a range of geographic regions, fishing gear types, and key bycatch concerns.

What GAO Recommends

GAO is making four recommendations, including that NMFS identify and communicate resource needs from across the regions to support fisheries observers; update its bycatch reduction implementation plan with measurable performance goals for reducing and monitoring bycatch, and a process for tracking progress; and develop a plan for reporting on bycatch estimates from its enhanced database. The agency agreed with GAO’s recommendations.

View [GAO-24-106336](#). For more information, contact Cardell Johnson at (202) 512-3841 or johnsoncd1@gao.gov.

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What GAO Found

Bycatch is fish and other marine species that are unintentionally caught or harmed by fishing activities. Fishers try to reduce bycatch with measures that are highly individualized due to the unique interactions among the fish species they are trying to catch, bycatch species, and fishing gear. Such measures can include fishing gear modifications and fishing area closures.

Data on bycatch are primarily collected by fisheries observers, who deploy on fishing vessels to count or weigh bycatch. The percentage of fishing trips carrying observers varies widely by fishery, from zero to 100 percent. National Marine Fisheries Service (NMFS) officials reported that differences in observer funding can drive this variation, and that limited funding for observer coverage complicates bycatch data collection in some fisheries, as discussed below. They also reported challenges with recruiting and retaining observers.

The process for developing bycatch estimates varies across fisheries. It generally involves extrapolating data from a subset of fishing trips with observers to generate bycatch estimates for a whole fishery. GAO found that developing estimates is more complicated and less reliable for fisheries with fewer observers and more limited data. NMFS and Regional Fishery Management Council officials said they use estimates to inform their management decisions. NMFS, however, has not gathered information from all regions on the resources they need to support observer programs, or communicated this information externally to stakeholders, such as Congress. By doing so, NMFS could ensure that stakeholders are more informed when making resource decisions.

Shark Bycatch and Fisheries Observers Working aboard a Fishing Vessel



Source: National Marine Fisheries Service. | GAO-24-106336

NMFS’ efforts to track its performance in reducing and monitoring bycatch do not align with key elements of evidence-based policymaking related to performance management. Specifically, the agency’s bycatch reduction implementation plan lacks measurable performance goals. Having an updated plan with measurable goals and a tracking process could help inform agency decision-making. Additionally, NMFS has enhanced its database to compile bycatch estimates but does not have a comprehensive written plan for how it will report the estimates. Developing such a plan could help the agency better monitor bycatch levels, trends, and information gaps, and demonstrate progress over time to internal and external stakeholders.

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Abbreviations

BRD	bycatch reduction device
FOSS	Fisheries One Stop Shop
FY	fiscal year
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
TED	turtle excluder device

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June 14, 2024

The Honorable Raúl M. Grijalva
Ranking Member
Committee on Natural Resources
House of Representatives

Dear Mr. Grijalva:

Commercial and recreational marine fisheries are critical to the nation's economy, generating economic impacts of \$183 billion in production sales and supporting approximately 1.6 million jobs in 2022, according to the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA).¹ The long-term sustainability of these marine fisheries, as well as the protection of marine mammals and seabirds, depends on the management of bycatch.² Bycatch refers to marine life that is unintentionally caught, discarded, or harmed due to encounters with fishing vessels and fishing gear.³ Bycatch is a complex issue that threatens the sustainability and resiliency of fishing communities and ocean ecosystems.

¹U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, *Fisheries Economics of the United States, 2022*, NOAA Technical Memorandum NMFS-F/SPO-248 (Silver Spring, Md.: April 2024).

²A fishery is (1) one or more stocks of fish that can be treated as a unit for the purposes of conservation and management and that are identified on the basis of geographic, scientific, technical, recreational, or economic characteristics, or method of catch; or (2) any fishing for such stocks.

³Under the Magnuson-Stevens Act, bycatch is defined as fish that are harvested in a fishery, but that are not sold or kept for personal use, and includes both economic and regulatory discards. The act defines fish as finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds. Economic discards are fish that are the target of a fishery, but are not retained because they are of an undesirable size, sex, or quality, or for other economic reasons. Regulatory discards are fish harvested in a fishery which fishermen are required by regulation to discard whenever caught, or are required by regulation to retain but not sell. 16 U.S.C. § 1802(2), (9), (12), (38). For species protected under the Endangered Species Act and Marine Mammal Protection Act, bycatch is a kind of "take," which generally includes any of the following actions: capturing, collecting, harming, harassing, hunting, killing, pursuing, shooting, trapping, or wounding any species protected by the acts, or attempting to engage in any such conduct. See 16 U.S.C. §§ 1362(13), 1532(19). For the purposes of this report, we use the National Marine Fisheries Service's working definition for bycatch, which refers to the discarded catch of marine species and unobserved mortality due to a direct encounter with fishing vessels and gear.

NOAA's National Marine Fisheries Service (NMFS) is the lead agency responsible for managing commercial and recreational marine fisheries in federal waters.⁴ The Magnuson-Stevens Fishery Conservation and Management Act sets forth national standards for federal fisheries conservation and management.⁵ NMFS and eight Regional Fishery Management Councils established by the act have responsibilities regarding fisheries management and conservation in federal waters, consistent with the act's requirements, including the national standards.⁶ NMFS and the councils work together to reduce bycatch of fish and other marine species, including marine mammals, seabirds, and sea turtles. NMFS is also responsible for mitigating the bycatch of protected species, pursuant to the Marine Mammal Protection Act and the Endangered Species Act.⁷

As part of these management efforts, NMFS conducts various activities to monitor bycatch, as well as to develop new tools and approaches for reducing bycatch. This includes deploying human observers on fishing vessels to observe and record bycatch. Additionally, NMFS and the councils work together to develop and implement management measures that aim to reduce the amount of bycatch, as well as minimize the mortality, serious injury, and adverse impacts of bycatch that occur. This

⁴Federal waters generally extend from 3 to 200 nautical miles off the coast of the United States. However, federal waters in some areas, and for the management of some fish, begin at 9 nautical miles. Coastal states generally maintain responsibility for managing fisheries in state waters, which extend from their coastlines to the boundary with federal waters. A nautical mile equals one minute of latitude, equivalent to 1.1508 statute miles.

⁵Fishery Conservation and Management Act of 1976, Pub. L. No. 94-265, § 301(a), 90 Stat. 331, 346 (codified as amended at 16 U.S.C. § 1851(a)). The act was later renamed the Magnuson-Stevens Fishery Conservation and Management Act. See Pub. L. No. 104-208, § 211(a), 110 Stat. 3009, 3009-41 (1996).

⁶Specifically, the councils are responsible for the fisheries that require conservation and management in their region. The councils are supported by federal funds and generally comprise voting members and nonvoting members. Voting members include the principal state official responsible for fishery management in each state within the council's region, the relevant NMFS regional director, and individuals appointed by the Secretary of Commerce who are knowledgeable regarding the conservation and management, or the commercial and recreational harvest, of fishery resources within the councils' geographic areas. The councils also include nonvoting members, including officials from other federal agencies. The councils also generally have other staff members who provide support in the performance of council functions.

⁷See Marine Mammal Protection Act of 1972, Pub. L. No. 92-522, 86 Stat. 1027 (codified as amended at 16 U.S.C. §§ 1362-1423h); Endangered Species Act of 1973, Pub. L. No. 93-205, 87 Stat. 884 (codified as amended at 16 U.S.C. §§ 1531-1544).

includes requiring certain fishing practices or gear modifications in designated areas.

You asked us to review federal efforts to manage bycatch. This report addresses (1) the measures that are being used by fishers to reduce bycatch in fishing, (2) coverage and funding levels for fisheries observers, (3) how bycatch data are developed and reported, and (4) how NMFS is tracking its performance towards reducing and monitoring bycatch.

To address all four objectives, we reviewed relevant laws and regulations, as well as NMFS' guidelines and policies related to the reduction of bycatch, observer deployment, and bycatch data collection and reporting for commercial fisheries in federal waters. Our review focuses on commercial fisheries, given the focus on commercial bycatch in most NMFS regions, the relative lack of information on bycatch in recreational fisheries, and the fact that observers are not generally deployed on recreational fishing vessels. We reviewed NMFS' National Bycatch Reduction Strategy and the associated National Bycatch Reduction Strategy Implementation Plan.⁸ We interviewed officials from NMFS' headquarters, all five of its regional offices, and all six of its fisheries science centers, as well as representatives from seven of the eight councils.⁹ We also interviewed a nongeneralizable sample of nine stakeholders from various organizations—including representatives from the commercial fishing sector, an environmental organization, and observer providers—about NMFS' and the councils' efforts to reduce bycatch, collect data on bycatch, and develop fishery-wide estimates of bycatch.

In order to further examine our four objectives, we selected a sample of five fisheries for more in-depth review. For each of the selected fisheries, we conducted additional interviews with officials from each of the NMFS

⁸U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, *National Bycatch Reduction Strategy*, (December 2016). U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, *National Bycatch Reduction Strategy Implementation Plan 2020-2024*, (2019).

⁹We reached out to the eighth council, the Caribbean Fisheries Management Council, but we were unable to schedule an interview with the council. According to NMFS, this council is responsible for fishery management in federal waters seaward of the Commonwealth of Puerto Rico and the United States Virgin Islands. We use the term council representative to refer to council members and council staff.

regions, as well as with a sample of stakeholders that were knowledgeable about the selected fisheries. For the purposes of our discussion of the selected fisheries, we use the term “fishery” to refer to a fishery or group of fisheries with certain shared characteristics—including geography, target species, fishing method, gear type, council oversight, observer coverage, and management structure. The five selected fisheries were chosen to reflect a range of characteristics, including geography, fishing gear type, target fish species, and key bycatch concerns, among others. The information we gathered about the selected fisheries reflects a nongeneralizable sample from which generalizations across all federal fisheries cannot be drawn.

We assessed NMFS’ efforts to develop bycatch estimates against selected principles in *GAO’s Key Practices for Evidence-Based Policymaking*.¹⁰ We also assessed NMFS’ efforts to track its performance toward reducing and monitoring bycatch, as laid out in NMFS’ National Bycatch Reduction Strategy Implementation Plan 2020-2024, against these key practices.¹¹ For more details about our scope and methodology, see appendix I.

We conducted this performance audit from November 2022 to June 2024, in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Federal Fisheries Management

Under the Magnuson-Stevens Act, NMFS and the eight councils are responsible for managing approximately 460 fish stocks in federal waters across five geographic regions of the country.¹² Federal waters generally

¹⁰GAO, *Evidence-Based Policymaking: Practices to Help Manage and Assess the Results of Federal Efforts*, [GAO-23-105460](#) (Washington, D.C.: July 12, 2023).

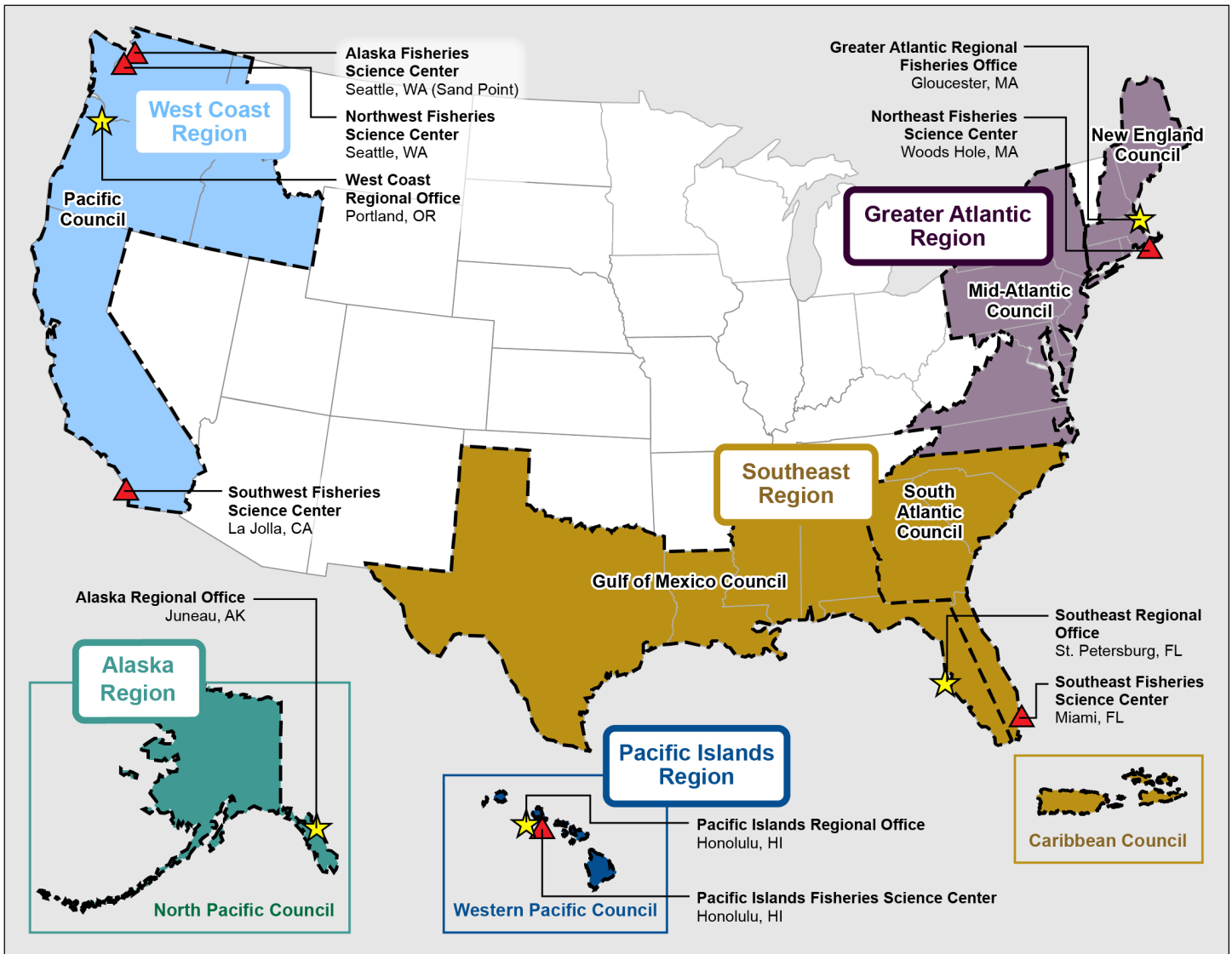
¹¹U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, *National Bycatch Reduction Strategy Implementation Plan 2020-2024* (2019).

¹²A stock of fish, or fish stock, means a species, subspecies, geographical grouping, or other category of fish capable of management as a unit.

extend from 3 to 200 nautical miles off the coast of the United States. NMFS operates through its headquarters, five regional offices, and six science centers to partner with the councils to manage federal fisheries, as shown in figure 1. Under this structure, NMFS provides scientific information and management advice, and the councils use this information to make management recommendations that they submit to NMFS for approval. In addition, NMFS' Atlantic Highly Migratory Species Division manages highly migratory fish species in certain federal waters.¹³

¹³Specifically, the Highly Migratory Species Management Division is responsible for managing billfish, shark, and swordfish in federal waters, from Maine to Texas, as well as Puerto Rico and the U.S. Virgin Islands. This division is also responsible for managing Atlantic tuna stocks in federal waters to the shore in all states except Connecticut and Mississippi. Many of these species are managed via international agreement with the International Commission for the Conservation of Atlantic Tunas under the authority of the Atlantic Tunas Convention Act in addition to the Magnuson-Stevens Act. See Pub. L. No. 94-70, 89 Stat. 385 (1975) (codified as amended at 16 U.S.C. §§ 971-971k).

Figure 1: National Marine Fisheries Service (NMFS) Regional Offices, Fisheries Science Centers, and Regional Fishery Management Councils (Council)



Sources: NMFS; Map Resources (map). | GAO-24-106336

NMFS' six science centers are primarily responsible for collecting fisheries data and for conducting scientific research and analysis necessary for the conservation, management, and use of marine resources, including fisheries. The centers are to collect data on fish stocks and ecosystem conditions on an ongoing basis to support scientific analyses. The science centers provide the results of their analyses to the

councils, which use the information to develop fishery management plans and plan amendments, that include fishery conservation and management measures for specific fisheries. Plans are then submitted to NMFS for approval or disapproval, and NMFS promulgates regulations to implement approved plans.¹⁴

Legal Framework for Bycatch

The Magnuson-Stevens Act established 10 national standards for fishery conservation and management and provided that fishery management plans are to be consistent with the standards.¹⁵ National Standard 9 of the Magnuson-Stevens Act states that conservation and management measures shall, to the extent practicable, minimize bycatch and, to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.¹⁶ Additionally, under the Endangered Species Act and the Marine Mammal Protection Act, the “take” of protected species—with bycatch being considered a form of “take”—is generally prohibited, with certain exceptions.¹⁷ While each of these authorities defines bycatch somewhat differently, and specific measures to address bycatch occur in accordance with the appropriate statutory definitions and authorities, NMFS uses a working definition of bycatch as the discarded catch, both nonlethal and lethal, of marine species due to a direct encounter with fishing vessels and gear.

In addition to working with the councils under the Magnuson-Stevens Act, NMFS undertakes bycatch reduction efforts pursuant to the Endangered Species Act and Marine Mammal Protection Act. For example, NMFS

¹⁴The Magnuson-Stevens Act provides that the Secretary of Commerce shall approve, disapprove, or partially approve a fishery management plan or plan amendment submitted by the councils after a public comment period. 16 U.S.C. § 1854(a)(3). The Secretary has subsequently delegated this responsibility to the Assistant Administrator for NMFS.

¹⁵The 10 national standards relate to prevention of overfishing while achieving optimum yield, scientific information, management units, allocations, efficiency, variations and contingencies, costs and benefits, fishing communities, bycatch, and safety of life at sea. 16 U.S.C. § 1851(a)(1)-(10). The act called for NOAA to establish advisory guidelines, which are not to have the force and effect of law, based on the national standards, to assist in the development of fishery management plans. 16 U.S.C. § 1851(b). For NOAA's guidelines based on the national standards, see 50 C.F.R. §§ 600.305-355.

¹⁶16 U.S.C. § 1851(a)(9).

¹⁷See 16 U.S.C. §§ 1371(a), 1538(a)(1)(B). The Endangered Species Act and Marine Mammal Protection Act have different definitions of take; however, in general, take includes capturing, collecting, harming, harassing, hunting, killing, pursuing, shooting, trapping, or wounding any species protected by the Endangered Species Act or the Marine Mammal Protection Act, or attempting to engage in such conduct. See 16 U.S.C. §§ 1362(13), 1532(19).

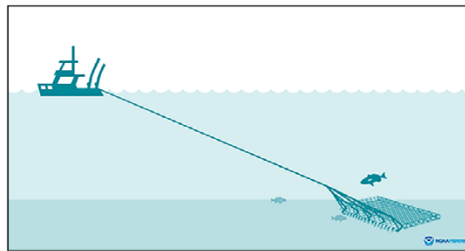
works with Take Reduction Teams, established under the Marine Mammal Protection Act, to develop plans to help recover and prevent the depletion of certain marine mammal stocks that interact with certain commercial fisheries. These teams consist of members with expertise regarding the conservation or biology of the relevant marine mammal species or relevant fishing practices. These members include fishers from relevant fisheries, NMFS and state fisheries officials, and members of conservation groups. Additionally, under the Endangered Species Act, NMFS develops recovery plans and conducts section 7 consultations and promulgates various regulations related to minimizing bycatch of protected species, such as regulations requiring the use of turtle excluder devices.¹⁸

Fishing Practices and Gear

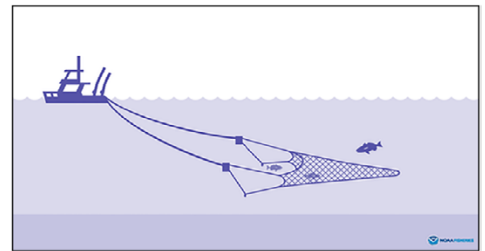
Depending on the target species, fishers use different types of fishing gear and fishing practices. The size of fishing vessels can vary, such as from vessels 30 feet in length that deploy to sea for one day to large vessels 300 feet in length that deploy to sea for one month and process fish onboard. Additionally, fishing practices and gear can involve the use of nets, lines, pots, trawls, or dredges, among other items (see fig. 2). The types of fishing gear and fishing practices in use affect the type of bycatch that occurs. For example, pulling trawl nets along the ocean bottom can inadvertently entangle marine mammals foraging on the ocean floor, whereas in longline fishing turtles can become inadvertently entangled in the lines or hooks.

¹⁸Under section 4(f) of the Endangered Species Act, NMFS is responsible for developing and implementing recovery plans for threatened and endangered species, unless such a plan would not promote conservation of the species. See 16 U.S.C. § 1533(f). Under section 7 of the act, federal agencies must consult with NMFS when any action the agency carries out, funds, or authorizes may affect either a species listed as threatened or endangered under the act, or any critical habitat designated for it. See 16 U.S.C. § 1536. For NMFS regulations addressing approved turtle excluder devices, see 50 C.F.R. § 223.207.

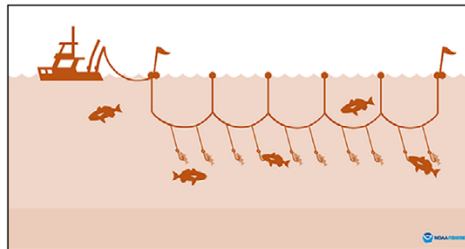
Figure 2: Selected Examples of Types of Fishing Gear



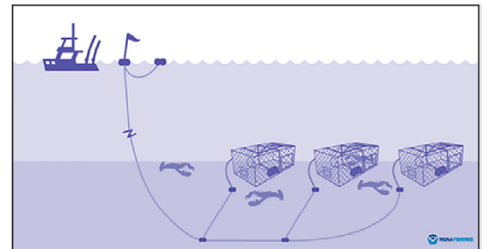
Dredge – dredge dragged across the seafloor to gather target bottom-dwelling species.



Midwater trawl – net pulled through the water column to gather target species.



Pelagic longline – series of lines and baited hooks to attract and hook species.



Traps and pots – baited and submerged wire or wood devices that permit species to enter but not escape.

Source: National Marine Fisheries Service information. | GAO-24-106336

Reduction of Bycatch

NMFS works with the councils and Take Reduction Teams to develop and implement measures designed to reduce bycatch or the mortality of bycatch. In general, the councils incorporate bycatch reduction measures into fishery management plans and amendments. These measures can take various forms, including

- gear modifications, designed to reduce bycatch species' interaction with gear or improve species' ability to escape from gear;
- changes to fishing practices, such as varying the duration and timing of fishing gear deployment;
- time-area closures, in which fishing in certain areas is prohibited for periods of time;
- bycatch caps, which may incentivize fishers to adjust fishing practices in order to avoid exceeding a bycatch cap that can result in the temporary closure of a fishery; and
- species handling education, designed to help reduce the mortality of bycatch through more informed handling of species during interactions.

Collection of Bycatch Data

NMFS gathers data on bycatch across fisheries, in order to better understand the amount of bycatch over time and help inform management decisions. A key source of bycatch data is fisheries observers, or humans trained to observe and record bycatch species while aboard fishing vessels. Observers collect data on bycatch while at sea, generally by weight or number of individual species, and subsequently transmit the data to regional databases for further analysis by NMFS officials. NMFS uses the bycatch data collected by observers to develop total estimates of bycatch across a fishery as a whole. In some fisheries, in addition to data from observers, information is collected from fishing vessel logbooks and electronic monitoring, such as video cameras that record activity on a fishing vessel.

However, according to NMFS officials, the presence of human observers aboard a vessel, is considered critical to the collection of bycatch data, given the complexity and variability of the work. For example, in some fisheries, observers sort through a large haul of fish on deck, in order to identify, weigh, and count the different bycatch species. In other fisheries, observers must estimate the length of a marine mammal or shark in the water that has become entangled in fishing gear.¹⁹ See figure 3 for examples of bycatch and observers working aboard fishing vessels.

¹⁹NMFS officials said that for some protected species, applications, or fisheries, electronic monitoring could provide adequate or better bycatch information at significantly reduced costs, relative to human observers.

Figure 3: Examples of Bycatch and Fisheries Observers Working aboard Fishing Vessels



Source: National Marine Fisheries Service. | GAO-24-106336

NMFS oversees observers through its NMFS' six regional observer programs, which are administered by NMFS' regional offices and science centers.²⁰ The regional observer programs are responsible for day-to-day operations, as well as working with the third-party contracting companies that recruit and hire observers, known as observer providers. NMFS' National Observer Program is responsible for coordinating with the regional observer programs and developing necessary policies and procedures for the program. Funding for observer programs comes from

²⁰There is one regional observer program for each NMFS region, except in the West Coast Region which has two regional observer programs.

congressionally appropriated funds, as well as funding from the fishing industry.

According to NMFS officials, the level of observer coverage for each fishery in a region, or the percentage of fishing trips in that will have an observer onboard, is determined by the regional observer programs in consultation with the fishery management councils. Observer coverage levels can be influenced by a number of variables, including available funding, the number of participants in the fishery, management needs, and program goals. In some fisheries, the fishery management plan specifies a mandated or targeted level of coverage. In other cases, there is no mandated or targeted coverage level.

Selected Fisheries in This Review

NMFS and the councils make decisions about bycatch management and monitoring for individual fisheries, which exhibit a wide range of geographic, ecological, and other differences. In order to examine this diversity and how it interacts with bycatch management and monitoring in more detail, we selected five fisheries for further review. These fisheries reflect a range of geographic areas, fishing gear types, target fish species, and types of bycatch. See table 1 for information on the five fisheries and appendix II for profiles of each selected fishery.

Table 1: Background Information on the Five Selected Fisheries We Reviewed

Fishery name	Location of fishery	Fishing gear used	Target fish species	Example bycatch
Bering Sea pollock trawl	Bering Sea, off the coast of Alaska	Pelagic trawl ^a	Pollock	Salmon, Alaskan crab, Stellar sea lions, whales, harbor seals, seabirds
Gulf of Mexico shrimp trawl	Gulf coast from Florida to Texas	Otter trawl ^b	Pink, brown, and white shrimp	Red snapper, sea turtles, smalltooth sawfish, giant manta rays, dolphins
Hawaii deep-set tuna longline	Coast of Hawaiian Islands	Longline	Tuna	Sea turtles, sharks, false killer whales, seabirds
New England scallop dredge	New England coast from Connecticut to Maine	Dredge	Sea scallops	Groundfish, monkfish, skates, sea turtles
West Coast groundfish fixed gear ^c	Pacific coast from California to Washington	Bottom longline and pot	Roundfish, flatfish, rockfish, sharks, skates	Yelloweye rockfish, halibut, seabirds, marine mammals

Source: GAO analysis of National Marine Fisheries Service information. | GAO-24-106336

^aPelagic trawl refers to a trawl net pulled through any point in the water column, generally anywhere from the surface to 1,000 meters below the surface.

^bOtter trawl refers to a cone-shape trawl net whose horizontal spread is maintained by a pair of doors, referred to as boards.

^cGroundfish refers to more than 90 different types of roundfish, flatfish, rockfish, sharks, and skates off the West Coast. With a few exceptions, groundfish live on or near the bottom of the ocean.

Bycatch Reduction Measures Are Fishery-Specific Due to Various Factors

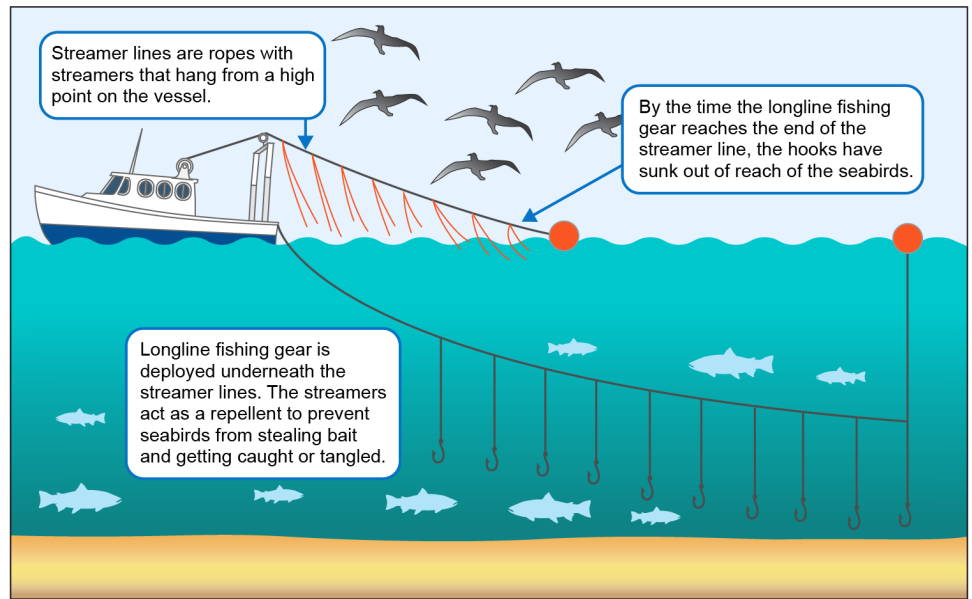
According to NMFS officials, council representatives, and stakeholders, measures used to reduce bycatch and bycatch mortality are individualized by fishery due to a variety of factors. NMFS officials and council representatives implement bycatch reduction measures that are tailored to the specific interactions among a target fish species, bycatch species, and fishing gear. A range of biological, technical, and other factors affect the possible measures that can be used in a fishery. NMFS officials, council representatives, and stakeholders also told us that engaging with and educating industry can aid in the development and implementation of bycatch reduction measures.

Bycatch Reduction Measures Are Fishery-Specific, and Several Biological, Technical, and Other Factors Affect Which Measures Can Be Implemented

According to our interviews with NMFS officials and stakeholders, bycatch reduction measures are individualized due to the unique nature of interactions among a target fish species, bycatch species, and the fishing gear in use. NMFS officials and council representatives decide which bycatch reduction measures will be used in a given fishery and when they apply. Factors that can affect such decisions include fish biology and behavior, resources available, the availability of bycatch data, and the management structure of a fishery.

Fish biology and behavior. Officials from two NMFS regions and three stakeholders indicated that the biology and behavior of both the target species and bycatch species affect the types of bycatch reduction measures available to a fishery. When target and bycatch species share the same habitat, avoiding bycatch can be challenging. In these cases, measures to reduce bycatch can involve gear modifications or changes to fishing practices. According to NMFS officials and stakeholders, gear modifications may focus on using repellents or facilitating escape when bycatch species interact with the gear. For example, in the West Coast groundfish fixed gear fishery, fishers hang streamers from their vessel when fishing with longline gear to prevent seabirds from stealing bait and getting hooked or tangled in the fishing line (see fig. 4). Measures to minimize bycatch mortality may also include modifying handling practices to reduce stress and injury and improve the post-release survival of the bycatch species. For example, NMFS officials told us that in the Hawaii deep-set tuna longline fishery, fishers follow shark handling procedures to remove fishing line from sharks that are caught as bycatch, increasing the probability that the sharks will survive once released.

Figure 4: Longline Vessel with Streamer Lines to Repel Seabirds



Sources: GAO analysis of National Marine Fisheries Service (NMFS) documents and interviews with NMFS officials; GAO (illustration). | GAO-24-106336

New England Scallop Dredge

Turtle deflector dredge: According to National Marine Fisheries Service (NMFS) officials and a stakeholder, a unique funding source supporting years of development helped produce a gear modification to reduce turtle bycatch. The scallop fishery sets aside a portion of profits to fund research within the fishery, including research on bycatch reduction. These funds supported research into how turtles interacted with the scallop dredge and alternative designs to reduce turtle bycatch.

Researchers tested several different dredge designs. The research resulted in a turtle deflector dredge, which introduced a ramp on the front of the dredge to prevent sea turtle entry by guiding them over the top of the dredge, among other modifications.

Source: GAO analysis based on NMFS documents and interviews. | GAO-24-106336

Resources available for investment. Officials from three NMFS regions and representatives from four councils said that available resources—including time, money, and labor—can affect which bycatch reduction measures are used in a fishery. According to NMFS officials, council representatives, and stakeholders, gear modifications are often a preferred bycatch reduction measure because they allow continued fishing while reducing bycatch, which reduces the economic impact compared to broader measures such as closures. However, gear modifications can take considerable resources to develop. For example, it took years of research and testing to develop and implement a new dredge design for the New England scallop dredge fishery to reduce turtle bycatch, according to NMFS officials (see the New England Scallop Dredge sidebar).

Officials from three NMFS regions also said that broad or restrictive measures, such as time-area closures that shut down portions of a fishery for certain periods of time, may be used while gear modifications are being developed. NMFS officials from the West Coast region noted that these closures prevent bycatch but often are not an ideal long-term solution because of their economic impact on fishers. NMFS supports the development of some bycatch reduction measures through its Bycatch

Reduction Engineering Program, which awards grants to external partners. In fiscal year (FY) 2020, this program awarded \$2.3 million to support 13 projects that aimed to reduce bycatch through new technologies, improved fishing practices, and reduced post-release mortality.

Availability of bycatch data. According to our review, the availability of bycatch data affects whether and how NMFS and the councils implement bycatch reduction measures. Specifically, NMFS and the councils need data demonstrating the effectiveness of new bycatch reduction measures before they can require them. The extent of data available can also affect where and when bycatch measures may be required. According to officials from two NMFS regions, limited data may lead to broader restrictions, such as longer and larger fishery closures, because officials are less confident about where bycatch is occurring. Additionally, officials from two NMFS regions, representatives from two councils, and three stakeholders indicated that robust data may enable more nimble management that can target bycatch reduction measures to times and areas with more bycatch, known as hotspots. For example, according to NMFS officials and one stakeholder, observers in the Bering Sea pollock trawl fishery collect robust and timely bycatch data that enable the identification of salmon bycatch hotspots as they are developing, which, in turn, allows fishers to move their vessels to avoid hotspots.

Management structure of a fishery. Fisheries with cooperative management structures may use bycatch reduction measures not available to other fisheries, according to our interviews with officials from one NMFS region, representatives from one council, and one stakeholder. Representatives from one council reported that this is because cooperatives operate through contracts that allocate bycatch allowances among member vessels and establish incentives to manage bycatch. Representatives from two councils told us that these mechanisms allow cooperatives to respond quickly to in-season needs for bycatch reduction in a given fishery, which can help them keep fisheries open longer.

According to our interviews with officials from one NMFS region and representatives from two councils, the presence of cooperatives allows councils to rely more on fishers' self-regulation to remain within their bycatch allocations. For example, in the Bering Sea pollock trawl fishery, which has a cooperative management structure, NMFS allocates a portion of the annual Chinook salmon bycatch cap to each cooperative and encourages them to create their own measures and enforcement

mechanisms to stay under the cap. The cooperatives submit their proposed measures to NMFS in incentive plan agreements. In exchange for participating in these plans, the cooperatives receive a higher cap allocation (see the Bering Sea Pollock Trawl sidebar).

Industry Engagement and Education Are Key to Implementing Fishery-Specific Bycatch Reduction Measures

Bering Sea Pollock Trawl

Incentive plan agreement for salmon bycatch: The North Pacific Council established a bycatch cap for Chinook salmon, and a portion of the cap is allocated to each cooperative. According to National Marine Fisheries Service (NMFS) officials, cooperatives create incentive plan agreements with their own bycatch reduction measures.

Cooperatives may use a number of different measures in their incentive plan agreements. They may require member vessels to use certain gear modifications or inform the fleet of bycatch hotspots they encounter. Cooperatives may also define area closures or set "move along" rules, which require member vessels to leave a location if they encounter a certain amount of bycatch. Another approach involves creating a "savings credit," which allows vessels to roll unused bycatch allocations to future years.

Source: GAO analysis based on NMFS documents and interviews. | GAO-24-106336

The successful development and implementation of bycatch reduction measures depends heavily on engagement with the fishing industry, according to our interviews with NMFS officials, council representatives, and stakeholders. According to officials from three NMFS regions, representatives from one council, and four stakeholders, industry input during the development of bycatch reduction measures can make measures less disruptive to fishing practices, increase their effectiveness at reducing bycatch, and improve compliance by gaining buy-in from fishers. For example, in the New England scallop dredge fishery, researchers tested turtle deflector dredges on industry vessels and consulted with scallop fishers to improve the design's practicality. NMFS officials and council representatives said fishers are less likely to comply with a time-consuming or difficult bycatch reduction measure, or one that significantly reduces the catch of their target species.

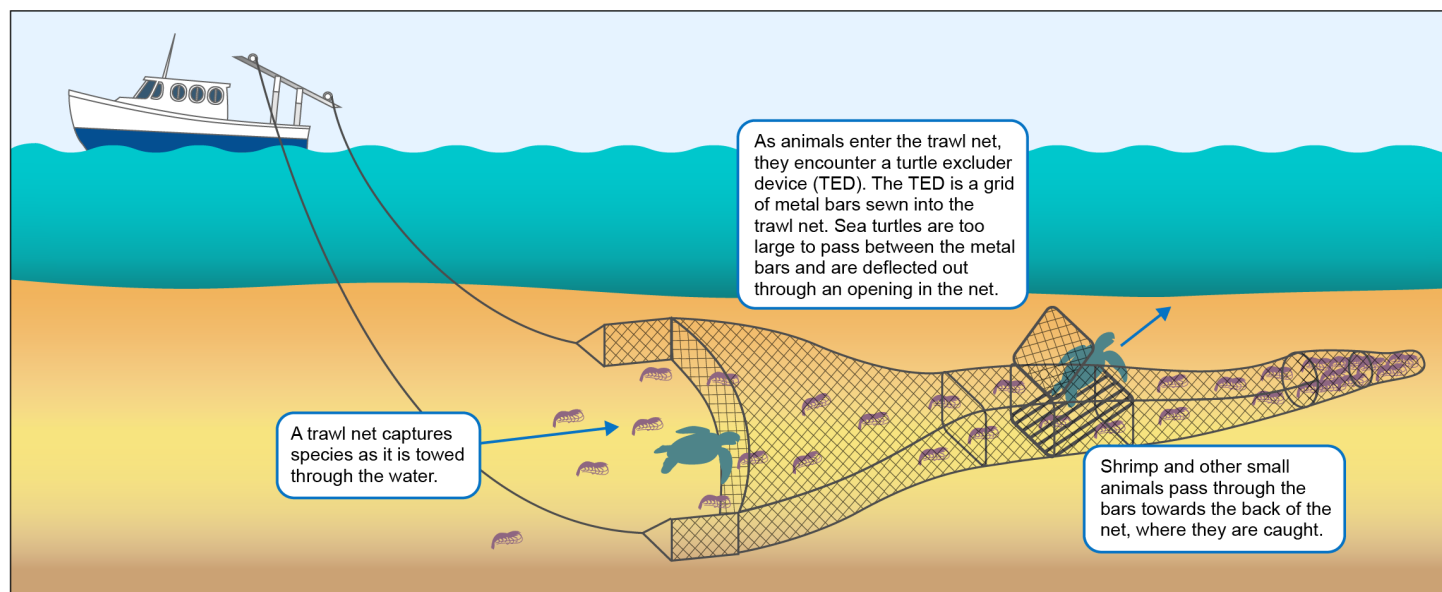
According to officials from four NMFS regions and three stakeholders, education and outreach efforts are also important to ensure fishers adopt and correctly implement bycatch reduction measures. For example, NMFS officials told us that in the West Coast groundfish fixed gear fishery, when NMFS instituted a requirement for streamer lines to reduce seabird bycatch, NMFS and nongovernmental organizations taught fishers how to use the streamer lines and provided free equipment to them.²¹

NMFS officials from the Southeast region told us that some gear modifications can require routine maintenance to remain effective, for which fishers may require training. For example, in the Gulf of Mexico shrimp trawl fishery, turtle excluder devices in trawl nets are effective at

²¹NMFS and its partners determined a streamer line design used in other fisheries was suitable for the groundfish fishery. While testing this design on industry vessels, researchers discovered that fishing at night was also effective at reducing seabird bycatch. According to NMFS officials and one stakeholder, NMFS permitted both measures in the fishery management plan to give fishers flexibility and partnered with nongovernmental organizations to hand out streamer lines and teach fishers to use them. This engagement with fishers helped gain their buy-in and increase their compliance with the new measure.

reducing turtle bycatch, but only if properly installed and maintained so that the turtle-deflecting bars are angled at 30 to 55 degrees, as generally required by federal regulations (see fig. 5).²² NMFS spent decades developing effective turtle excluder devices, which are required under Endangered Species Act regulations, but NMFS officials told us that compliance and proper use remain a challenge that requires NMFS outreach to shrimpers.

Figure 5: Shrimp Trawl with Turtle Excluder Device



Sources: GAO analysis of National Marine Fisheries Service documents and interview with shrimp industry officials; GAO (illustration). | GAO-24-106336

Officials from one NMFS region and representatives from one council told us that in some cases, councils may informally notify fishers of a bycatch problem with the goal of prompting voluntary measures to reduce bycatch. For example, NMFS officials told us that in one West Coast trawl fishery, council representatives informed fishers that halibut bycatch was becoming a problem, and fishers volunteered to test a halibut excluder device to address the problem. According to NMFS officials, voluntary bycatch reduction measures can allow NMFS and the councils to avoid implementing more stringent measures, such as fishery closures, and allow fishers to identify the measures that work best for them. However, according to officials from NMFS headquarters, officials from two NMFS regions, and three stakeholders, a sense of urgency to act—via the threat

²²See 50 C.F.R. § 223.207(a)(3)(i).

of economic impacts to the fishery or regulations—is often needed for voluntary measures to be adopted.

Observer Coverage Varies Widely across Fisheries, and Recruitment and Retention of Observers Is a Challenge

We found that the level of observer coverage can vary widely across fisheries, and the recruitment and retention of observers is an ongoing challenge. NMFS officials and council representatives told us that various factors influence the observer coverage rate for a given fishery, including the availability of funding, any protected species concerns, and the size and geographic range of a fishery’s fleet. Additionally, NMFS officials told us that noncompetitive compensation and difficult working conditions hamper the recruitment and retention of observers.

Observer Coverage Varies Widely, Based Largely on Available Funding

Coverage by observers—who are essential for the collection of bycatch data—varies widely across fisheries, according to interviews with NMFS officials and council representatives. Some of these and other officials noted various factors that influence observer coverage for a given fishery, including the availability of federal funding or industry funding, protected species concerns, and the size and geographic range of a fishery’s fleet. Among these factors, NMFS officials and council representatives said that available funding is a driver of observer variability.

Federal funding. Officials from NMFS headquarters and three NMFS regions, and representatives from two councils reported that the availability of federal funding is a driver of observer coverage. According to NMFS’ FY 2021 annual report on the observer program, federal appropriations provided about 70 percent of total observer funding in FY 2021 (\$53 million out of \$75 million).²³ According to officials from NMFS headquarters and four NMFS regions, the funding amounts that are allocated to regional observer programs stem from historical funding trends and have not changed much over the years.

Additionally, officials from NMFS headquarters and one NMFS region, and representatives from one council said that limited federal funding for observers is an ongoing challenge for some fisheries. For example, officials from NMFS’ Southeast Fisheries Science Center said that

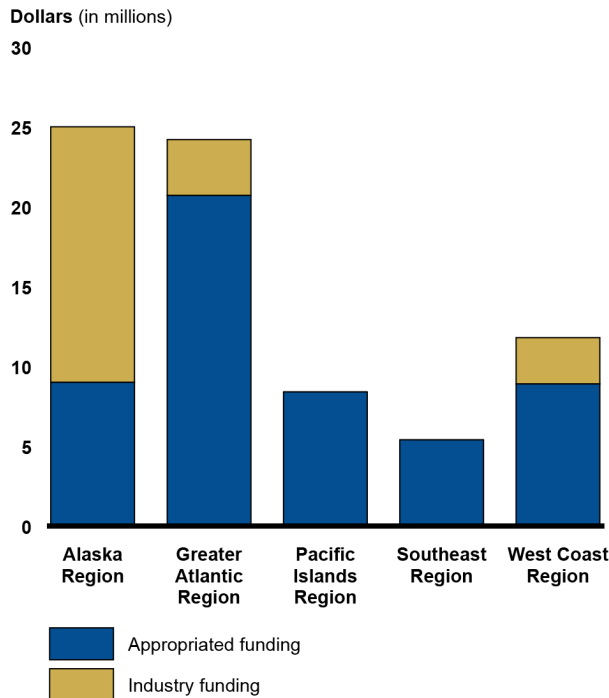
²³National Marine Fisheries Service, *FY 2021 National Observer Program Annual Report*, NOAA Technical Memorandum NMFS-F/SPO-241 (May 2023).

funding for the region constrains the Gulf of Mexico shrimp trawl fishery to approximately 2 percent observer coverage, equating to an observer present on 2 percent of total fishing trips. Officials told us that this coverage level compromises the ability to collect reliable information on bycatch in the Gulf of Mexico shrimp trawl fishery. Similarly, in the Hawaii deep-set tuna longline fishery, officials from NMFS' Pacific Islands Regional Office and Fisheries Science Center told us that they have a target observer coverage rate of 20 percent, but this has been challenging to meet with available funding. Even at a target level of 20 percent coverage, they told us collecting reliable bycatch data is an ongoing challenge for the fishery. According to officials at NMFS headquarters, reliable data can be especially challenging for bycatch of marine mammals and protected species because of the relatively few interactions between fishing vessels and these species. We discuss challenges with reliable bycatch data later in this report.

Industry funding. Officials from NMFS headquarters and one NMFS region, representatives from two councils, and one stakeholder said that the availability of industry funding for observers is also a driver of observer coverage. According to NMFS' FY2021 annual report on the observer program, of the total funding for observer programs across the regions, industry funding accounted for approximately 30 percent, or \$22 million of \$75 million in FY 2021.²⁴ According to two stakeholders, industry funding can involve "pay-as-you-go" programs, in which vessels pay each time they have an observer onboard, or fee-based programs in which a fee is levied across all vessels in a fishery. For a breakdown of appropriated and industry funding for observers across NMFS regions in FY2021, see figure 6.

²⁴National Marine Fisheries Service, *FY 2021 National Observer Program Annual Report*.

Figure 6: Federal and Industry Funding for Fisheries Observers across National Marine Fisheries Service Regions, in Fiscal Year 2021



Source: GAO analysis of information from National Marine Fisheries Service, *National Observer Program Annual Report, FY 2021*, NOAA Technical Memorandum NMFS-F/SPO-241 (May 2023). | GAO-24-106336

The Bering Sea pollock trawl and New England scallop dredge fisheries use the “pay-as-you-go” approach, with vessels paying each time they host an observer. Under this approach, observer coverage in the Bering Sea pollock fishery maintains at least 100 percent coverage, meaning there is at least one observer on every fishing trip. In the New England scallop dredge fishery, the cost of having an observer onboard is offset by a scallop set-aside program, in which vessels are eligible to harvest additional scallops in exchange for paying for an observer. Under this approach, observer coverage in the New England scallop fishery was approximately 11 percent in 2023.

Pending U.S. Supreme Court Cases *Loper* and *Relentless*

As of May 2024, two cases challenging the National Marine Fisheries Service's (NMFS) authority to require commercial fishing vessels to pay for observers are pending before the U.S. Supreme Court—*Loper Bright Enterprises v. Raimondo and Relentless, Inc. v. Department of Commerce*.

The petitioners—four fishing companies in *Loper* and three vessel owners in *Relentless*—asked the Supreme Court to hear the question of whether it should overrule, or at least clarify, the precedent known as the *Chevron* doctrine. This doctrine requires federal courts to defer to a federal agency's reasonable interpretation of ambiguous statutory provisions the agency administers.

While the petitioners also asked the Supreme Court to hear a narrow question related to whether NMFS has the statutory authority to require vessels to pay observer costs, in both cases, the Supreme Court agreed to hear only the broad question challenging the *Chevron* doctrine. The cases were argued in tandem in January 2024 and remained pending as of June 7, 2024. Opinions are expected in June 2024 by the end of the Court's term.

Source: GAO analysis of *Loper* (No. 22-451) and *Relentless* (No. 22-1219) docket information and filings. | GAO-24-106336

According to officials from NMFS headquarters and one NMFS region, and representatives from one council, there is a limited extent to which fisheries can pay for observers, as only some fisheries are profitable enough to do so. For example, NMFS officials in the Southeast region told us that many shrimp trawl vessels would not be able to afford to pay for an observer, which costs \$600 per day. In contrast, the Bering Sea pollock trawl fishery is a high-value fishery in which fishers can afford the cost of having observers onboard, according to North Pacific Council representatives. As of May 2024, some uncertainty exists regarding the future of industry funding for observers, given two cases pending before the U.S. Supreme Court (see sidebar on Pending U.S. Supreme Court Cases *Loper* and *Relentless*).

Protected species. Officials from NMFS headquarters and two NMFS regions, and representatives from two councils noted that whether bycatch includes species protected by the Endangered Species Act or the Marine Mammal Protection Act can influence the level of observer coverage. NMFS' Office of Protected Resources is responsible for the conservation, protection, and recovery of certain species under both acts, including minimizing bycatch of protected species. According to officials from the Office of Protected Resources, they can sometimes use a limited amount of funding to help pay for observer coverage in fisheries where a protected species is a bycatch concern. Similarly, officials from NMFS noted that federal funding for observers in the Hawaii deep-set tuna longline fishery was made available through additional appropriations, when false killer whales, which are protected under both acts, became a bycatch species of concern.

Fleet size and geographic range. Given that observers deploy on individual vessels, officials from NMFS headquarters and two regions noted that the more vessels there are in a fleet, the more observers are needed to provide coverage across the fishery. Additionally, the more ports that vessels in the fleet operate from, the greater the logistical challenges and costs of deploying observers, according to an official from NMFS headquarters and a stakeholder. For example, officials from NMFS' Southeast Fisheries Science Center told us that the large number of vessels in the Gulf of Mexico shrimp trawl fishery—NMFS reported 1,311 vessels permitted to operate in 2023—and their numerous and dispersed ports pose ongoing challenges for observer coverage. In contrast, in the Hawaii deep-set tuna longline fishery, all of the vessels—NMFS reported 164 authorized permits in 2023—operate out of a few ports. See table 2 for an overview of observer coverage rates, funding sources, and numbers of vessels or permits, as well as reported

information on observer coverage, across the five selected fisheries we reviewed.

Table 2: Observer Coverage Rate, Funding Source, Number of Vessels or Permits, and Reported Information on Fisheries Observer Coverage for the Five Selected Fisheries We Reviewed

Fishery	Observer coverage rate (year)	Funding source for observers	Number of vessels or permits in fishery (year)	Reported information on observer coverage
Bering Sea pollock trawl	100+ ^a (2023)	Industry	80 catcher vessels, 13 catcher processor vessels, three motherships ^b (2023)	Coverage is facilitated by relatively small number of ports.
Gulf of Mexico shrimp trawl	~2% (2021)	Federal	1,311 permitted vessels (2023)	Coverage is challenged by large number and geographic range of ports.
Hawaii deep-set tuna longline	17.4% (2023)	Federal	164 authorized permits, but on average 150 permits used annually (2023)	Coverage is facilitated by relatively small fleet and few ports.
New England scallop dredge	10.8% (2023)	Federal and industry	345 Limited Access permits, 250 Limited Access General Category permits ^c (2023)	Coverage is challenged by large geographic range of ports.
West Coast groundfish fixed gear	41% (2022)	Federal	190 longline permits, 33 trap permits in the Limited Entry sector ^d (2021)	Coverage is facilitated by relatively small fleet. Some vessels in fleet are too small to allow for an observer.

Source: GAO analysis of interviews with National Marine Fisheries Service officials. | GAO-24-106336

^aThere is at least one observer on every fishing trip.

^bCatcher vessels are vessels that deliver catch to onshore processing facilities. Catcher processors are vessels that catch and process their catch. Motherships receive and process from catcher vessels.

^cThe Limited Access and Limited Access General Category are the two primary fleets within the fishery, which are managed differently.

^dVessels within the limited entry sector of the West Coast groundfish fixed gear fishery are classified by whether they have a sablefish endorsement. Both subsectors target sablefish; however, the sablefish-endorsed subsector has its own limited access privilege and is managed separately.

Recruitment and Retention of Observers Is an Ongoing Challenge

According to officials from NMFS headquarters and all five NMFS regions, recruiting and retaining enough observers to support the data collection needs across fisheries has been an ongoing challenge.

Observer Providers

Observer providers are private companies responsible for recruiting, hiring, and deploying observers. These observers historically have been recent college graduates with a degree in marine biology. Once hired, observers undergo training provided by the National Marine Fisheries Service (NMFS). According to an observer provider, they are responsible for deploying trained observers across fisheries—that is, assigning and routing observers to fishing vessels. Observer providers hire and deploy observers for both federally funded and industry-funded observer programs. For federally funded programs, observer providers operate under contracts with NMFS. For industry-funded programs, observer providers operate via contracts with fishing industry groups and vessels. One observer provider noted that, while they are responsible for hiring and deploying observers in many fisheries, in certain situations NMFS plays a substantial role in deploying observers.

Source: GAO analysis of NMFS documents and interviews with NMFS officials and stakeholders. | GAO-24-106336

Observer providers—the companies contracted to recruit, hire, and deploy observers in many fisheries (see sidebar on Observer Providers)—historically have recruited recent marine biology graduates from colleges around the country. According to officials from NMFS headquarters and representatives from two councils, there have been notable drops in the number of recruits. Further, officials from NMFS headquarters and a stakeholder said that compensation rates for observers, which they noted are set rates in the federally funded observer programs, have not remained competitive with other jobs for similar graduates. We discuss challenges with funding for observers later in the report.

Observer retention is an ongoing challenge across fisheries, according to NMFS headquarters and regional officials. Officials from three NMFS regions and three stakeholders told us that the working conditions for observers can be difficult for a variety of reasons, leading to low retention. Two observer providers said that observers can face seasickness, contentious working relationships with vessel crew, and long deployments. For example, for observers in three of the five fisheries we examined—Gulf of Mexico shrimp trawl, Bering Sea pollock trawl, and Hawaii deep-set tuna longline—a deployment can last a few weeks. According to one observer provider we interviewed, almost half of recruited observers leave after one year. Given this high turnover, the observer provider said that it generally hires two to three times more observers than it needs at any given point in time, to account for anticipated attrition.

Development and Availability of Bycatch Estimates Vary Widely and Are Challenged by Limited Data for Some Fisheries

The development and availability of fishery-wide bycatch estimates can vary widely by fishery, and developing these estimates can be challenging for fisheries with limited data stemming from low observer coverage, according to our review. The development of these estimates generally involves staff from NMFS' fisheries science centers extrapolating data collected from the subset of fishing trips with observers onboard, to generate and report estimates of bycatch for the fishery as a whole. According to NMFS officials, the lower the observer coverage rate, the harder it is to develop reliable bycatch estimates and the more uncertainty there is in the estimates.

Development and Availability of Bycatch Estimates Vary across Fisheries

The development and availability of fishery-wide bycatch estimates can vary widely by fishery, according to our review of documents and interviews with NMFS officials and council representatives. The development of fishery-wide estimates generally involves staff from NMFS' fisheries science centers or regional offices extrapolating data collected from the subset of fishing trips with observers onboard, to generate and report estimates of bycatch for the fishery as a whole. In fisheries with 100 percent observer coverage, extrapolation of data is generally not necessary to develop fishery-wide bycatch estimates.

According to officials from four NMFS regions, the development of bycatch estimates can vary based on the manner in which data are collected on vessels. According to officials from NMFS headquarters, in general, bycatch of protected species is counted by number of individuals, while fish bycatch is recorded by weight. For example, NMFS officials noted that, in the Hawaii deep-set tuna longline fishery, observers record bycatch of protected species—such as seabirds, sea turtles, and marine mammals—by counting every interaction with individual species. Similarly, according to NMFS officials, in the Bering Sea pollock trawl fishery, every Chinook salmon caught as bycatch is recorded. In the New England scallop dredge fishery, NMFS officials said that observers record the bycatch of finfish in pounds and bycatch of sea turtles in number of individual turtles.²⁵

Similarly, officials from NMFS headquarters and three regions, and representatives from one council, noted that differences in how bycatch data are compiled and input into regional databases can affect the manner and time frame in which bycatch estimates are developed. For example, NMFS officials told us that, in the Gulf of Mexico shrimp trawl fishery, observers record bycatch data on paper forms, sometimes numbering in the hundreds of pages, and mail them to a centralized NMFS office for entry into a database. By contrast, in the West Coast groundfish fixed gear fishery, NMFS officials said that observers record data electronically using a tablet application, which automatically uploads the data into a regional database once the observers are back ashore.

According to two councils and two stakeholders, the availability of bycatch estimates varies across NMFS regions, including the frequency and extent to which they are publicly reported. For example, in the Hawaii

²⁵Finfish refer to vertebrate and cartilaginous fishery species, not including crustaceans, cephalopods, or other mollusks.

deep-set tuna longline fishery, fish and protected species bycatch estimates are reported as part of the fishery's annual Stock Assessment and Fisheries Evaluation report. These reports aim to provide a summary of the condition of a fish stock and its marine ecosystems, and bycatch estimates are just one part of the report. In the Gulf of Mexico shrimp trawl fishery, fishery-wide bycatch estimates are produced on different time frames ranging from 3 to 5 years as part of the stock assessment process for finfish species, or for biological opinions in the case of species protected under the Endangered Species Act. Representatives from the Gulf of Mexico Council told us that the long time frames for receiving bycatch estimates, as well as the complexity of the estimates, complicates their ability to make timely management decisions for the fishery. In contrast, NMFS officials said that, for the Bering Sea pollock trawl fishery, the North Pacific Council has access to bycatch estimates throughout the year via a NMFS website, facilitating their ability to make in-season management decisions, as needed. As described earlier, this fishery had an observer coverage level of over 100 percent in 2023.

Development of Bycatch Estimates Is Challenged by Limited Data in Some Fisheries

The development of bycatch estimates can be challenging for fisheries with limited data stemming from low observer coverage, according to officials from NMFS headquarters and one NMFS region, and representatives from two councils. Three of these officials and one stakeholder noted that in fisheries with low observer coverage, the extrapolation efforts needed are more extensive and less statistically reliable. For example, in the New England scallop dredge, Hawaii deep-set tuna longline, and Gulf of Mexico shrimp trawl fisheries, three fisheries with observer coverage on the lower end (10.8 percent, 17.4 percent, and approximately 2 percent in 2021, respectively), significant extrapolation is required, and fishery-wide bycatch estimates can have a high degree of uncertainty. According to one NMFS region and two stakeholders, the presence of an observer onboard can prompt fishers to behave differently, particularly in fisheries with low observer coverage, potentially skewing the collection of bycatch data and development of bycatch estimates. NMFS officials from the Southeast Region told us this is an ongoing concern with the Gulf of Mexico shrimp trawl fishery, among other concerns associated with low observer coverage. Additionally, bycatch estimates for the fishery are not available on a stock level for marine mammals because the observer coverage is insufficient to support this level of precision, which in turn hinders NMFS' ability to understand population-level effects. See table 3 for reported information on fishery-wide bycatch estimates across the five selected fisheries.

Table 3: Reported Information on Availability of Fishery-Wide Bycatch Estimates and Observer Coverage, for the Five Selected Fisheries We Reviewed

Fishery name	Reported information on availability of fishery-wide bycatch estimates	Reported information on observer coverage
Bering Sea pollock trawl	Bycatch estimates are posted on a website and are included in annual reports to the North Pacific Fishery Management Council.	100+ ^a % observer rate and census of all salmon facilitates the bycatch estimation process
Gulf of Mexico shrimp trawl	Bycatch estimates are available via stock assessments (conducted every 3 to 5 years), technical memoranda, and biological opinions ^b .	Approximately 2% observer rate complicates the bycatch estimation process
Hawaii deep-set tuna longline	Fish and protected species bycatch estimates are included in annual Stock Assessment and Fishery Evaluation reports, marine mammal estimates are in Stock Assessment Reports, and seabird estimates are in the Seabird Interactions and Mitigation Efforts in Hawaii Longline Fisheries annual reports.	17.4% observer rate complicates the bycatch estimation process
New England scallop dredge	Bycatch estimates are available on NMFS websites.	10.8% observer rate complicates the bycatch estimation process
West Coast groundfish fixed gear	Bycatch estimates are included in annual mortality reports for fish, seabirds, and marine mammals.	41% observer rate facilitates the bycatch estimation process

Source: GAO analysis of interviews with officials from the National Marine Fisheries Service (NMFS) and Regional Fishery Management Councils. | GAO-24-106336

^aThere is at least one observer on every fishing trip.

^bUnder the Endangered Species Act, federal agencies must consult with NMFS on activities that may affect protected species listed under the act. The outcome of these consultations is a biological opinion. Biological opinions are issued on a wide range of actions.

According to officials from NMFS headquarters and two regions, and representatives from two councils, the challenge of developing bycatch estimates affects decision-making, as bycatch estimates are used to inform management decisions regarding fisheries. They noted that this challenge stems from limited funding, including federal funding, for observers. However, our review of NMFS’ National Observer Program fiscal year 2021 annual report and budget justifications for fiscal years 2020-2024 found that these documents do not describe the effect that limited observer coverage has had on NMFS’ ability to collect bycatch data and develop bycatch estimates, or the additional resources that may be needed to address these challenges. For example, in its most recent annual report for the observer program, NMFS stated that the “FY2021 budget included funds to pay for most regional observer program costs for the fisheries currently observed,” but it did not discuss the effects of limited resources on observer programs.²⁶ Additionally, NOAA’s budget

²⁶National Marine Fisheries Service, *National Observer Program, FY 2021 Annual Report*.

justification documents for the past 5 years (FY2020-FY2024) include some limited discussion of observers and resources, but they do not discuss specific resource needs. Specifically, these documents talk in general terms about the goals to maintain existing observer coverage and expand coverage in certain instances.

GAO's *Key Practices for Evidence-Based Policymaking* lays out 13 key practices agencies can use to build and use evidence to manage their performance.²⁷ It states that federal organizations should identify resources, including funding, needed to achieve goals. It also states that federal organizations should use evidence in decision making, as doing so helps ensure the organization's activities help achieve the desired results. Additionally, it states that federal organizations should communicate relevant information on their learning and results internally as well as to key stakeholders. When we asked NMFS officials from the National Observer Program about whether resource needs for observers have been identified, they said some regions have compiled impact statements outlining their resource needs for observers, but this information has not been gathered for all regions or communicated externally. Additionally, they noted that NMFS officials have generally viewed the federal funding amounts allocated to regional observer programs as static, given historical patterns. By gathering and communicating information on the resources needed to improve bycatch data collection and support observer coverage across the regions, NMFS could help ensure that stakeholders, including Congress, are more fully informed when making decisions about NMFS' observer programs.

NMFS Is Considering Other Options for Developing Bycatch Estimates

Given the challenges in developing bycatch estimates for fisheries with low observer coverage, officials from the Southeast Fisheries Science Center noted that, in some cases, the agency is considering other options for developing bycatch estimates. Options include alternative methods, such as using fishing effort data to supplement observer data. Fishing effort data refers to information collected on the fishing activity of a given vessel, including the duration and location of active fishing operations for a given type of fishing gear. NMFS officials stated that this information can be paired with previously developed estimates of bycatch for vessels operating under similar conditions, to develop fishery-wide estimates of bycatch.

²⁷[GAO-23-105460](#).

Bycatch in Recreational Fisheries in the Southeast Region

According to National Marine Fisheries Service (NMFS) and council officials in the Southeast Region, bycatch is a concern in some recreational fisheries, in addition to commercial fisheries. NMFS officials noted that key bycatch concerns in the recreational fisheries primarily stem from the high rate of discarded fish by recreational fishers. Such fish may be discarded for reasons of size or desirability, or because fishers are catching and releasing fish. Discarded fish can have a high rate of mortality, often stemming from pressure changes as they rapidly ascend in the water column after being caught, according to representatives from one council and a stakeholder. In addition, NMFS officials noted that marine mammals, sea turtles, and other protected species can become entangled in recreational fishing gear.

NMFS officials told us that the high (and growing) number of recreational vessels in the Southeast Region, as well as the efficiency of the vessels in catching fish, presents a substantial threat of bycatch, specifically the overall mortality of certain fish species, such as reef fish. A stakeholder noted that, at present, some for-hire recreational vessels in the Southeast Region collect data and may carry observers. But observers are not currently deployed on private recreational vessels, and any data collection from such vessels comes from voluntary self-reporting by recreational fishers.

Source: GAO analysis of interviews with NMFS, councils, and stakeholders. | GAO-24-106336

NMFS officials noted that this approach is being considered for the Gulf of Mexico shrimp trawl fishery, but challenges exist including nonrandom reporting of vessel location by a subset of fishery participants and a lack of commercial logbooks across the fishery.²⁸ Additionally, there has been significant resistance to the collection of fishing effort data, because of privacy concerns according to officials from the Southeast region. According to these officials and representatives from the Gulf of Mexico Council, alternative methods would be necessary for developing estimates of bycatch in recreational fisheries (see sidebar on Bycatch in Recreational Fisheries in the Southeast Region).

²⁸According to NMFS officials, recent federal appropriations have facilitated the transition of a small subset of Gulf of Mexico shrimp vessels to a new reporting infrastructure; however, many barriers remain to full adoption of this approach, including cost and regulatory barriers.

NMFS' Efforts to Track the Performance of Its Bycatch Reduction and Monitoring Efforts Do Not Align with Key Elements of Performance Management

NMFS does not use key elements of performance management in implementing its National Bycatch Reduction Strategy, and does not have a comprehensive plan for reporting on bycatch estimates from its newly enhanced database.²⁹ Performance management can help an organization define what it is trying to achieve, assess how well it is performing, and identify what it could do to improve results. NMFS' strategy, issued in 2016, includes strategic objectives, but the associated National Bycatch Reduction Strategy Implementation Plan 2020-2024 does not have key elements for tracking the agency's performance, including measurable performance goals or a process for tracking these.³⁰ Additionally, the agency is working on a database project to enhance its ability to compile bycatch estimates, but the agency does not have a comprehensive plan for how it will report these estimates.

NMFS' Bycatch Strategy Lays Out Strategic Objectives, but the Associated Implementation Plan Does Not Include Key Elements to Track Performance

In 2016, NMFS issued its bycatch strategy to guide and coordinate the agency's efforts to reduce bycatch and bycatch mortality. The strategy took an important first step in the performance management process by laying out five strategic objectives, as well as a series of general actions to carry out under each objective, as shown in table 4 below. These objectives broadly fall into three areas: improving NMFS' efforts to monitor bycatch, developing and implementing measures to reduce bycatch, and communicating information on NMFS' efforts to address bycatch.

Table 4: Summary of Objectives and Actions in the National Marine Fishery Service's National Bycatch Reduction Strategy

Objective	Number of actions
Monitor and estimate rates of bycatch and bycatch mortality in fisheries to understand the level of impact and the nature of the interaction.	Nine actions are listed including evaluating the bycatch collection programs comprehensively to identify gaps, and recommended program improvements, and implement changes as appropriate.
Conduct research to improve bycatch estimates, understand the impacts of bycatch on species and community dynamics, and develop solutions to reduce bycatch and bycatch mortality.	Six actions are listed including assessing how technology is developed and adopted in fisheries, and how technology can affect bycatch reduction.

²⁹U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, *National Bycatch Reduction Strategy*, (December 2016).

³⁰U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, *National Bycatch Reduction Strategy Implementation Plan 2020-2024*, (2019).

Conserve and manage fisheries and protected species by implementing measures to reduce bycatch and its adverse impacts.	Eleven actions are listed, including working with the Regional Fishery Management Councils, fishing industry, and stakeholders to develop, implement and promote bycatch reduction measures.
Enforce fishery management measures, including those aimed at reducing bycatch and bycatch mortality, to ensure compliance with applicable laws.	Five actions are listed including working with gear technology specialists to improve the compliance of fishers with bycatch mitigation requirements.
Communicate to develop a common understanding of bycatch, to share information on efforts to address bycatch, and to identify areas for improvement.	Nine actions are listed, including improving the fishing industry's understanding of existing bycatch reduction measures.

Source: GAO summary of information in the National Marine Fisheries Service's (NMFS) National Bycatch Reduction Strategy. | GAO-24-106336

In 2019, NMFS released the implementation plan, which identified 167 actions in order to implement the strategy.³¹ For example, one of the actions under the monitor and estimate objective from the strategy is to continue to improve the reporting of Alaska seabird bycatch. While the implementation plan lays out actions to carry out the strategy and general timelines, it does not generally include performance goals that have quantitative targets and specific time frames against which performance can be measured.

GAO's *Key Practices for Evidence-Based Policymaking* lays out 13 key practices agencies can implement to build and use evidence to manage their performance.³² One of these practices is setting measurable goals, specifically long-term strategic goals and near-term measurable outcomes. According to NMFS officials in the Office of Sustainable Fisheries and the Office of Science and Technology, the agency has not prioritized development of performance goals because of a lack of resources. By developing an updated implementation plan that includes performance goals with quantitative targets and clear time frames for completion, NMFS would have a way to measure its performance on bycatch efforts.

In the strategy, NMFS highlighted the importance of tracking its work, noting that embedded in the strategic objectives is an explicit recognition of the need to regularly evaluate NMFS' programs to ensure they are achieving objectives, learning from experiences, and then continually improving based on new information. However, according to NMFS officials in the Office of Sustainable Fisheries and Office of Science and Technology, the agency has not reviewed progress toward the

³¹National Marine Fisheries Service, *National Bycatch Reduction Strategy Implementation Plan 2020-2024*.

³²[GAO-23-105460](#).

implementation plan since finalizing it in 2019 because of staffing turnover and changing agency priorities.

GAO's *Key Practices for Evidence-Based Policymaking* states that federal organizations should use evidence to learn and apply this learning to agency decision-making. Further, it states that agencies should communicate relevant information on their learning and results internally as well as to key external stakeholders. By developing a process for tracking progress toward performance goals in an updated implementation plan, and using the information learned to guide decision-making, NMFS could better track its progress toward bycatch reduction and adjust agency efforts accordingly. Moreover, this information could be provided to external stakeholders to communicate agency progress.

NMFS Has Enhanced an Existing Database to Help Monitor Bycatch, but Does Not Have a Comprehensive Plan for Reporting Estimates from It

NMFS officials told us that the agency is working on a database project to better compile bycatch estimates, but the agency does not have a comprehensive plan for how it will report bycatch estimates from the database. The database, called the Fisheries One Stop Shop (FOSS), has been used in the past to publicly compile various data on the fishing sector, including landings, foreign trade, and per capita consumption.³³ Recently, NMFS has been working to use this database to improve upon prior efforts to compile bycatch estimates.

The agency first compiled bycatch estimates in the National Bycatch Report, published in 2011, with subsequent updates in 2013, 2016, and 2019.³⁴ In the 2011 edition, NMFS noted that the first step in reducing bycatch is accurately characterizing current bycatch levels, which provides a benchmark for evaluating the effectiveness of the agency's efforts to reduce bycatch. The 2011 report provided an overall bycatch ratio for commercial fisheries that compared estimated bycatch to total catch of fish.

According to officials in NMFS' Office of Science and Technology who were involved in developing the report, NMFS moved away from calculating this ratio in subsequent reports because it involved too many assumptions and was based on data of varying quality from many

³³Landings are the number or poundage of fish unloaded by commercial fishers or brought to shore by recreational fishers for personal use.

³⁴U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, *U.S. National Bycatch Report*, NOAA Technical Memorandum. NMFS-F/SPO-117E (Sept30, 2011).

different fisheries. In the 2019 update, NMFS added qualifications for the information in the National Bycatch Report, noting that because the data summary and analysis methods used in the report to produce comparable bycatch estimates across fisheries and regions did not reflect individual aspects of specific fisheries, the estimates may not represent the best available bycatch data for management purposes. Further, it noted that the report should not be used for day-to-day management of fisheries, but rather considered as a source of information on bycatch at a national level.

NMFS officials said that, after the 2019 report, the National Bycatch Report was put on hold, following a review to assess and improve future versions of the report. The results of the review led to the decision to use FOSS to report bycatch estimates, according to officials in the Office of Science and Technology. These officials said that efforts to move bycatch estimates into FOSS are nearing completion for some regions. They also told us that they plan to use FOSS to provide regular updates of bycatch estimates at the fishery level, as well as annual information about bycatch estimates at a higher level, including key takeaways, new methodologies used, and any information gaps.

The agency, however, lacks a comprehensive plan, with written documentation of how and when these efforts will be accomplished, including the level of detail to be provided, the format for reporting, projected timelines, and roles and responsibilities across the agency. Officials in the Office of Science and Technology told us that developing a plan for reporting bycatch estimates is challenging, given the different ways that estimates are developed and reported across the regions. Additionally, the officials said that the Southeast regional databases are not currently compatible with the FOSS database, and there is uncertainty as to when these issues will be resolved.

As noted, GAO's *Key Practices for Evidence-Based Policymaking* states that federal organizations should communicate relevant information on their learning and results internally and externally to key stakeholders.³⁵ By tailoring this information to meet various stakeholders' needs, a federal organization helps its stakeholders understand how well it is performing. Two of the five objectives outlined in NMFS' Bycatch Reduction Strategy focus on the collection of bycatch data, and a third objective calls for communicating information on bycatch. Moreover, the

³⁵[GAO-23-105460](#).

implementation plan for the strategy calls for updating and revising the National Bycatch Report to improve the timeliness and quality of bycatch estimates. By developing a comprehensive written plan for reporting on bycatch estimates from FOSS, the agency will be better able to communicate bycatch levels, trends, and information gaps to internal and external stakeholders. Additionally, such communication may also facilitate the agency's ability to track progress at a national level toward reducing bycatch.

Conclusions

NMFS is the lead federal agency responsible for managing the commercial fisheries that are critical to our nation's economy. In this role, NMFS conducts various activities to monitor bycatch, as well as to develop new tools and approaches for reducing bycatch. To help guide these activities, the agency has regional observer programs that oversee the deployment of fisheries observers, who collect data on bycatch.

In some fisheries, developing the bycatch estimates used to inform agency decision-making is challenging because of limited data resulting from limited observer coverage, according to agency officials. These officials noted that these challenges stem from limited resources, including funding for observers. Our review of program and budget documents found that the documents do not describe the effect of limited observer coverage on the development of bycatch estimates, or the additional resources needed to address these challenges. For example, in its recent budget justifications to Congress, there is some discussion of observers and resources, but no discussion of specific resource needs, resulting in stakeholders lacking a complete picture of the agency's resource needs. NMFS officials said that, while some regions have outlined their resource needs for observers, the agency has not gathered this information from all regions or communicated these resource needs externally. By gathering information across the agency to identify any additional resources needed to support observer coverage and communicating these needs, NMFS could better ensure stakeholders, including Congress, are more fully informed when making resource decisions related to NMFS' observer program.

The agency issued its National Bycatch Reduction Strategy in 2016 to guide and coordinate the agency's efforts to reduce bycatch and bycatch mortality and issued an implementation plan in 2019 to carry out the

strategy.³⁶ In developing the implementation plan, NMFS did not develop measurable performance goals, including goals that have quantitative targets and specific time frames against which performance can be measured. Additionally, the agency did not develop a process for regularly tracking the actions in the plan. By developing an updated implementation plan with measurable performance goals, as well as a process for tracking progress toward those goals, the agency will be better able to determine its progress toward reducing bycatch and adjust agency efforts accordingly.

NMFS is planning to use its FOSS database to provide regular updates on bycatch estimates and other information, but the agency lacks a comprehensive plan, including written documentation, for how it will use or report the bycatch estimates that will be available through FOSS. By developing a comprehensive written plan for reporting on bycatch estimates, NMFS will be better able to communicate bycatch levels, trends, and information gaps to internal and external stakeholders. Such a plan will also facilitate NMFS' ability to track national-level progress toward reducing bycatch, thus helping to ensure the long-term sustainability of marine fisheries and minimize unintentional catch and harm of protected species.

Recommendations for Executive Action

We are making the following four recommendations to NMFS:

The Assistant Administrator for NMFS should gather information from across the regions to identify any additional resources needed to support fisheries observers, and communicate these needs to relevant stakeholders, including Congress. (Recommendation 1)

The Assistant Administrator for NMFS should develop an updated National Bycatch Reduction Strategy Implementation Plan with measurable performance goals tied to specific time frames. (Recommendation 2)

The Assistant Administrator for NMFS should develop a process for tracking progress toward the performance goals in the updated National Bycatch Reduction Strategy Implementation Plan and use the information to guide agency decision-making. (Recommendation 3)

³⁶National Marine Fisheries Service, *National Bycatch Reduction Strategy and National Bycatch Reduction Strategy Implementation Plan 2020-2024*.

The Assistant Administrator for NMFS should develop a comprehensive written plan for reporting on bycatch estimates from the enhanced Fisheries One Stop Shop database, including how the agency will communicate over time on bycatch levels, trends, and information gaps. (Recommendation 4)

Agency Comments

We provided a draft of this report to the Department of Commerce for review and comment. In written comments (reproduced in app. III), Commerce and NOAA agreed with our recommendations. NOAA commended GAO for its thorough and detailed review of a complex subject and described actions it plans to take to address our recommendations. Specifically, NOAA noted that it commits to transparently articulating costs related to bycatch monitoring to enhance public understanding and inform decision-making. Further, NOAA described plans to improve tracking bycatch tasks, including developing measurable performance goals and more regular tracking to inform decision-making. In addition, NOAA stated that it plans to publish an annual online report on bycatch data sets, trends, and changes in monitoring and estimation methodologies. NOAA also provided technical comments, which we incorporated as appropriate.

As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of this report to the appropriate congressional committees, the Secretary of Commerce, and other interested parties. In addition, the report is available at no charge on the GAO website at <https://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or JohnsonCD1@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix IV.

Sincerely,



Cardell D. Johnson
Director, Natural Resources and Environment

Appendix I: Objectives, Scope, and Methodology

This report examines (1) the measures that are being used to reduce bycatch in fishing, (2) coverage and funding levels for fisheries observers, (3) how bycatch data are developed and reported, and (4) how the National Marine Fisheries Service (NMFS) is tracking its performance towards reducing and monitoring bycatch.

To examine all four objectives, we reviewed relevant laws, such as the Magnuson-Stevens Fishery Conservation and Management Act, including the national standards it sets forth for fishery conservation and management.¹ We also reviewed relevant regulations, including the guidelines based on the national standards, established by the National Oceanic and Atmospheric Administration (NOAA) to assist with fisheries management.² While all 10 national standards are principles that are important for fisheries conservation and management and must be followed when preparing fisheries management plans, we focused on National Standard 9, and the guidelines implementing it, which specifically focus on bycatch.³ We also reviewed relevant sections of the Marine Mammal Protection Act and the Endangered Species Act, pursuant to which NMFS undertakes efforts to reduce bycatch of species protected under the acts.⁴

We also reviewed various agency documents related to the steps NMFS and the Regional Fishery Management Councils take regarding reduction of bycatch, observer deployment, and bycatch data collection and reporting, including NMFS guidelines, procedures, and technical memorandums. This included reviewing NMFS' National Bycatch Reduction Strategy and its associated implementation plan, the U.S.

¹Fishery Conservation and Management Act of 1976, Pub. L. No. 94-265, 90 Stat. 331 (codified as amended at 16 U.S.C. §§ 1801-1884). The act was later renamed the Magnuson-Stevens Fishery Conservation and Management Act. See Pub. L. No. 104-208, § 211(a), 110 Stat. 3009, 3009-41 (1996).

²50 C.F.R. pt. 600, subpt. D (guidelines based on the national standards). The Magnuson-Stevens Act called for NOAA to establish advisory guidelines, which are not to have the force and effect of law, based on the national standards, to assist in the development of fishery management plans. 16 U.S.C. § 1851(b).

³See 16 U.S.C. § 1851(a)(9); 50 C.F.R. § 600.350.

⁴See Marine Mammal Protection Act of 1972, Pub. L. No. 92-522, 86 Stat. 1027 (codified as amended at 16 U.S.C. §§ 1362-1423h); Endangered Species Act of 1973, Pub. L. No. 93-205, 87 Stat. 884 (codified as amended at 16 U.S.C. §§ 1531-1544).

National Bycatch Report, and the National Observer Program Report, among others.⁵

We also interviewed officials from NMFS' headquarters office and all five NMFS regions, including officials from the five regional offices and six corresponding NMFS regional fisheries science centers, about steps taken to reduce bycatch, collect data on bycatch, and develop fishery-wide estimates of bycatch. Similarly, we interviewed representatives from seven of the eight councils responsible for fisheries management in their respective regions (New England, Mid-Atlantic, South Atlantic, Gulf of Mexico, North Pacific, Pacific, and West Pacific).⁶

Additionally, we interviewed stakeholders from nine organizations—including representatives from environmental, research, and state organizations; commercial and recreational fishing groups; and observer providers—about NMFS' and the councils' efforts to reduce bycatch, collect data on bycatch, and develop fishery-wide estimate of bycatch. Based on discussions with NMFS, we selected stakeholders that were familiar with different aspects of the fisheries management process and that could provide a range of views. Stakeholders we interviewed were affiliated with the following organizations: A.I.S. Inc., Alaska Bering Sea Crabbers, Bama Seafood Products, Florida Fish and Wildlife Conservation Commission, Gulf of Mexico Reef Fish Shareholders Alliance, Hubbard's Marina, Ocean Conservancy, Pew Charitable Trusts, and Saltwater Inc. Views from selected stakeholders cannot be generalized to those we did not select and interview.

In order to further examine our four objectives, we selected a sample of five fisheries for more in-depth reviews. For the purposes of this selection, we use the term "fishery" to refer to a fishery or group of fisheries with certain shared characteristics—including geography, target species, fishing method, gear type, council oversight, and management structure.

⁵National Marine Fisheries Service, *National Bycatch Reduction Strategy*. National Marine Fisheries Service, *National Bycatch Reduction Strategy Implementation Plan*; National Marine Fisheries Service, *U.S. National Bycatch Report*; U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, *National Observer Program FY 2021 Annual Report*, NOAA Technical Memorandum NMFS-F/SPO-241 (May 2023).

⁶We reached out to the eighth council, the Caribbean Fishery Management Council, but we were unable to schedule an interview with the council. According to NMFS, this council is responsible for fishery management in federal waters seaward of the Commonwealth of Puerto Rico and the U.S. Virgin Islands. We use the term council representative to refer to council members and council staff.

The five selected fisheries were chosen to reflect a range of characteristics, including NMFS region, target fish species, fishing gear used, and key bycatch concerns, among others. The fisheries we selected were Bering Sea pollock trawl, Gulf of Mexico shrimp trawl, Hawaii deep-set tuna longline, New England scallop trawl, and West Coast groundfish fixed gear.

Each of the five selected fisheries was located in one of NMFS' five regions. As a result, we conducted additional interviews with officials from the five NMFS regional offices and science centers about steps taken to reduce bycatch, deployment of observers, and the processes to collect data on bycatch, and develop fishery-wide estimates of bycatch for the relevant fishery. We also conducted interviews with at least one stakeholder that was knowledgeable about each selected fishery. The stakeholders we interviewed were affiliated with the following organizations: Fisheries Survival Fund, Fishing Vessel Owners' Association, Hawaii Longline Association, Southern Shrimp Alliance, Oregon Sea Grant, United Catcher Boats, University of Massachusetts at Dartmouth, and University of Washington. The information we gathered about the selected fisheries reflects a nongeneralizable sample from which generalizations across all federal fisheries cannot be drawn.

For each of the five selected fisheries, we requested recent estimates of available bycatch data for the fishery. To determine the reliability of the estimates we received, we interviewed agency officials familiar with the estimates, and reviewed documentation about the regional databases where the estimates are stored. In the case of one fishery, bycatch estimates were not available for the time period requested. Otherwise, we determined that the data were sufficiently reliable for including some estimates of bycatch in our profiles of the selected fisheries in appendix II.

To examine how NMFS is reporting on its efforts to reduce and monitor bycatch, we reviewed the agency's National Bycatch Reduction Strategy and associated implementation plan. We also interviewed relevant NMFS officials for additional information. We then assessed the strategy and implementation plan against key practices that can help federal organizations effectively implement evidence-building and performance-management activities, as presented in GAO's *Key Practices for Evidence-Based Policymaking*.⁷ We focused our review on key practices

⁷GAO, *Evidence-Based Policymaking: Practices to Help Manage and Assess the Results of Federal Efforts*, [GAO-23-105460](#) (Washington, D.C.: July 12, 2023).

related to areas of performance management that we determined were most relevant for the purposes of our review.

Similarly, to assess the extent to which NMFS has followed selected key practices in developing a plan for reporting bycatch estimates from its enhanced Fisheries One Stop Shop database, we reviewed agency documentation related to the project and interviewed relevant NMFS officials. We then assessed the project against the key practices in GAO's *Key Practices for Evidence-Based Policymaking*.⁸

We conducted this performance audit from November 2022 to June 2024, in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

⁸[GAO-23-105460](#).

Appendix II: Profiles of Selected Fisheries

This appendix contains profiles for each of the five fisheries that we selected for more in-depth review. As noted earlier, we selected one fishery from each of the National Marine Fisheries Service (NMFS) regions. We selected these fisheries to reflect a range of characteristics, including, target fish species, fishing gear used, key bycatch concerns, and management structure. We compiled information on these fisheries by reviewing relevant fishery management plans and amendments, reviewing agency and other documents, and interviewing officials from NMFS as well as stakeholders. The information in each profile is intended to highlight examples of information about the fishery for illustrative purposes—the profile is not intended to be a comprehensive description of the fishery. Additionally, the information highlighted in each profile varies according to the characteristics of each fishery and is not intended for comparison across the five selected fisheries. The information gathered about the selected fisheries reflects a nongeneralizable sample from which generalizations across all federal fisheries cannot be drawn.

Bering Sea Pollock Trawl Fishery



Fishery characteristics

National Marine Fisheries Service region: Alaska.

Regional Fishery Management Council: North Pacific.

Vessels (2023): 80 catcher vessels (81–193’ in length), 13 catcher processor vessels (200–344’ in length), three motherships (276–367’ in length). Catcher vessels are vessels that deliver catch to onshore processing facilities or motherships. Catcher processors are vessels that catch and process their catch. Motherships receive and process catch from catcher vessels.

Observer coverage (2023): Catcher processors and motherships always have two observers onboard (over 100 percent coverage) and every haul is monitored. Catcher vessel fishing trips have at least one observer (100 percent coverage) or an electronic monitoring system. In addition, observers monitor each delivery at the shoreside processing plant.

Examples of encountered bycatch: Chinook salmon, chum salmon, crab, Steller sea lions, humpback whales, harbor seals, and seabirds.

Target species: Alaska pollock are a semi-bottom-dwelling fish and swim in large schools in waters generally between 330 feet and 985 feet deep. They are typically between 12 and 20 inches and weigh between 1 and 3 pounds. Common uses of pollock include surimi (imitation crab), roe (eggs), and fish fillets.

Fishing gear used: Pelagic trawl. Catcher vessels and catcher processor vessels pull a cone-shaped net, with a large opening at the front that narrows towards the back, through the pelagic zone of the water column.



Pollock trawl.



Pollock.

Sources: GAO analysis of interviews with National Marine Fisheries Service and review of documents (text); North Pacific Fishery Management Council (boat image); National Marine Fisheries Service (fish image); Map Resources (map). | GAO-24-106336

Examples of Bycatch Reduction Measures

According to NMFS officials from the Alaska Region, Chinook salmon and chum salmon are the primary bycatch concern in the fishery. Below are two example bycatch reduction measures for Chinook salmon and chum salmon.

Prohibited Species Catch Limits: The North Pacific Council designated Chinook salmon as a prohibited species in the Bering Sea pollock trawl fishery because they are the target of other commercial fishers. This prohibited species designation comes with certain restrictions. First, pollock trawl fishers are not allowed to benefit from retaining Chinook salmon bycatch. Instead, fishers must donate it, when feasible, so the

catch is not wasted. Second, there are limits to how much prohibited species bycatch is allowed in the fishery, also known as a bycatch cap.

There is a cap of Chinook salmon bycatch for the pollock fishery as a whole, and NMFS allocates a portion to different sectors of the fishery, including catcher vessels, catcher processors, and motherships.¹ If a sector's total bycatch cap is reached, their vessels must stop fishing for pollock for the season. The bycatch cap is set according to Chinook salmon abundance. Each year, NMFS uses a State of Alaska index of abundance for Chinook salmon and applies either the cap for high abundance or the cap for low abundance.

The sectors manage their bycatch cap through sector-level cooperatives, which were established alongside a quota system for the fishery in 1998 under the American Fisheries Act.²

Incentive Plan Agreements: To motivate fishers to further reduce Chinook salmon and chum salmon bycatch below the prohibited species limit described above, NMFS and the North Pacific Council permitted cooperatives to establish incentive plan agreements. Incentive plan agreements are plans that participating vessels agree to follow in order to reduce Chinook salmon and chum salmon bycatch, according to regulations for this fishery.³

According to NMFS officials from the Alaska region, cooperatives decide what is in their incentive plan agreements, which may include bycatch reduction measures such as informing other fishers of bycatch hotspots and area closures. According to council representatives, the existing cooperative structure allows fishers to enforce incentive plan agreement rules themselves, such as through civil suits. NMFS officials told us the comprehensive bycatch data in the fishery holds fishers accountable for

¹In 1998, the American Fisheries Act established sector allocations in the Bering Sea and Aleutian Islands pollock trawl fishery and determined eligible vessels and processors, among other things. Pub. L. No. 105-277, div. C, tit. II, subtit. II, 112 Stat. 2681, 2681-621 (16 U.S.C. § 1851 note). These requirements were determined based on prior catch and processing history.

²See 16 U.S.C. § 1851 note. Cooperatives are groups of fishing vessels that operate through contractual agreements to cooperatively harvest the sector's total allowable catch and minimize bycatch.

³See 50 C.F.R. § 679.21(f)(12).

their bycatch and provides detailed and timely information for vessels to change behavior to avoid salmon bycatch.

According to amendment 91 of the fishery management plan, participation in the incentive plan agreements is voluntary, but there is a higher bycatch cap for the fishery, up to 60,000 Chinook salmon in high Chinook salmon abundance years and about 48,000 Chinook salmon in a low abundance year, when all vessels in a sector or cooperative participate. Sectors or cooperatives that choose not to participate will instead receive a reduced “opt-out” allocation. According to NMFS officials from the Alaska region, this leads to a financial incentive to participate because a higher bycatch cap means there is less risk of reaching it and causing the fishing season for a cooperative to close before the whole pollock quota is caught. Since the incentive plan agreements were implemented, all eligible vessels have participated.

Bycatch cap allocations are also tied to performance over time. If a cooperative exceeds its bycatch cap allocation more than three times within 7 years, its allocation of the total cap is permanently lowered. This gives fishers some flexibility for a bad year.

According to NMFS officials from the Alaska region, it was initially a logistical challenge to track salmon brought onboard as bycatch because pollock trawls can catch millions of pounds of pollock per trip. Industry had asked, and NMFS now requires, fisheries observers to manually count all salmon brought onboard as bycatch, instead of counting salmon from samples of each pollock haul. According to NMFS officials, this was to ensure accurate salmon counts and mitigate the risk that any one pollock haul with a high amount of salmon bycatch could be extrapolated and affect the fishery’s bycatch totals. To implement this process, NMFS had to develop a program and increase monitoring using cameras to ensure all salmon was counted.

Fishery Observers

According to NMFS officials from the Alaska region, the Bering Sea pollock trawl fishery is considered one of the most heavily monitored U.S. commercial fisheries. Federal regulations require vessels to maintain at least 100 percent observer coverage, meaning at least one observer is present on every trip, which can last up to 4 weeks.⁴ Industry funds this coverage by paying observer provider companies each time a vessel has an observer onboard. According to NMFS officials, it is a profitable

⁴See 50 C.F.R. § 679.51(a)(2)(i).

Bycatch Data Collection and Estimates

fishery, which allows fishers to afford the cost of the high observer coverage. They added that federal funds support NMFS' infrastructure costs of the observer program, including observer training, database development, and gear procurement.

According to NMFS officials from the Alaska region, observers prioritize counting the number of individuals or weight of the bycatch when collecting bycatch data. Pollock is a high-volume fishery, so for most bycatch species observers collect data by taking samples from each haul and NMFS officials extrapolate bycatch estimates to the total catch. Bycatch data are recorded by observers onboard using NMFS-provided software and are transmitted at least once per day to databases at the Alaska Fisheries Science Center. NMFS publishes weekly reports of bycatch estimates for the fishery on the NMFS Alaska Region website. Additionally, one industry group told us that data from some vessels are also sent to a third-party data manager, which uses the data to identify bycatch "hot spots" in real time, so that fishers can avoid them.

In the case of salmon, however, each individual salmon, including Chinook salmon and chum salmon, is sorted from the catch and identified and counted by observers. NMFS officials told us electronic monitoring is used to ensure fishers place the salmon bycatch in a designated spot for observers to access.

We asked NMFS for any available information on bycatch estimates for the fishery for 2018–2022. In response, NMFS provided us estimates of fish bycatch for 2018–2023, marine mammal bycatch for 2017–2021, and seabird bycatch for 2011–2021. These bycatch estimates were delineated by species. In 2023, fishers in the Bering Sea pollock trawl caught over 2.7 billion pounds of pollock. We totaled the fish bycatch estimates for the fishery, excluding crab and salmon bycatch, which is counted by the number of individuals, for approximately 13.2 million pounds of fish bycatch in 2023. Fishers also caught nearly 12,000 Chinook salmon, among other prohibited species catch, that year. In 2021, other bycatch in the Bering Sea pollock trawl fishery included 117 seabirds, primarily Northern Fulmars, and 11 marine mammals, including six Steller sea lions.

Gulf of Mexico Shrimp Trawl Fishery

Fishery characteristics

National Marine Fisheries Service region: Southeast.

Regional Fishery Management Council: Gulf of Mexico.

Vessels (2023): In June 2023, there were 1,311 federally permitted vessels. The average permitted vessel is 68 feet long.

Observer coverage (2021): In fiscal year 2021, observer coverage was about 2 percent.

Examples of encountered bycatch: Sea trout, sea turtles, smalltooth sawfish, giant manta rays, and bottlenose and spotted dolphins.

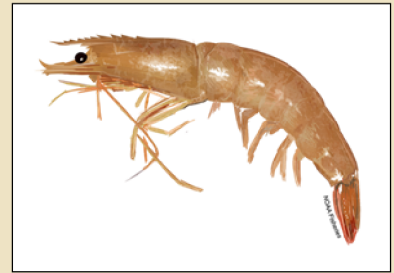


Target species: Brown, pink, and white shrimp. Shrimp commonly inhabit estuaries and near-coastal and offshore waters.

Fishing gear used: Otter trawl. A vessel pulls a cone-shaped net, with a large opening at the front that narrows towards the back, through the water. Otter trawls use boards, called doors, secured at the mouth of the net, to ensure that the net remains open throughout the trawl.



Shrimp trawl.



Shrimp.

Sources: GAO analysis of interviews with National Marine Fisheries Service and review of documents (text); GAO (boat image); National Marine Fisheries Service (fish image); Map Resources (map). | GAO-24-106336

Examples of Bycatch Reduction Measures

Turtle Excluder Devices (TEDs): TEDs promote sea turtle conservation by addressing interactions between sea turtles and trawl fishing gear. A TED is a metal grid that hangs at a certain angle in a trawl net so when large animals like sea turtles encounter a trawl, they are deflected by the TED and guided out of a hole in the net. Small animals, such as shrimp, pass through the grid into the mesh bag at the end of the trawl and are caught. Fishers have been required to use TEDs in the Gulf of Mexico shrimp fishery since 1987. According to officials from the NMFS Southeast Regional Office, one challenge in using the TED is to maintain the angle of the grid at 30 to 55 degrees as generally required by federal regulations (see fig. 7).

Bycatch Reduction Devices (BRDs): BRDs are used to reduce finfish bycatch by a shrimp trawl by providing fish an exit to swim out of the shrimp net. A number of certified devices meet the requirements for BRDs, including the fisheye device, the most commonly used BRD. The fisheye device is a cone-shaped rigid frame at a set distance from the

drawstring of the rear end of a trawl net, where the catch is gathered. Fishers have been required to use BRDs in the western Gulf of Mexico federal shrimp fleet since 1998. Officials from the NMFS Southeast Regional Office said that while BRDs allow for fish to swim out, they are less successful for fish with spines on their fins, such as red snapper, whose fins may still get stuck (see fig. 7).

Figure 7: Turtle Excluder Device (TED) and Bycatch Reduction Device (BRD) on Shrimp Trawl



Source: GAO. | GAO-24-106336

Fishery Observers

According to officials from the NMFS Southeast Fisheries Science Center, observer coverage for the Gulf of Mexico Shrimp Trawl Fishery is about 2 percent, and a typical observer deployment can be a few weeks. They also said all funding for observers in this fishery is federal. According to NMFS Southeast regional officials, the Southeast Fisheries Science Center is currently reorganizing its observer programs to improve observer program flexibility, such as by using the region's observer pool to work across different fisheries.

Bycatch Data Collection and Estimates

According to officials from the Southeast Fisheries Science Center, observers may collect the following data on protected resources bycatch: species identification, sex, measurements (lengths), tag information, pictures, video, and condition (disposition). For fish bycatch, observers collect the species identification, counts, and weights.

However, according to Gulf of Mexico Council representatives, low observer coverage creates uncertainty in bycatch estimates. Officials from the NMFS Southeast Regional Office explained that extrapolating data from a small percentage of fishing trips to the remainder of the fleet results in poor bycatch estimates. NMFS officials added that for marine mammals, bycatch estimates are grouped over large regions given lack of sufficient coverage to inform more precise bycatch estimates at the population level.

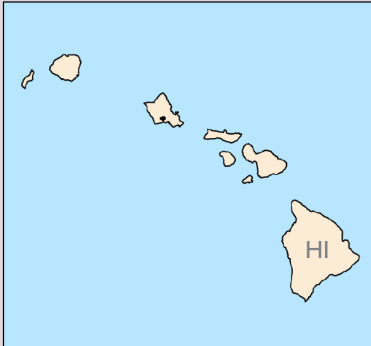
Observers collect bycatch data using paper forms, which are sent to the Southeast Fisheries Science Center and then extrapolated to estimate bycatch for the fishery as a whole. The fishery-wide bycatch estimates are included as part of the finfish fishery's stock assessments, protected species biological opinions, and marine mammal bycatch estimates technical memorandums.

Some fishers in the shrimp trawl fishery have also collected data on their fishing efforts using a cellular electronic logbook. This information helped the Southeast Fisheries Science Center estimate the total fishing effort for the fleet and to better extrapolate observer bycatch data to the whole fleet. However, the instrument used to collect this information no longer transmits data because the devices used a form of cellular data that is no longer supported. As a result, according to an official from the Ocean Conservancy, the commercial shrimp trawl program, which has significant red snapper bycatch and protected species interactions, no longer has a functioning trip reporting system.

According to Gulf of Mexico Council representatives, electronic monitoring and self-reported data could bolster bycatch data given the lack of observers. However, Gulf of Mexico Council representatives said that some fishers are reluctant to use electronic monitoring and it can be very hard to get a representative sample of people to self-report information. According to Southern Shrimp Alliance officials, while electronic monitoring could work well to document turtle interactions, it wouldn't do so for fish bycatch because the catch is dumped on deck where the camera cannot differentiate between fish species.

We asked NMFS to provide us any available information on bycatch estimates for the fishery for years 2018–2022. NMFS said they did not have bycatch estimates for fish or protected species for that time frame.

Hawaii Deep-Set Longline Tuna Fishery



Fishery characteristics

National Marine Fisheries Service region: Pacific Islands.

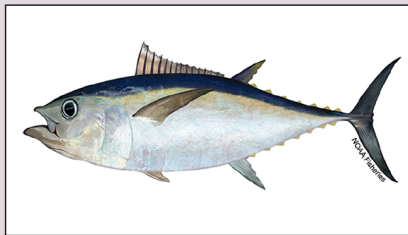
Regional Fishery Management Council: Western Pacific.

Vessels (2023): The fishery has 164 vessels authorized to participate in the fishery, and as of 2023, about 150 of the permits are actively used annually. Longline vessels range between 49 feet and 98 feet in length.

Observer coverage (2023): In calendar year 2023, observer coverage was 17.4 percent.

Examples of encountered bycatch: The key focus on bycatch in this fishery includes seabirds and a number of protected species such as sharks, giant manta rays, sea turtles, and false killer whales.

Target species: This fishery primarily targets bigeye tuna, and occasionally yellowfin tuna, around the Hawaiian Islands. Bigeye tuna grow fast and can reach about 6.5 feet in length and weigh up to about 400 pounds. Yellowfin tuna can grow to be up to 6 feet long and weigh between 60 and 400 pounds. Tuna caught in this fishery are sold almost exclusively for the raw fish market for making poke, sashimi, and sushi.



Pacific bigeye tuna.

Fishing gear used: Longline fishing employs a type of fishing gear consisting of a mainline that exceeds one nautical mile in length suspended horizontally in the water column. Crewmembers attach branch lines to the mainline at regular intervals, and each branch line has a single baited hook. The gear is deployed for several hours before being retrieved. Fishers in this fishery usually deploy and retrieve one longline a day, typically with between 2,000 and 3,000 attached hooks.



Longline vessel.

Sources: GAO analysis of interviews with National Marine Fisheries and review of documents (text); National Marine Fisheries Service (images); Map Resources (map). | GAO-24-106336

Examples of Bycatch Reduction Measures

Leader Modification: Fishers use monofilament leaders—the line between the dropper line weight and its hook—instead of steel wire leaders to reduce shark bycatch. To reduce impacts to oceanic whitetip sharks—listed by NMFS as a threatened species under the Endangered Species Act in 2018—longline fishers initiated the change from steel wire to monofilament leaders, because, unlike steel wires, sharks can bite through monofilament and free themselves. The use of monofilament leaders may also facilitate the removal of gear from other bycaught species.

According to NMFS Pacific Islands regional officials, an important factor in facilitating this bycatch measure was the fishing industry’s involvement in its development; the measure subsequently became required in May

2022.⁵ Notably, in December 2022 the international Western and Central Pacific Fisheries Commission and each of its members adopted a similar conservation and management measure in the Western and Central Pacific Ocean. Fisher safety was one challenge associated with implementing this bycatch measure. When using a monofilament leader, the dropper line weight may ‘fly back’ back toward the vessel or crew at high speed if the line breaks or if the hook is thrown from a fish. To mitigate the risk of ‘fly back,’ NMFS and the Hawaii Longline Association educated fishers on the use of a flyback prevention device and on proper handling of sharks that may become entangled by the leader.

False killer whale gear: NMFS has also implemented a suite of measures intended to reduce the likelihood of fishers incidentally hooking, entangling, killing, or seriously injuring false killer whales during longline fishing operations. For example, NMFS issued a final rule in 2012 implementing various measures including gear requirements and educational components, such as requiring all Hawaii-based longline vessels to post a NMFS-approved placard with information on marine mammal handling.⁶

According to officials from the NMFS Pacific Islands Regional Office, an important factor in facilitating this bycatch measure was creating graphics and animated videos depicting handling and release guidelines. They said that a challenge to this measure was translating information and outreach to non-English speaking fishers of the fleet.

Fishery Observers

According to NMFS Pacific Islands Regional officials, the actual observer coverage rate in calendar year 2023 was 17.4 percent. In this fishery, observers remain aboard for 2- to 3-week intervals.

Observers are managed by NMFS’ observer program and are federally funded. The annual cost of the observer program for this fishery is approximately \$6 million. However, to accommodate information collection to monitor compliance and effectiveness for recently implemented bycatch mitigation measures, NMFS Pacific Islands Regional officials said they anticipate annual observer program costs to increase to over \$9 million over the next 5 years. To accommodate the

⁵87 Fed. Reg. 25,153 (Apr. 28, 2022). The final rule prohibiting such wire leaders was promulgated on April 28, 2022 and became effective May 31, 2022.

⁶See 77 Fed.Reg.71,260 (Nov. 29, 2012).

current funding level, starting in fiscal year 2024, NMFS will reduce observer coverage in the fishery to 15 percent.

According to a Hawaii Longline Association official, NMFS has used the same observer coverage protocol in this fishery for years. This official said the protocol works well, in part, because vessels primarily leave from one port, which simplifies observer deployment logistics. NMFS Pacific Islands Regional officials said vessel owners are required to notify the contracted observer provider of their intention to depart on a fishing trip 72 hours before a trip. The observer provider then checks whether the Pacific Islands Fisheries Science Center randomly selected that vessel as among those required to carry an observer.

Bycatch Data Collection and Estimates

Bycatch data for this fishery are composed of data that fishers are required to self-report through logbooks and from data collected by observers. For both fisher logbooks and observer data, bycatch data are collected by number of individuals caught. For finfish species, statisticians convert the number of individuals caught to weight. For seabirds, sea turtles and marine mammals, NMFS reports bycatch by estimated number of individuals.

Longline permit holders must report their record of catch using an NMFS certified electronic logbook submitted to NMFS within 24 hours after the end of each fishing day. The logbook forms track the number of fish caught, number of fish released, and the number of protected species interactions.

Observers collect the information using paper records. Once a longline trip is completed, observers enter the data into an electronic management system and a debriefer reviews the data for quality control. This process can take up to 3 months after the fishing trip ends, and a few weeks for trips with protected species interactions. Western Pacific Council members said that this delay limits implementation of bycatch mitigation strategies that would benefit from more timely information on bycatch. However, NMFS is developing an electronic reporting platform to facilitate observers' ability to collect and store information in a timelier manner and to report the data to NMFS in near real-time. This platform is to include a mobile application for entering data at the point of collection and transmit the data to the receiving database, which is called the Pacific Islands Region Observer Program System.

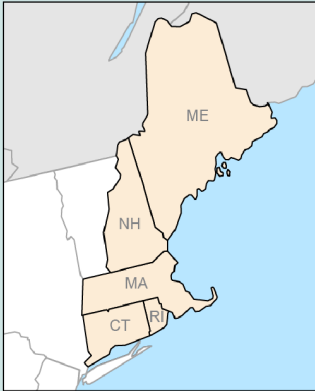
Bycatch estimates from the fishery are reported through an annual Pelagic Fishery Ecosystem Plan Stock Assessment and Fisheries

Evaluation Report. NMFS also publishes an annual report. However, Western Pacific Council representatives said they do not have access to near real-time bycatch estimates, unless they request it, which can delay responsive bycatch management actions. According to NMFS regional officials, in 2022, the Pacific Islands Fishery Science Center began developing a bycatch Guided User Interface application, which, as of February 2024, was being tested with various clients. They said that the application would be available for use in 2024 and would enable the Council to extract bycatch estimates for any observed species.

We asked NMFS for any available information on bycatch estimates for the fishery for fiscal years 2018 through 2022. In response, NMFS provided us estimates of the number of fish for the fishery as a whole. According to this information, the estimated bycatch, in number of fish, for species that comprise over 90 percent of its total bycatch in 2021 was 521,924 fish. According to the 2022 Annual Stock Assessment and Fishery Evaluation Report, the estimated bycatch for incidental take for oceanic whitetip shark was 3,084, and for giant manta rays was 11.⁷

⁷Western Pacific Regional Fishery Management Council, *Annual Stock Assessment and Fishery Evaluation Report for U.S. Pacific Island Pelagic Fisheries Ecosystem Plan 2022* (Honolulu, HI: 2023).

New England Scallop Dredge Fishery



Fishery characteristics

National Marine Fisheries Service region: Greater Atlantic.

Regional Fishery Management Council: New England.

Vessels (2023): For the Limited Access fleet, 345 issued vessel permits (and generally that number of vessels); for the Limited Access General Category fleet, 250 vessel permits (and generally 130–150 active vessels). The Limited Access fleet is managed by a number of days that can be fished per year and an access area rotation program. The Limited Access General Category fleet is managed using a quota. Overall, the vessels range from approximately 30 feet to 100 feet.

Observer coverage (2023): The average target coverage rate is 10.8%.

Examples of encountered bycatch: Groundfish, including flatfish such as the yellowtail flounder and Northern windowpane flounder, monkfish, skates, and sea turtles.

Target species: Atlantic sea scallop. Scallops live in groups called “beds” on the ocean floor, generally at depths of about 100 feet to 300 feet. Most vessels bring to shore Atlantic sea scallops as meat already shucked from the shell, but some vessels also land whole, in-shell scallops.

Fishing gear used: Scallop dredge. A vessel pulls a scallop dredge—a metal frame with an attached collection net—along the ocean floor.



Scallop dredge.



Scallop.

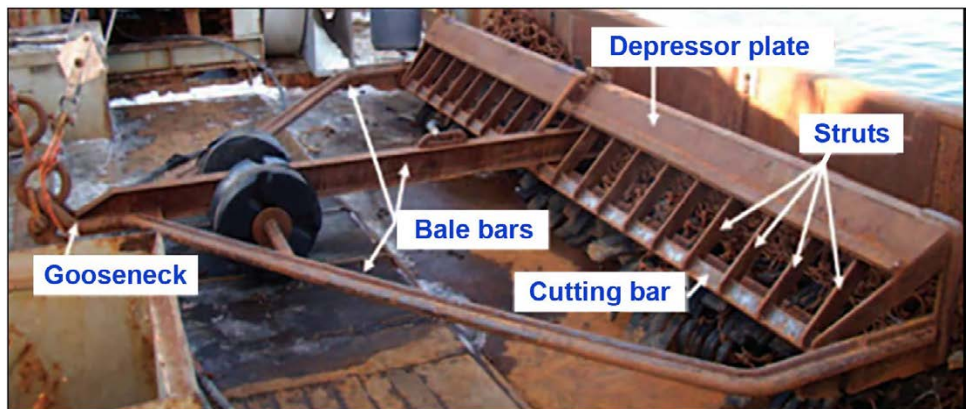
Sources: GAO analysis of interviews with National Marine Fisheries Service and review of documents (text); National Marine Fisheries Service (images); Map Resources (map). | GAO-24-106336

Examples of Bycatch Reduction Measures

Turtle deflector dredge: According to NMFS officials, the turtle deflector dredge uses metal bars placed at a specified spacing and angle to deflect turtles away from entering the dredge (see fig. 8). Maintaining maximum distance between the bars in the dredge allows it to be used in the rockier ocean bottoms that are more common in New England. NMFS officials said that involvement and input from the fishing industry has helped facilitate the use of this bycatch reduction measure. Specifically, they said the turtle deflector dredge was developed on industry vessels with involvement and input from the fishing industry, rather than on a research vessel. According to NMFS officials, such direct input from scallopers resulted in a practical and usable bycatch reduction tool. The turtle deflector dredge is only required in the fishery in specific areas and during certain times of year.

Accountability measures: The New England Council assigns the scallop fishery a bycatch limit of windowpane and yellowtail flounder each year. If the fishery exceeds its bycatch limit, NMFS may require additional gear modifications to reduce bycatch further. According to NMFS officials and a stakeholder group, the gear modifications include restricting how tightly fishers tie the mesh net that covers a portion of the top of a scallop dredge, or twine-top, and limiting the rows of rings on the back of a dredge. When the accountability measure is active, NMFS requires fishers to hang it in a certain pattern and limit the rows of rings at the end of the dredge to seven rows, increasing the likelihood of bycatch escaping.

Figure 8: Close-Up of Turtle Deflector Dredge



Source: National Marine Fisheries Service/Henry Milliken. | GAO-24-106336

Note: The turtle deflector dredge includes a cutting bar that forms a ramp. If a sea turtle encounters this dredge, it will be deflected up and over it, avoiding capture.

According to NMFS Greater Atlantic Region officials, the use of accountability measures affords scallopers flexibility in where they fish. One stakeholder group noted that accountability measures help reduce time-area closures. However, they also told us the bycatch limit that triggers the accountability measures applies to the entire fleet and can be upset by a single vessel intentionally targeting a specific bycatch species.

Fishery Observers

The observer coverage for the fishery was approximately 3.7 percent, according to the 2021 National Observer Program Report. According to NMFS officials, observers remain on board for the average 6- to 7-day trip in the Limited Access sector and the 1- to 3-day trip in the Limited Access General Category sector. Observers are funded through a combination of industry and federal funds. Fishers that carry an observer are permitted to harvest additional scallops beyond their initial allocation, which helps

offset the cost of paying for observers directly. This allocation of scallops is set aside by the fishery each season.

In April 2024, the fishery began using the Pre-Trip Notification System to assign observers, which is a web-based system that requires vessels to provide notification of upcoming trips. Vessels notify a maximum of 10 days in advance, and a minimum of 48 hours prior to the intended trip sail date and time. The system determines whether the vessel will be selected for observer coverage and either automatically waives vessels of the requirement or, if selected, contacts providers to connect them with the vessel.

Bycatch Data Collection and Estimates

According to New England Council representatives, NMFS uses two sources to develop bycatch estimates for the fishery: self-reported fisher data and data collected by observers. NMFS officials from the Greater Atlantic Region told us observer data, which is the primary source of bycatch data, is collected via paper logbooks and that a 6- to 7-day trip could result in 300 to 400 pages of bycatch data. They also said that observers record finfish bycatch and scallop discards by weight, and record turtle bycatch by number of individuals. The fishery did not use electronic monitoring as of June 2023.

According to NMFS officials, within 48 hours of returning from a trip, observers upload a subset of bycatch data to a NMFS database and within 90 days of the trip, the full set of data is subsequently uploaded to another database. According to New England Council representatives, the Science Center is responsible for data quality assurance and control of the data, as well as extrapolation of the data into bycatch estimates. New England Council representatives expressed some concerns about the data quality, but said that as of February 2023, the Science Center was developing a new data system to track bycatch data called the Catch Accounting Management System.

NMFS provides reports of the bycatch estimates it develops to the New England Council and the council has access to the NMFS databases, according to NMFS officials. However, council officials told us that the 4 to 4.5 months it takes for NMFS to process the data limits the council's ability to respond to real-time observations in the fishery that may require timely management shifts.

We asked NMFS for any available information on bycatch estimates for the fishery for 2018–2022. In response, NMFS provided us bycatch data—or recorded observations of bycatch from a subset of vessels—for

fish and protected species over that time period. The data did not reflect extrapolation in order to generate bycatch estimates for the fishery as a whole. These data included the total weight for each species of fish bycatch recorded, as well as the number of recorded incidental takes of protected species. We totaled the fish bycatch data and the incidental takes for the fishery. According to these data, the total observations of bycatch for fish in 2021 was 23,790,617 pounds. The total number of incidental takes for other bycatch in 2021 was 11.

West Coast Groundfish Fixed Gear Fishery

Fishery characteristics

National Marine Fisheries Service region: West Coast.

Regional Fishery Management Council: Pacific.

Permits (FY2021): 190 longline permits and 33 trap permits in the limited entry sector. Vessels within the limited entry sector of the West Coast groundfish fixed gear fishery are classified by whether they have a sablefish endorsement. Both subsectors target sablefish; however, the sablefish-endorsed subsector has its own limited access privilege and is managed separately. According to NMFS officials, vessels range from 15 feet to 92 feet long.

Observer coverage (2022): 41 percent of trips in the limited entry sector had an observer onboard, according to NMFS officials.

Examples of encountered bycatch: Yelloweye rockfish, halibut, seabirds.



Fixed gear vessel.

Target species: Groundfish, including sablefish, rockfish, and flatfish. Groundfish are a group of over 90 species of fish that live near the bottom of the ocean. In 2020, whole groundfish caught in the U.S. was one of the country's top valued seafood exports.

Fishing gear used: Pots and bottom longline gear. Pots are submerged traps that allow organisms to enter but make it difficult to escape. Bottom longline gear has a weighted mainline with baited hooks attached. Fishers leave both gear types in the water for a period of time before retrieving them.



Sablefish.

Sources: GAO analysis of interviews with National Marine Fisheries Service (text); GAO (boat image); National Marine Fisheries Service (fish image); Map Resources (map). | GAO-24-106336

Examples of Bycatch Reduction Measures

Biodegradable escape panels: Federal regulations require groundfish pots to have biodegradable escape panels to reduce bycatch in the event that a pot is lost.⁸ The escape panel is to be constructed with untreated cotton twine in such a manner that when the twine deteriorates, it will create an opening of at least 8 inches in diameter. This ensures that if a pot is lost, the escape panel will open after a relatively short period of time, leaving the pot open and preventing fish from becoming trapped.

Streamer lines and night-setting: According to NMFS officials from the West Coast region, a short-tailed albatross, which is listed as endangered under the Endangered Species Act, was caught as bycatch in the

⁸See 50 C.F.R. § 660.230(b)(4).

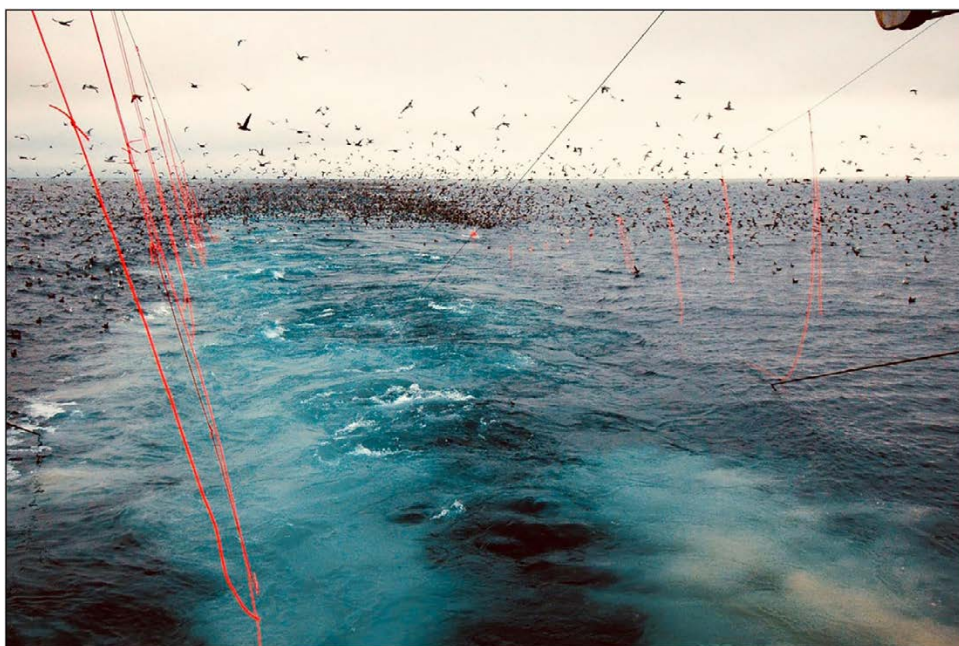
groundfish fixed gear fishery by longline fishers in 2011. They told us this bycatch triggered a review process for ways to mitigate the bycatch of seabirds in the future. According to NMFS officials from the West Coast region, seabird bycatch has historically been an issue in other U.S. longline fisheries, so officials tested existing bycatch measures for efficacy in the West Coast groundfish fishery. Specifically, officials tested and, in 2015, began requiring the use of streamer lines, also known as tori lines (see fig. 9).

Streamer lines are ropes with brightly colored streamers that hang from a high point on a vessel and out over the water. As fishers deploy longline gear from the vessel, the fishing line takes time to sink into the water. Seabirds are attracted to the baited hooks and are known to dive near the surface of the water to steal the bait off hooks as the line sinks, where they can become entangled and drown. The streamer lines function as a deterrent and scare seabirds away from the gear as fishers deploy it underneath the streamer lines, reducing their bycatch.

Pacific Council representatives also noted that the Council permitted an alternative seabird bycatch measure: fishing at night, also known as night-setting. This measure requires fishers to complete their fishing between one hour after sunset and one hour before sunrise. According to NMFS officials from the West Coast region, when researchers from the Oregon Sea Grant program were testing streamer lines, they heard anecdotes from longline fishers that there was typically less seabird bycatch when fishing at night.⁹ The NMFS officials told us, after reviewing observer data from the fishery, the researchers found night-setting resulted in less seabird bycatch.

⁹The National Sea Grant College program, established in 1966, consists of federal and university partnerships across the U.S. and works to create and maintain a healthy coastal environment and economy.

Figure 9: Streamer Lines



Source: National Marine Fisheries Service. | GAO-24-106336

According to NMFS officials and a stakeholder, staff from non-governmental organizations, like Oregon Sea Grant, can interact with fishers in a way that NMFS staff cannot, which helps improve collaboration with fishers during the research process. This in turn helped fisher buy-in and adoption of streamer lines. NMFS officials told us that once use of streamer lines or night-setting became required, NMFS and its partners—including the Sea Grant program, observers, and law enforcement—distributed free streamer lines and taught fishers to use them.

According to one stakeholder, vessels using longline gear will sometimes add floats to their lines, which decreases the effectiveness of streamer lines as a bycatch reduction measure. The stakeholder told us some fishers add the floats because they believe they will catch more fish when the longline is suspended slightly off the ocean floor. The floated longline gear, however, sinks more slowly such that the hooks can stay near the surface and accessible to seabirds beyond the reach of the streamer lines. As of 2024, NMFS and stakeholders are researching additional alternatives for vessels using longline gear with floats.

Fishery Observers

NMFS officials reported that they placed observers on 41 percent of trips in the limited entry sector of the West Coast groundfish fixed gear fishery in 2022. According to NMFS officials from the West Coast region, NMFS sets an observer coverage level each year based on the funding allocated to the region. Vessels are randomly selected to carry an observer, and their trips last an average of 1 to 5 days.

According to NMFS officials from the West Coast region, observers in the fishery are funded by federal funds. They told us the amount of funding they receive has generally been constant over the years and has not accounted for the increased costs of running the program because of inflation and a higher cost of living in the region. According to NMFS officials from the region, observers must cover ports along the entire West Coast, which is a logistical challenge. They also said that, without additional funding, observer coverage in the fishery may decrease in the future.

Bycatch Data Collection and Estimates

According to NMFS officials from the West Coast region, observers are the primary source of bycatch data for the fishery. They collect a range of data on both target catch and bycatch, but they primarily focus on bycatch. NMFS officials said that observers use electronic tablets to record data, though paper forms may still be used occasionally. They told us bycatch estimates based on the data are typically available about 9 months after the closure of the fishing year. The estimates are published in an annual groundfish mortality report and uploaded into a publicly accessible database maintained by the Northwest Fisheries Science Center.

According to NMFS officials from the West Coast region, the lag between when the data are collected and estimates are published means that the information is not available for the Pacific Council to make management decisions during the fishing season, such as in-season hotspot closures. NMFS officials told us they began to use preliminary observer data throughout the year to estimate in-season catch and bycatch totals to help increase the availability of bycatch estimates during the fishing season. They also noted that as of 2023, no electronic monitoring was used in the fishery.

We asked NMFS for any available information on bycatch estimates for the fishery for 2018–2022. In response, NMFS provided us bycatch estimates for the limited entry sablefish-endorsed sub-sector, including groundfish bycatch for 2018–2022, marine mammal bycatch for 2018–2021, and seabird bycatch for 2018. The bycatch estimates were

delineated by species. We totaled the groundfish landings and bycatch data for the fishery. In 2022, the West Coast groundfish fixed gear fishery landed approximately 716 metric tons of groundfish and discarded approximately 425 metric tons of groundfish. The discards included 3 metric tons of yelloweye rockfish and 42 metric tons of Pacific halibut, among other species. Other bycatch in the fishery included seabird bycatch and marine mammal bycatch. In 2018, this included an estimated 48 black-footed albatrosses and an estimate of 2.7 California sea lions.

Appendix III: Comments from the Department of Commerce



UNITED STATES DEPARTMENT OF COMMERCE
Office of the Chief Financial Officer and
Assistant Secretary for Administration
Washington, D.C. 20230

June 3, 2024

Mr. Cardell Johnson
Director
Natural Resources and Environment
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Johnson:

Thank you for the opportunity to review and comment on the Government Accountability Office's (GAO) draft report, *Federal Fisheries Management: Efforts to Reduce and Monitor Unintentional Catch and Harm Need Better Tracking* (GAO-24-106336).

The Department of Commerce agrees with GAO's recommendations directed to the National Oceanic and Atmospheric Administration. Enclosed is our response to the draft report.

Should you have any questions, please contact MaryAnn Mausser, GAO Liaison, at (202) 482-8120 or MMAusser@doc.gov.

Sincerely,

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Jeremy Pelter
Deputy Assistant Secretary for
Administration, Performing the non-exclusive
functions and duties of the Chief Financial
Officer and Assistant Secretary for Administration

Enclosure

Department of Commerce
National Oceanic and Atmospheric Administration
Response to the GAO Draft Report Entitled
*Federal Fisheries Management. Efforts to Reduce and Monitor Unintentional Catch
and Harm Need Better Tracking*
(GAO-24-106336, May 2024)

General Comments

The Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) appreciates the opportunity to review the Government Accountability Office's (GAO) report on Bycatch and Fisheries Management. GAO conducted a detailed review of this complex subject and highlighted challenges the agency faces in estimating and reporting bycatch in Federal fisheries. GAO thoroughly interviewed the regional experts to understand and characterize the various processes and challenges related to deploying observers across a wide variety of fisheries to gather data to estimate bycatch for a wide variety of fish, sea turtles, marine mammals, and seabird species. The report recognizes the efforts NOAA's National Marine Fisheries Service (NMFS) has made to improve the estimation and reporting of bycatch at regional and national levels despite limited resources to enhance those processes.

Bycatch monitoring is among the most expensive endeavors the agency undertakes, and this report highlights how the limited funding for bycatch reduction and monitoring impacts NMFS' ability to collect and analyze bycatch data, and how these funding constraints ultimately affect NMFS' ability to more accurately estimate and report on bycatch impacts in Federal fisheries. Consistent with the Magnuson-Stevens Act's statutory and regulatory requirements, NMFS recognizes that different bycatch estimation approaches and bycatch reporting methodology designs may be appropriate for different fisheries. NMFS and the Regional Fishery Management Councils (Councils) consider various factors when establishing or reviewing bycatch estimation approaches – including fishery bycatch characteristics, monitoring feasibility – and the degree of acceptable data uncertainty in light of particular fishery monitoring needs.

NOAA concurs with the finding that NMFS should communicate to the Councils the specific resources needed to address bycatch monitoring objectives identified by NMFS and the Councils. The identification of bycatch monitoring objectives is an ongoing process that could benefit from additional evaluation at the national level to: 1) ensure NMFS' statutorily required and highest priority monitoring needs are being addressed with current resources; and 2) articulate needed resources for specific objectives related to monitoring data gaps. NMFS will aim to better inform stakeholders regarding those needs.

NMFS also notes that observers are a discretionary measure under the Magnuson-Stevens Act, and bycatch information may come from observers, electronic monitoring and reporting technologies, and/or self-reported mechanisms (e.g., vessel logbooks, recreational sampling, etc.). NMFS manages fisheries using the best scientific information available, as required by the Act.

NOAA agrees with GAO's recommendations to improve tracking bycatch performance and reporting. NOAA is in the process of addressing some of the GAO's recommendations via the

Department of Commerce
National Oceanic and Atmospheric Administration
Response to the GAO Draft Report Entitled
*Federal Fisheries Management. Efforts to Reduce and Monitor Unintentional Catch
and Harm Need Better Tracking*
(GAO-24-106336, May 2024)

development of a working group to revise the National Bycatch Reduction Strategy Implementation Plan. NOAA plans to report its progress in developing an enhanced National Bycatch Report database, which will be incorporated into the NMFS Fisheries One Stop Shop (FOSS) database¹ to share bycatch estimates.

NOAA Response to GAO Recommendations

The draft report made four recommendations pertaining to NOAA.

Recommendation 1: “The Assistant Administrator for NMFS should gather information from across the regions to identify any additional resources needed to support fisheries observers, and communicate these needs to relevant stakeholders, including Congress.”

NOAA Response: NOAA agrees with this recommendation. Monitoring coverage in fisheries involves both regulatory-required levels and additional discretionary monitoring scaled to available funding. NMFS continuously assesses its ability to meet these objectives within budget constraints and commits to transparently articulating costs associated with evolving or new objectives to enhance public understanding and inform decision-making processes.

Recommendation 2: “The Assistant Administrator for NMFS should develop an updated National Bycatch Reduction Strategy Implementation Plan with measurable performance goals tied to specific time frames.”

NOAA Response: NOAA agrees with this recommendation. The current National Bycatch Reduction Strategy Implementation Plan outlined tasks to implement the strategy for the years 2020-2024. To prepare for the next iteration of the implementation plan, NMFS has already initiated an internal discussion to evaluate the existing implementation tasks and update them, as needed. We intend to focus on measurable performance goals over the next 5-year plan based on resource availability. Where appropriate, NMFS will consider the development of measurable goals with more specific timeframes to more easily track progress.

Recommendation 3: “The Assistant Administrator for NMFS should develop a process for tracking progress toward the performance goals in the updated National Bycatch Reduction Strategy Implementation Plan, and use the information to guide agency decision-making.”

NOAA Response: NOAA agrees with this recommendation. As NMFS evaluates ongoing resource availability and is developing the 2025-2029 National Bycatch Reduction Strategy Implementation Plan, we plan to discuss more timely and regular tracking of the tasks and

¹ www.fisheries.noaa.gov/foss/f?p=215:200:::

**Appendix III: Comments from the Department
of Commerce**

**Department of Commerce
National Oceanic and Atmospheric Administration
Response to the GAO Draft Report Entitled
*Federal Fisheries Management. Efforts to Reduce and Monitor Unintentional Catch
and Harm Need Better Tracking*
(GAO-24-106336, May 2024)**

metrics associated with the relevant NMFS headquarters offices, regional offices, and science centers in a way that can inform decision-making.

Recommendation 4: “The Assistant Administrator for NMFS should develop a comprehensive written plan for reporting on bycatch estimates from the enhanced Fisheries One Stop Shop database, including how the agency will communicate over time on bycatch levels, trends, and information gaps.”

NOAA Response: NOAA agrees with this recommendation. The NOAA Technical Memorandum, “Bycatch Estimation Methodologies used for the National Bycatch Report Database,” planned for publication by early May 2024, includes a section, “The Future of the National Bycatch Report (NBR),” that reads as follows:

“In an effort to make the NBR more timely and useful for stakeholders and the public, NMFS will no longer publish national hard-copy reports that include bycatch estimates for all NBR fisheries over the same set of years. Rather, NMFS will develop an enhanced NBR database, which will be incorporated into the NMFS Fisheries One Stop Shop (FOSS) database² as the main vehicle for sharing bycatch estimates for these fisheries. NMFS staff are in the process of establishing linkages between regional bycatch estimate databases and FOSS to increase the efficiency of the data input process. NMFS staff are also exploring automated quality assurance and quality control procedures of data inputs.

NMFS still recognizes the need to actively share information about NBR bycatch estimates with the public. Therefore, beginning in 2025, by the end of March, and annually thereafter, NMFS, based on resource availability, plans to publish an online report describing, for the prior calendar year bycatch estimate data sets, trends, and changes in monitoring and estimation methodologies. The updated NBR database and public portal in FOSS will support timely communication of bycatch-reduction progress to Congress, stakeholders, and the public.”

² www.fisheries.noaa.gov/foss/f?p=215:200:::

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

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Staff Acknowledgments

In addition to the contact named above, Scott Heacock (Assistant Director), Rebecca Sandulli (Analyst in Charge), Archie Scoville, and Ulana Bihun made key contributions to this report. Also contributing to the report were Cindy Gilbert, Benjamin Licht, Matt McLaughlin, Patricia Moye, Danny Royer, and Craig Starger.

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