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Review of Standardized Bycatch Reporting Methodology for the Gulf of Mexico and Joint Gulf of Mexico-South Atlantic Fishery Management Plans

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Review of Standardized Bycatch Reporting Methodology for the Gulf of Mexico and Joint Gulf of Mexico-South Atlantic Fishery Management Plans

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ABBREVIATIONS USED IN THIS DOCUMENT

ACL	annual catch limit
APAIS	Access Point Angler Intercept Survey
ASMFC	Atlantic States Marine Fisheries Commission
BiOp	biological opinion
BRD	Bycatch Reduction Device
cELB	Cellular Electronic Logbook
CFLP	Coastal Fisheries Logbook Program
CHTS	Coastal Household Telephone Survey
CMP FMP	Fishery Management Plan for Coastal Migratory Pelagic Resources in the Gulf of Mexico and Atlantic Region
CMP	Coastal Migratory Pelagic
C.F.R.	Code of Federal Regulations
Coral FMP	Fishery Management Plan for Coral and Coral Reefs of the Gulf of Mexico
CV	Coefficient of Variation
DCNR MRD	Alabama Department of Conservation and Natural Resources, Marine Resources Division
DPS	distinct population segment
EEZ	exclusive economic zone
ELB	Electronic Logbook
ESA	Endangered Species Act
FES	Fishing Effort Survey
FMP	fishery management plan
FWC	Florida Fish and Wildlife Conservation Commission
GMFMC	Gulf of Mexico Fishery Management Council
GRFOP	Gulf Reef Fish Observer Program
GRFS	Gulf Reef Fish Survey
GT-IFQ	Grouper-Tilefish Individual Fishing Quota
Gulf Council	Gulf of Mexico Fishery Management Council
Gulf	Gulf of Mexico
HMS	Highly Migratory Species
IFQ	Individual Fishing Quota
LDWF	Louisiana Department of Wildlife and Fisheries
LL	Longline
Logbook	Southeast Coastal Fisheries Trip Report Form
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MDMR	Mississippi Department of Marine Resources
MMPA	Marine Mammal Protection Act
MRFSS	Marine Recreational Fisheries Statistics Survey
MRIP	Marine Recreational Information Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOP	National Observer Program

OST	Office of Science and Technology
PSE	Proportional Standard Error
Red Drum FMP	Fishery Management Plan for Red Drum in the Gulf of Mexico
Reef Fish FMP	Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico
RS-IFQ	Red Snapper Individual Fishing Quota
SAFMC	South Atlantic Fisheries Management Council
SBRM	Standardized Bycatch Reporting Methodology
SD	Standard Deviation
SDDP	Supplementary Discard Data Program
SEDAR	Southeast Data Assessment and Review
SEFHIER	Southeast For-Hire Integrated Electronic Reporting Program
SEFSC	Southeast Fisheries Science Center
SERO	Southeast Regional Office
SFA Amendment	Sustainable Fisheries Act Amendment
Shrimp FMP	Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico
South Atlantic Council	South Atlantic Fishery Management Council
Spiny Lobster FMP	Fishery Management Plan for Spiny Lobster in the Gulf of Mexico and the South Atlantic
SRHS	Southeast Region Headboat Survey
SSC	Scientific and Statistical Committee
STSSN	Sea Turtle Strandings and Salvage Network
TED	Turtle Excluder Device
TL	Total length
TPWD	Texas Parks and Wildlife Department

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EXECUTIVE SUMMARY

All fishery management plans (FMP) must establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, the purpose of which is to collect, record, and report bycatch data. The Gulf of Mexico Fishery Management Council (Gulf Council) has specified Standardized Bycatch Reporting Methodologies (SBRM) for all its Gulf Council and Joint FMPs with the South Atlantic Fishery Management Council. A final rule, effective on March 21, 2017, requires Regional Fishery Management Councils (Councils) to explain, in an FMP or a fishery research plan, how the current SBRMs meet the statutory purpose of an SBRM based on an analysis of four required considerations. The Councils, in consultation with the National Marine Fisheries Service (NMFS), must review the current SBRMs within five years of the final rule effective date, and must conduct follow up reviews at least once every five years. A workgroup consisting of individuals from the NMFS Southeast Regional Office, NMFS Southeast Fisheries Science Center, and the Gulf Council, using the four criteria outlined in the final rule, has analyzed the current SBRMs in this document. This report uses data from the 2015-2019 fishing years where available, as in most cases it represents the most recent and complete dataset available. In cases where 2015-2019 data is not available or complete, a summary of the most recent years' data available (where applicable) is used. The information included in this document constitutes the review required by the SBRM final rule.

CHAPTER 1. INTRODUCTION

1.1 Background

The National Marine Fisheries Service (NMFS), including the Southeast Regional Office (SERO) and Southeast Fisheries Science Center (SEFSC), is responsible for the conservation, management, and protection of marine resources and their habitat in the exclusive economic zone (EEZ) of the southeastern United States. NMFS works cooperatively with the Gulf of Mexico Fishery Management Council (Gulf Council [from Texas to western Florida]), South Atlantic Fishery Management Council (South Atlantic Council [from North Carolina to eastern Florida including the Atlantic side of the Florida Keys]), and Caribbean Fishery Management Council to accomplish regional fisheries management goals. In combination, the Councils have developed, and NMFS has approved and implemented, 14 fishery management plans (FMP), many of which manage diverse species complexes such as reef fish or corals as a unit. The Gulf Council and South Atlantic Council jointly manage two of these FMPs (Coastal Migratory Pelagics and Spiny Lobster).

1.2 What is bycatch and how is it recorded/monitored by NMFS?

Under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), bycatch is defined as "fish which are harvested in a fishery, but which are not sold or kept for personal use and includes economic discards and regulatory discards." The term "fish" under the Magnuson-Stevens Act means "finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds." Thus, species that meet the MSA definition of fish and are captured and released are referred to as "discards" or "bycatch" in this document. For example, the definition of fish is inclusive of sea turtles.

Bycatch includes economic discards of fish that are caught but discarded because of low market value due to size, sex, quality, or for other economic reasons. Bycatch also includes regulatory discards, which are fish that are discarded because regulations do not allow fishermen to retain the fish. For example, bycatch can result from prohibitions intended to reduce or eliminate directed fishing pressure on vulnerable stocks or species. In other cases, bycatch results from regulations such as size limits designed to protect spawning individuals or those that have not yet had a chance to grow to marketable size and/or spawn.

For species protected under the Endangered Species Act (ESA), bycatch is a type of "take." The ESA defines take as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Bycatch of ESA-listed species is a form of incidental take, i.e. an unintentional, but not unexpected, taking. While "take" is generally prohibited for species protected under the ESA, there are some exceptions. Section 7 of the ESA provides for the exemption for the incidental take of listed species that result from federal actions that NMFS or the Fish and Wildlife Service have found are not likely to jeopardize the continued existence of the species. With respect to federal fisheries, the incidental take of listed species is authorized through the incidental take statement in a biological opinion on the fishery.

As noted previously, the Magnuson-Stevens Act definition of fish excludes marine mammals. NMFS manages bycatch of marine mammals separately under the Marine Mammal Protection Act (MMPA). The MMPA includes its own program to authorize and manage the take of marine mammals incidental to commercial fishing operations.

National Standard 9 of the Magnuson-Stevens Act provides that "[c]onservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch." 16U.S.C. 1851(a)(9). To achieve this goal, each FMP must: "Establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority—(A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided" 16 U.S.C. § 1853(a)(11). With regard to bycatch reporting, the National Standard 9 Guidelines state: "A review and, where necessary, improvement of data collection methods, data sources, and applications of data must be initiated for each fishery to determine the amount, type, disposition, and other characteristics of bycatch and bycatch mortality in each fishery for purposes of this standard and of section 303(a)(11) and (12) of the Magnuson-Stevens Act" 50 C.F.R. § 600.350(d)(1).

There are a variety of standardized methods for monitoring bycatch. The most appropriate methods depend on the conservation and management objectives of the fishery, the data uncertainty associated with the standardized bycatch reporting methodology (SBRM), and feasibility of collecting the data from cost, technical, and operational perspectives.

In January 2017, NMFS published a final rule that established requirements and provided guidance on the development, documentation, and review of SBRMs (82 FR 6317, January 19, 2017). The regulations implemented by the final rule define "*standardized reporting methodology*" as "an established procedure or procedures used to collect, record, and report bycatch data in a fishery, which may vary from one fishery to another." This definition notes that bycatch assessment is not part of the SBRM, but must be considered when establishing an SBRM. 50 C.F.R. § 600.1605(a)(1). The regulations recognize that due to the inherent diversity of fisheries, different standardized reporting methodologies may be appropriate for different fisheries. 50 C.F.R. § 600.1610(a)(2). The purpose of this document is to review SBRMs that are currently in place for fisheries managed by the Gulf Council, including those managed jointly with the South Atlantic Council, according to the criteria established in the final rule.

1.3 Overview of Bycatch Reporting

The regulations require that NMFS and a Fishery Management Council must consider four criteria when establishing or reviewing SBRMs: (1) the characteristics of the bycatch occurring in the fishery, (2) the feasibility of the methodology from cost, technical and operational perspectives, (3) the uncertainty of the data resulting from the methodology, and (4) how the data resulting from the

SBRM Review Criteria

1. Bycatch characteristics
2. Feasibility of methodology (cost, technical, operational)
3. Data uncertainty
4. Data use for assessing amount and type of bycatch

methodology are used to assess the amount and type of bycatch occurring in the fishery. 50 C.F.R. § 600.1610(a)(2)(i)-(iv). Recognizing that there may be a need to adjust how an SBRM is implemented, the regulations also directs the Fishery Management Council to consider how the implementation of an SBRM may be adjusted while still meeting its purpose and suggest that a Fishery Management Council provide guidance to NMFS on how to adjust the implementation of the SBRM consistent with the FMP. 50 C.F.R. § 600.1610(a)(1).

All FMPs must be consistent with the SBRM regulations by February 21, 2022. 50 C.F.R. § 600.1610(b). Therefore, the Gulf Council, in coordination with NMFS, must conduct an initial review of its existing FMPs. This document is the initial review of existing FMPs. After the initial review, the Gulf Council, in consultation with NMFS, should conduct a review of standardized reporting methodologies at least every five years. The review should provide information to determine whether the Gulf Council needs to amend any of its FMPs. Any amendments or changes to FMPs that are required as outlined in this document and by the Gulf Council and its Scientific and Statistical Committee reviews are required to be implemented by February 22, 2022.

Characteristics of the bycatch occurring in the fishery

When evaluating an SBRM, a Fishery Management Council in cooperation with NMFS must consider information about the characteristics of bycatch in the fishery when available, including, but not limited to, the amount of bycatch occurring in the fishery, the importance of bycatch in estimating the fishing mortality of fish stocks, and the effect of bycatch on ecosystems. 50 C.F.R. § 600.1610(a)(2)(i). In concert, these considerations will design the most appropriate reporting methodology (i.e., SBRM) for a specific fishery or fishery sector. The amount of bycatch may vary in different fisheries or sectors and depends on how the fishery or sector operates, including fleet size, gear types used, gear selectivity, fishing effort, fishing location, and market conditions. The importance of bycatch in estimating the fishing mortality will depend on the amount of bycatch occurring in the fishery and the level of uncertainty associated with those bycatch data. For example, if bycatch represents a very small fraction of total fishing mortality estimates, it may be less important if there is a lot of uncertainty around the bycatch data than if the bycatch is a substantial portion of fishing mortality. Information about the effect of bycatch on the ecosystem could also affect the choices that a Fishery Management Council makes about establishing or amending its SBRM.

Feasibility of the SBRM

The regulations require that an SBRM be feasible from cost, technical, and operational perspectives. Data collection, reporting, and recording procedures can be expensive and logistically challenging to design and implement. Therefore, it is reasonable and appropriate for a Fishery Management Council and NMFS to analyze issues of feasibility when considering or reviewing an SBRM and to ultimately choose a methodology that is feasible (i.e., capable of being implemented) from cost, technical, and operational perspectives. 50 C.F.R. § 600.1610(a)(2)(ii). Feasibility constraints could arise on a periodic basis that may require adjustment of the established SBRM, but continue to allow the SBRM to meet its purpose described in 50 C.F.R. § 600.1600. For example, the level of funding for observer coverage may

vary from year to year and NMFS (and perhaps a Fishery Management Council for more long-term issues) may need to consider approaches for prioritizing resources or adjusting the SBRM in the case of a funding shortfall.

Data uncertainty resulting from the SBRM

The regulations require the Gulf Council in cooperation with NMFS to design the SBRM so that the uncertainty associated with the resulting bycatch data can be described, quantitatively or qualitatively. 50 C.F.R. § 600.1610(a)(2)(iii). The regulations recognizes that different degrees of data uncertainty may be appropriate for different fisheries. Understanding the uncertainty of the bycatch data will assist Fishery Management Councils in developing conservation management measures that, to the extent practicable minimize bycatch, and minimize the mortality of bycatch. For example, a Fishery Management Council may choose to adopt measures that are more conservation-based in instances where bycatch data are a large component of fishing mortality and are highly uncertain.

Data use to assess amount and type of bycatch

The regulations require a Council to consider how the data resulting from a SBRM are used to assess the amount and type of bycatch occurring in the fishery. Bycatch assessment is not part of an SBRM; however, a Fishery Management Council does need to consider it. 50 C.F.R. §§ 600.1600 and 600.1610(a)(2)(iv). The distinction between the SBRM and bycatch assessment clarifies that the policy choices related to statistical and technical approaches for estimating bycatch, which are inherently scientific and data dependent, should not be confused with the policy choices associated with developing measures to minimize bycatch.

The SBRM proposed rule (81 FR 9413, 9,414, February 25, 2016) mentions several steps leading to the development of conservation and management measures to minimize bycatch and bycatch mortality to the extent practicable. First, bycatch data are collected, recorded, and reported pursuant to an SBRM. Second, bycatch data from an SBRM, as well as other information about the fishery, are used to assess (i.e., evaluate or estimate) the amount and type of bycatch in a fishery. Third, bycatch assessments, evaluations, or estimates are used, sometimes in conjunction with the stock assessment process, to inform Fishery Management Councils as they develop conservation and management measures to minimize bycatch and bycatch mortality to the extent practicable.

To address how the data from the SBRM will be used, a Fishery Management Council must consult with its Scientific and Statistical Committee (SSC) and the regional NMFS science center, as appropriate, on reporting methodology design considerations such as data elements, sampling designs, sample sizes, and reporting frequency. 50 C.F.R. § 600.1610(a)(2)(iv). Information provided through the consultation process will enable a Fishery Management Council to develop an SBRM that incorporates scientific input and that will provide data that can be used to assess the amount and type of bycatch occurring in the fishery. In the design of an SBRM, the Fishery Management Council should also consider the scientific methods and techniques available to collect, record, and report bycatch data that could improve the quality of bycatch estimates. 50 C.F.R. § 600.1610(a)(2)(iv).

1.4 Overview of Bycatch Reporting

The southeast region contains predominantly multi-species fisheries, with relatively high commercial and recreational fishing pressure. Commonly used gear types include handlines, electric rigs, longlines, trolling rigs, traps, trawls, gillnets, and spears. Management regulations such as size, trip, and bag limits may produce relatively high levels of discards in both the recreational and commercial sectors. **Table 1.4.1** specifies the various reporting programs applicable to each fishery management unit. The operational programs in this table are detailed in Section 1.4.1 and 1.4.2.

Table 1.4.1. Discard reporting programs by region and fishery management unit. "n/a" indicates not applicable.

Fishery Management Unit	Recreational						Commercial	
	Headboat Observer	MRIP / FES	Louisiana Dept. of Natural Res	Texas Parks and Wildlife Dept.	FL Fish and Wildlife Comm.	Headboat Survey	Commercial Observer	Discard Logbook
Gulf of Mexico								
Reef Fish	No	Yes, except for sea turtles	Yes, except for sea turtles	No	Yes, on for-hire vessels	Yes	Yes	Yes
Coral and Coral Reefs	No coral fishery. Coral must be recorded in discard logbook if captured in reef fish or CMP fishery.							
Shrimp	No recreational fishery						Yes	n/a
Red Drum	No federal red drum fishery. Red drum must be recorded in discard logbook if captured in reef fish or CMP fishery.							
Joint South Atlantic and Gulf								
Coastal Migratory Pelagics	No	Yes, except for sea turtles	Yes, except for sea turtles	No	Yes, on for-hire vessels	Yes	Yes, Gillnet only	Yes
Spiny Lobster	No	No	No	No	Yes	No	No	Yes

MRIP/FES – Marine Recreational Information Program/Fishing Effort Survey

1.4.1 Recreational Reporting Programs

Marine Recreational Information Program / Fishing Effort Survey

In 1979, the Marine Recreational Fishery Statistics Survey (MRFSS) was established to estimate the impact of recreational fishing on marine resources. In 2008, the Marine Recreational Information Program (MRIP) replaced MRFSS to meet increasing demand for more precise, accurate, and timely recreational catch estimates. MRIP is a state-regional-federal partnership that uses a network of surveys to estimate total recreational fishing catch. MRIP does not collect data on sea turtle bycatch. Through these surveys, anglers and captains report the number of

recreational fishing trips taken and the number of finfish caught to NMFS and state and regional partners.

MRIP covers Gulf of Mexico (Gulf) coastal states from Florida to Mississippi, and provides estimated landings and discards for six 2-month periods (waves) each year. The survey provides estimates for three recreational fishing modes: shore based fishing, private and rental boat fishing, and for-hire charter and guide fishing.

MRIP uses two independent but complementary surveys to estimate recreational catch, effort, and participation. Until 2013, these surveys were the Coastal Household Telephone Survey (CHTS), which collected information about recreational fishing activity from households and for-hire vessel operators, and an angler intercept survey, which collected information about the finfish that were caught. In 2013, NMFS implemented a new Access Point Angler Intercept Survey (APAIS) to remove sources of potential bias from the sampling process. In 2015, in effort to improve efficiency and minimize the risk of error in private boat and shore effort estimates, NMFS launched a new household Fishing Effort Survey (FES), which collects information from Gulf fishermen by mail. MRIP determined that FES was superior in estimating effort and replaced CHTS with FES in 2018.

The estimate surveys (MRFSS/MRIP/APAIS/FES) classify recreational finfish catch into the following categories: Type A - Fishes that were caught, landed whole, and available for identification and enumeration by the interviewers; and Type B - Fishes that were caught but were either not kept or not available for identification. Type B1 - Fishes that were caught and filleted, released dead, given away, or disposed of in some way other than Types A or B2. Type B2 - Fishes that were caught and released alive, represent bycatch information for the private angler component of the recreational sector.

Southeast Region Headboat Survey / Headboat Observer

The Southeast Region Headboat Survey (SRHS) is administered by the Beaufort Laboratory of the NMFS SEFSC. The SRHS samples recreational headboats, wherein fishermen pay by the "head" and boats typically carry more than six passengers. The survey has operated along the southeast U.S. Atlantic since 1972 and in the Gulf since 1986. The SRHS data consist of trip-level logbook records submitted by captains and biological samples collected dockside by professional port agents. Fitzpatrick et al. (2017) documents the history, protocols, and methodological changes of the SRHS over time.

The SRHS requires collection of bycatch data in electronic logbooks. As noted below, as of January 2021, the owner or operator of a charter vessel or headboat for which a federal charter vessel/headboat permit for Gulf reef fish or Gulf coastal migratory pelagic (CMP) species, and whose vessel is operating as a charter vessel or headboat, regardless of fishing location, must submit an electronic fishing report of all fish harvested and discarded. In addition, if selected by the NMFS SEFSC, the owner or operator of a vessel for which a charter vessel/headboat permit for Gulf reef fish has been issued must report to the SRHS. The electronic fishing report must be submitted via NMFS approved hardware and software, as posted on the NMFS Southeast Region website. Completed electronic fishing reports must be submitted prior to removing any fish from

the vessel. If no fish were retained by any person on the vessel during a trip, the completed electronic fishing report must be submitted within 30 minutes of the completion of the trip, *e.g.,* arrival at the dock. While at-sea observers have been used by SRHS for past studies, no at-sea observer program has covered SRHS in the Gulf in recent years. All bycatch data are self-reported in the vessel trip logbook.

Southeast For-Hire Electronic Reporting Program

In January 2021, NMFS implemented the Southeast For-Hire Integrated Electronic Reporting (SEFHIER) Program, which implemented mandatory electronic reporting of for-hire (charter, headboat) vessel catch data for over 3,000 vessels in the Gulf and South Atlantic. The purpose of this program is to provide more accurate and reliable fisheries information about for-hire catch, effort, and discards. Operators of vessels with federal for-hire permits are required to report all catch (including protected sea turtles, ESA-listed fish, sea birds, marine mammals, etc.). Electronic reporting can provide more timely, accurate, and reliable information for species with low catches, low annual catch limits, or rarely encountered species. Because of the recent date of implementation, the efficacy of the data collected from the program in improving the quality of catch reporting has not yet been analyzed.

Louisiana Department of Wildlife and Fisheries Creel Survey

Beginning in 2014, the Louisiana Department of Wildlife and Fisheries (LDWF) replaced MRIP in their state with a quota monitoring survey designed to estimate the number of select reef fish landed in Louisiana. The program is referred to as "LA Creel." Dockside interviews are conducted by state personnel at sites commonly reporting offshore species. Anglers are asked questions about where they fished, length of their trip, number and species of finfish caught, number and species of finfish discarded, etc. To estimate fishing effort of private anglers, LDWF personnel contact a random portion of those anglers holding a Louisiana Recreational Offshore Landing Permit by phone and/or e-mail on a weekly basis. Anglers and charter captains are also called weekly and emailed to interview them about their fishing activities from the previous week. Together, these data provide information to calculate landings and effort estimates. The program design has been tailored to fit Louisiana's fisheries and coastal areas. Survey sites have been stratified to account for inshore versus offshore fishing activities. Estimated landings for fish species are produced based on observed catch rates, average weights, and estimated fishing effort (as adjusted for persons not possessing an offshore landing permit). Since the end of 2015, LA Creel has been the only recreational catch and effort survey in Louisiana, effectively replacing MRIP. LA creel is the only survey collecting discard data in Louisiana, and this survey only collects data on finfish discards, not sea turtles, other protected resources, or invertebrates.

Mississippi Department of Marine Resources

In 2014, the Mississippi Department of Marine Resources (MDMR) enacted a regulatory requirement for private and for-hire vessels to report all red snapper harvest regardless of waters fished and began development of an alternative survey design to accommodate required reporting of red snapper catches, with the goal of improved monitoring of red snapper catches

with respect to annual catch limits. In 2015, MDMR began development of the "Tails n' Scales" mobile application to facilitate required reporting and effective enforcement of reporting requirements.

In 2014, MDMR introduced a regulation that required private boat and for-hire vessel representatives to report all red snapper harvested and released. The Tails n' Scales survey design consists of two complimentary components: the Tails n' Scales reporting system and an access point intercept survey. Through a capture-recapture sampling approach, catch and effort information reported by anglers through the Tails n' Scales system is validated and corrected using information from the intercept survey, In using a capture-recapture approach, the assumption is made that access point intercept surveys and Tails n' Scales reporting are conducted independently. Compliance is maintained through strict enforcement of the red snapper reporting requirements. Tails n' Scales is only used in reporting red snapper and bycatch while targeting red snapper, although the program has recently begun requesting information from anglers on greater amberjack. MDMR does not operate similar programs that estimate catch of other recreational species, so these estimates are obtained through MRIP.

For all reef fish species aside from red snapper (and soon greater amberjack), recreational catch and bycatch in Mississippi is estimated from MRIP-FES. Mississippi does not collect bycatch data on sea turtles.

Texas Parks and Wildlife Department

The Texas Parks and Wildlife Department (TPWD) has been operating its own creel surveys for saltwater anglers since 1974. Survey methods were adjusted to the current format, which was adopted in 1983. Surveys are conducted seasonally throughout the year based on a high-use (May 15 – November 20) and low-use season (November 21 – May 14). Information is collected from private recreational and for-hire fishermen through dockside intercepts that provide data to estimate landings and effort. TPWD also counts empty boat slips and boat trailers at public access points to estimate the number of fishing trips being taken. Trips originating from and/or returning to private access points are not accounted for. TPWD partners with the Harte Research Institute to supplement its creel data with catch and effort data supplied from the "iSnapper" program. iSnapper requests private anglers and charter captains to electronically report information (including red snapper catch and bycatch, depths fished, effort, etc.) through an app or website after every trip. TPWD asks shore-based coastal anglers to provide information on their landed catch and fishing effort. Only species that are captured and kept are included in the survey. Thus, no information on turtles or ESA-listed fish is collected. These surveys are done periodically based on previous months' angler count data to determine if the proportion of landings from shore and vessel remain the same.

Florida: State Reef Fish Survey

Florida implemented the multispecies Gulf Reef Fish Survey (GRFS) in May of 2015, which became the State Reef Fish Survey (SRFS) in July of 2020. GRFS received its MRIP certification of the methodology in December of 2018. Information is collected from private recreational anglers and includes thirteen reef fish species: red snapper, greater and lesser

amberjack, almaco jack, banded rudderfish, gray triggerfish, mutton snapper, yellowtail snapper, vermilion snapper, gag, red and black grouper, and hogfish. The survey is voluntary but Florida-licensed saltwater fishermen that intend to fish for or harvest certain reef fish from a private vessel are required to get a free angler endorsement for the program, which acts to identify the sample universe. Similarly designed to the MRIP survey, the SRFS runs side-by-side with MRIP using angler interview data from both surveys; SRFS requests catch data through random angler intercepts and gathers effort data through a statistically designed mail survey.

In addition, since 2009, the Florida Fish and Wildlife Conservation Commission's (FWC) Fishery Dependent Monitoring Program has run a voluntary at-sea observer program aimed at collecting catch and bycatch data on for-hire state vessels in Florida waters of the Gulf, the Florida Keys, and the Florida east coast. The program collects data by placing observers on charter and headboats with state and federal issued permits that volunteer to participate in this program. The program covers an average of about 40 trips per month on the west coast of Florida and about 10-12 trips per month in the Florida Keys (Oscar Ayala, FWC; Personal Communication). The program attempts to cover any for-hire fishery that occurs in state and federal waters. Observers on headboats concentrate their efforts on eight or more random anglers aboard the vessel, and document (and sometimes sample) all catch by those anglers, including bycatch of fish and turtles. In addition, ESA listed fish or sea turtle species that are caught by any angler aboard the vessel, if seen by the observer, are recorded. Observers on charter vessels generally record all catch and bycatch for all anglers aboard. On all observed trips, observers record data on location fished (within 1 mile), depth, gear used, weather, hook location, fish size, and release condition, in addition to identifying and recording all fish and sea turtle interactions and bycatch. In addition, observers are trained to tag certain managed species that are caught and released, record predation/depredation on fish, and record if venting or descending devices were used in release. The data collected by this program enables scientists to provide a catch per unit effort for anglers aboard charter and headboat vessels. Although the program is currently unable to extrapolate this data to the entire fishery because there is no reliable estimate for the total number of for-hire trips that occur in Florida waters, scientists are hopeful that the NOAA SEFHIER program will provide additional data to make this possible in future years.

Alabama Department of Conservation and Natural Resources, Marine Resources Division

Since 2014, the Alabama Department of Conservation and Natural Resources, Marine Resources Division (DCNR MRD) has worked with the Gulf States Marine Fisheries Commission, NOAA Fisheries, and others to develop and refine "Snapper Check", which collects data on red snapper catch on private and charter boats. In 2021, the program also began requiring fishermen to report data on captured gray triggerfish and greater amberjack. The Snapper Check survey design for charter and private boat fishing consists of two complementary components: an electronic reporting system and a dockside access point intercept survey. Through a capture-recapture survey design, catch and effort information reported electronically by anglers is validated and corrected using information observed through a dockside intercept survey.

The captain or owner of any recreational or charter vessel in the waters of the State of Alabama must report the harvest of red snapper, gray triggerfish, and greater amberjack to the Alabama

DCNR MRD prior to landing. The captain/owner of each recreational or charter vessel possessing any of these species must include the vessel identification number provided or specified by the Marine Resources Division, the total number of fishermen onboard the vessel, whether fishermen were required to be licensed or not, the total number of red snapper, gray triggerfish, and greater amberjack onboard and the total number of these species that were dead or floating when discarded.

1.4.2 Commercial Reporting Programs

Commercial Logbook Program

The SEFSC currently operates the Coastal Fisheries Logbook Program (CFLP), which requires operators in the Gulf with a federal commercial reef fish or CMP permit to fill out the Southeast Coastal Fisheries Trip Report Form (logbook) for each trip taken. Logbook requirements include information on the quantity (in pounds) kept for each species, the area of catch, the type and quantity of gear, the date of departure and return, the dealer and location (county and state where the trip is unloaded), the duration of the trip (time away from dock), an estimate of the fishing time, and the number of crew. The purpose of the program is to provide a consistent data collection methodology for vessels that have federal permits in the Southeast Region. No information on bycatch is collected in the logbook.

In August 2001, the SEFSC initiated the Supplementary Discard Data Program (SDDP) to address bycatch reporting in Southeast fisheries. The SEFSC developed a supplemental form that is used with the CFLP logbook to collect discard data as mandated by the Sustainable Fisheries Act. Fishermen with Gulf reef fish and CMP permits are required to complete the discard logbook when selected. The report includes data collection on numbers and average size of any discarded catch by species, including sea turtles and ESA-listed fish species (**Table 1.4.2**). The discard form is not prepopulated with likely bycatch species, and thus any species that is discarded may be, and is required to be, entered on the form. A random sample of 20% of all commercial permit holders within a gear type are selected; fishermen are not selected for the next four years after they submit a discard form for a year. Therefore, over a five-year period, 100% of permit holders in these fisheries will have been required to report in one of the five years. Non-reporting is a known issue – captains can send back a form checking the "no discards" box and still be in compliance. This happens at a high rate in the Gulf (over 50% of trips) in both reef fish and CMP trips (SEFSC; personal communication). Due to the assumed prevalence of non-reporting and underreporting, there are limitations on the utility of discard data from commercial logbooks, but they are used are used in stock assessments in assessments for reef fish and CMP species. Although information is collected on sea turtle and ESA-listed fish interactions, they are not considered reliable due to infrequency of reports.

Table 1.4.2. ESA-listed fish species that occur in at least a portion of the Gulf of Mexico

Common Name	Scientific Name	Threatened or Endangered
Giant Manta Ray	*Manta birostris*	Threatened
Gulf sturgeon	*Acipenser oxyrichus desotoi*	Threatened
Nassau grouper	*Epinephelus striatus*	Threatened
Oceanic whitetip shark	*Carcharhinus logimanus*	Threatened

Smalltooth sawfish, U.S. DPS	*Pristis pectinata*	Endangered

Observer Programs

NMFS deploys fishery observers to collect catch and bycatch data from U.S. commercial fishing and processing vessels. Annually, 47 different fisheries nationwide are monitored by observer programs logging over 77,000 observer days at sea. NMFS has been using observers to collect fisheries data since 1972. Observers have monitored fishing activities on all U.S. coasts, collecting data for a range of conservation and management issues. The Southeast fishery observer program has existed since 1987 and was originally developed to provide an economic evaluation of turtle excluder devices (commonly referred to as TEDs) in shrimp trawls. Observer coverage became mandatory for Gulf commercial reef fish permit holders in 2006 and for Gulf commercial shrimp permit holders in 2007.

NMFS coordinates observer program management through its Office of Science and Technology (OST)/National Observer Program (NOP). The NOP seeks to support observer programs and increase their usefulness to the overall goals of NMFS. Improvements in data collection, observer training, and the integration of observer data with other research are among the important issues that the NOP works to achieve on a national level. Most commercial observer programs have coverages derived as a percentage of reported effort in the previous year. Five observer programs operate out of the Southeast Region, including the Pelagic Longline Observer Program, the Gulf of Mexico Reef Fish Observer Program (Bottom Longline and Vertical Line), the Shark Bottom Longline Observer Program (includes the Shark Research Fishery), and the Shrimp Trawl Observer Program. Beginning in 2006, NMFS expanded observer shark gillnet effort, to include other gillnet fisheries (e.g., Spanish mackerel, king mackerel), and that program has now evolved into the Southeast Coastal Gillnet Observer Program, which is the fifth observer program operating out of the Southeast Region. The Southeast Coastal Gillnet Observer Program covers all vessels fishing gillnets regardless of target and extends coverage to the full geographic range of gillnet fishing effort in the southeast United States. In the Gulf, only gillnetting for king mackerel has taken place since 2015. Sharks are not managed by the Gulf or South Atlantic Councils in the Southeast Region. **Table 1.4.1** lists South Atlantic and joint South Atlantic/Gulf fisheries with observer coverage and **Table 1.4.3** outlines observer coverage in those fisheries.

Table 1.4.3. Current observer coverage in Gulf fisheries.

Fishery	Observer Coverage? (Yes or No)	Current Level (Observed Days)
Gulf		
Reef Fish Recreational	Yes (FWC; For-hire only)	~40 days/month on FL west coast; 10-12 days per month in FL Keys (total for all for-hire fisheries)
Reef Fish Longline	Yes (NMFS)	3% (2015-2019 avg)
Reef Fish Vertical Line (Handline/Bandit)	Yes (NMFS)	1.24/2.72 (2015-2019 avg)
Shrimp	Yes (NMFS)	~2.5% of Gulf annual shrimp trips have observer coverage.
Coral	No	
Joint SA / Gulf		
CMP Recreational	Yes (FWC; For-hire only)	~40 days/month on FL west coast; ~10-12 days per month in FL Keys, ~30 day/month FL east coast (total for all for-hire fisheries)
CMP Gulf	Yes (NMFS)	Gillnet coverage only, no federal observer coverage of vertical line fishing
Spiny Lobster	No	No coverage

* These coverage levels are headboat sector as whole and not FMP fishery specific levels.

CHAPTER 2. FISHERY MANAGEMENT PLAN FOR THE REEF FISH FISHERY OF THE GULF OF MEXICO

2.1 Current Standardized Bycatch Reporting Methodology Requirement

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) provisions require a fishery management council in cooperation with NMFS to establish a standardized methodology to assess the amount and type of bycatch occurring in the fishery (Magnuson-Stevens Act §303(a)(11)). In addition, Magnuson-Stevens Act §303(b)(8) provides authority to require observers to be carried aboard fishing vessels as necessary.

The Gulf of Mexico Fishery Management Council (Gulf Council) manages fishing for reef fish species in federal waters of the Gulf of Mexico (Gulf). Bycatch practicability for the Fishery Management Plan (FMP) for Gulf of Mexico Reef Fish (Reef Fish FMP) was first addressed in the Generic Sustainable Fisheries Act Amendment (SFA Amendment; GMFMC 1999). The SFA Amendment discussed standardized bycatch reporting methodologies (SBRM) for all of the Council's Fishery Management Plans (FMP) including the Fishery Management Plan for the Reef Fish FMP. As part of the reporting requirements for each of the FMPs, the SBRM as specified in the SFA amendment authorized National Marine Fisheries Service (NMFS) to collect bycatch information using the most practical reporting requirements and methodology. That amendment contained a bycatch practicability analysis and evaluated the biological, ecological, social, economic, and administrative impacts associated with a wide range of alternatives, including those required for achieving the bycatch mandates of the Magnuson-Stevens Act. SBRM updates to the Reef Fish FMP was implemented through Amendment 22 to The Reef Fish Fishery Management Plan (70 FR 32266; June 2, 2005).

The Reef Fish FMP currently includes 31 species (**Table 2.1.1**). Fishermen often target certain species that co-occur with other reef fish species that can be incidentally caught. In some cases, these fish may be discarded for regulatory (or other) reasons and thus are considered bycatch. Bycatch practicability analyses, which examine the effects of fishing on targeted and bycatch species, have been completed for several species including red snapper (GMFMC 2004a, GMFMC 2007, GMFMC 2014, GMFMC 2015), grouper (GMFMC 2008a, GMFMC 2011, GMFMC 2012c), vermilion snapper (GMFMC 2004b), greater amberjack (GMFMC 2008b, GMFMC 2012a), gray triggerfish (GMFMC 2012b), hogfish (GMFMC 2016), and red grouper (GMFMC 2021 (draft)). In general, these analyses have found that reducing bycatch provides biological benefits to managed species as well as benefits to the fishery through less waste, higher yields, and less forgone yield.

Table 2.1.1: Reef fish species managed by the Gulf Council.

Group	Species	Taxonomy
Ballistidae, Triggerfishes	Gray triggerfish,	*Balistes capriscus*
Carangidae, Jacks	Greater amberjack	*Seriola dumerili*
	Lesser amberjack	*Seriola fasciata*
	Almaco jack	*Seriola rivoliana*
	Banded rudderfish	*Seriola zonata*
Labridae, Wrasses	Hogfish	*Lachnolaimus maximus*
Lutjanidae, Snappers	Queen snapper	*Etelis oculatus*
	Mutton snapper	*Lutjanus analis*
	Blackfin snapper	*Lutjanus buccanella*
	Red snapper	*Lutjanus campechanus*
	Cubera snapper	*Lutjanus cyanopterus*
	Gray (mangrove) snapper	*Lutjanus griseus*
	Lane snapper	*Lutjanus synagris*
	Silk snapper	*Lutjanus vivanus*
	Yellowtail snapper	*Ocyurus chrysurus*
	Wenchman	*Pristipomoides aquilonaris*
	Vermilion snapper	*Rhomboplites aurorubens*
Malacanthidae, Tilefishes	Goldface tilefish	*Caulolatilus chrysops*
	Blueline tilefish	*Caulolatilus microps*
	Golden Tilefish	*Lopholatilus chamaeleonticeps*
Serranidae, Groupers	Speckled hind	*Epinephelus drummondhayi*
	Yellowedge grouper	*Epinephelus flavolimbatus*
	Goliath grouper	*Epinephelus itajara*
	Red grouper	*Epinephelus morio*
	Warsaw grouper	*Epinephelus nigritus*
	Snowy grouper	*Epinephelus niveatus*
	Black grouper	*Mycteroperca bonaci*
	Yellowmouth grouper	*Mycteroperca interstitialis*
	Gag	*Mycteroperca microlepis*
	Scamp	*Mycteroperca phenax*
	Yellowfin grouper	*Mycteroperca venenosa*

2.2 Bycatch Reporting Methodology

2.2.1 Current Reporting Requirements/Methodologies

Current regulations (50 CFR §622.26) require commercial and recreational for-hire participants in the Gulf reef fish fishery to maintain and submit fishing records via NMFS approved hardware and software, as posted on the NMFS Southeast Region website. If selected by the NMFS SEFSC, the

owner or operator of a vessel for which a charter vessel/headboat permit for Gulf reef fish has been issued must report via the NMFS approved software for the Southeast Region Headboat Survey. Commercial vessels with federal Gulf reef fish permits are required to carry observers assigned by the Gulf Reef Fish Observer Program (GRFOP) when selected. The Southeast For-Hire Integrated Electronic Reporting (SEFHIER) program required for-hire vessel owners or operators to submit electronic logbooks that collect data on all catch and bycatch, including sea turtles and ESA-listed fish. Bycatch data on sea turtles, ESA-listed fish, and other protected species are currently required when assigned in the commercial reef fish fishery through the supplementary discard form. The Southeast Fisheries Science Center's (SEFSC) Beaufort For-Hire Headboat Survey and Marine Recreational Information Program (MRIP) collect information on finfish discards but do not collect data on sea turtle interactions. However, as noted above, all for-hire vessels are still required to submit data on these interactions through SEFHIER. States where MRIP is not used (i.e. LA, TX) either only collect data on discards of some managed finfish (LA) or do not collect any discard data (TX). Additional information on all of these data collection programs is presented in Section 1.3.

2.2.2 Characteristics of the Fishery

The commercial Gulf reef fish fishery consists of 837 federally permitted vessels (SERO Permit Counts Database; Data for 2020; Data pulled August 25, 2021). Primary gear used include bottom longline, vertical line (bandit or handline), and modified buoy gear. Although many reef fish species are retained, the predominant target species are groupers (*Epinephelus spp.*) and snappers (*Lutjanus spp*.). Longliners off the coast of Florida generally target red grouper (*Epinephelus morio)* in shallow waters, and target yellowedge grouper (*E. flavolimbatus)*, tilefish (Malacanthidae), and sharks (several orders) in deeper waters. Vertical line vessel operators target red grouper, gag (*Mycteroperca microlepis*), other shallow-water grouper, red snapper (*Lutjanus campechanus*), and may also seek yellowedge grouper and vermilion snapper (*Rhomboplites aurorubens*). From historical effort data, most commercial fishing effort for red snapper occurs in the western Gulf. The effectiveness of quota systems, size limits, and area closures as management tools to reduce mortality has been debated (O'Keefe et al., 2014). For example, once a vessel's red snapper quota is reached, the vessel often targets other reef fish, making red snapper a bycatch species requiring regulatory discards. The mortality rates of both undersized target species and non-targeted species caught on the various gear types remains a pressing concern. Findings from mark-release mortality studies indicate variable rates of mortality based on depth, time of year/water temperature, and method of capture.

The recreational fishery is made up of two components including the for-hire component (charter boats and headboats), and the private angling component. Recreational fishermen generally employ vertical line gear (for data processing purposes, this also includes spearfishing and buoy gear). Any for-hire fishing vessel that takes anglers to harvest any species in the reef fish fishery from federal waters must have a charter/headboat permit for reef fish, which is a limited access permit specifically assigned to that vessel (1,289 in 2020-*NMFS data pulled 10/2021*). Limited access permits may be renewed or transferred, but no additional permits may be issued. From 2012 through 2018, the number of vessels with the permit declined, in part due to the moratorium on the issuance of new permits since 2003. Anglers on privately owned or rented vessels do not need a federal permit to harvest reef fish in federal waters. However, anglers aboard these vessels must either be federally registered or licensed in states that have a system to provide complete information on the states' saltwater anglers to the national registry.

Many of the reef fish species co-occur in the same habitat and may be incidentally caught when fishermen target one particular species. In some cases, these fish may be discarded for regulatory reasons and thus are considered bycatch. Analyses have found that reducing bycatch provides biological benefits to managed species, as well as benefits to the fishery through less waste, higher yields, and less forgone yield. However, in some cases, actions are approved that can increase bycatch through regulatory discards, such as increased minimum sizes and closed seasons. Under these circumstances, there is some biological benefit to managed species that outweighs any increases in discards from the action.

Sea turtles, fish, and corals that are listed as threatened or endangered under the ESA occur in at least a portion of or throughout the Gulf. These include the following: six species of sea turtles (Kemp's ridley, loggerhead (Northwest Atlantic Ocean distinct population segment (DPS)), green (North Atlantic and South Atlantic DPSs), leatherback, and hawksbill); five species of fish (Gulf sturgeon, smalltooth sawfish, Nassau grouper, oceanic whitetip shark and giant manta ray); and six species of coral (elkhorn, staghorn, lobed star, mountainous star, boulder star, and rough cactus).

The most recent biological opinion (BiOp) for the FMP was completed on September 30, 2011. The BiOp determined the operation of the Gulf reef fish fishery managed under the Reef Fish FMP is not likely to adversely affect coral, and was not likely to jeopardize the continued existence of sea turtles (loggerhead, Kemp's ridley, green, hawksbill, and leatherback) or smalltooth sawfish. Since issuing the opinion, in memoranda dated September 16, 2014, and October 7, 2014, NMFS concluded that the activities associated with the Reef Fish FMP are not likely to adversely affect four species of corals (lobed star, mountainous star, boulder star, and rough cactus). On September 29, 2016, NMFS requested re-initiation of Section 7 consultation on the operation of reef fish fishing managed by the Reef Fish FMP because new species (i.e., Nassau grouper [81 FR 42268] and green sea turtle North Atlantic and South Atlantic DPSs [81 FR 20057]) were listed under the ESA that may be affected by the proposed action. NMFS documented a determination that the operation of the fishery to continue during the re-initiation period is not likely to adversely affect these species.

On January 22, 2018, NMFS published a final rule (83 FR 2916) listing the giant manta ray as threatened under the ESA. On January 30, 2018, NMFS published a final rule (83 FR 4153) listing the oceanic whitetip shark as threatened under the ESA. In a memorandum dated March 6, 2018, NMFS revised the request for re-initiation of consultation on the Reef Fish FMP to address the listings of the giant manta and oceanic whitetip. In that memorandum, NMFS also determined that fishing under the Reef Fish FMP during the extended re-initiation period is not likely to jeopardize the continued existence of the giant manta ray, oceanic whitetip shark, Nassau grouper, or the North Atlantic and South Atlantic DPSs of green sea turtles.

NMFS published a final rule on April 15, 2019, listing the Gulf Bryde's whale as endangered. In a memorandum dated June 20, 2019, NMFS revised the re-initiation request to include the Gulf Bryde's whale and determined that fishing under the Reef Fish FMP during the re-initiation period is not likely to jeopardize the continued existence of any of the newly listed species discussed above.

2.2.3 Reporting Requirements

Commercial Vessels

Logbook reports have been required from all vessels with Gulf federal reef fish commercial permits since 1993 (NOAA Data.gov, 2021). Catch and effort data per trip is reported via the Coastal Fisheries Logbook Program (CFLP). Information on the quantity (reported in pounds) caught for each species, the area of catch, the type and quantity of gear, the dates of departure and return, the dealer and location (county and state where the trip is unloaded), the duration of the trip (time away from dock), an estimate of the fishing time, and the number of crew is required. Since 2001, commercial reef fish fishermen have been required, if selected, to report the number and average size of fish being discarded by species (includes sea turtles and ESA-listed fish) and the reasons for those discards (regulatory or market conditions) using the Supplemental Discard and Gear Interaction Trip Report Form. These bycatch data are sent to a stratified, random sample of the commercial reef fish permit holders (20% coverage).

Two ongoing observer programs provide information on reef fish harvests and bycatch rates. Each program was independently designed, and implemented sampling regimes for different but overlapping portions of the Gulf commercial reef-fish fishery. In 2006, NMFS initiated an observer program for the commercial reef fish fishery under Amendment 22 to the Reef Fish FMP, which dictated mandatory observer coverage. The GRFOP is administered through the SEFSC, Galveston Laboratory. It utilizes a random selection process, stratified by gear and season. Under this program, observers report all catch and bycatch, including bycatch of all protected resources (i.e. turtles, ESA listed fish, marine mammals, and seabirds). Increased observer coverage levels were directed at the bottom longline portion of the reef fish fishery in the eastern Gulf starting in February 2009, due to concerns regarding sea turtle bycatch. Additionally, in 2011, increased funding allowed enhanced coverage of both the vertical line and bottom longline sectors through 2014. Observer coverage levels have not remained consistent since, varying depending on available funding (**Table 2.2.3.1**).

Table 2.2.3.1: Reef Fish Observer Program Yearly Coverage, 2015-2019

Year	Total Percent Coverage	Percent Coverage Longline	*Percent Coverage Handline	*Percent Coverage Bandit
2015	4.0	3.7	2.5	5
2016	4.3	7.4	1.5	3.7
2017	1.6	2	1	1.5
2018	0.9	0.7	0.5	1.3
2019	1.0	0.8	0.4	1.5
Total	2.36 (Avg)			

*Handline and bandit gear comprise the vertical line sector in this analysis.

The Highly Migratory Species (HMS) shark fishery targets large coastal sharks (e.g., blacktip shark) and small coastal sharks (e.g., Atlantic sharpnose). In 1994, the HMS shark bottom longline observer program was established. This program is currently administered by the SEFSC, Panama City Laboratory. The shark bottom-longline portion of HMS is active on the southeast coast of the

United States and throughout the Gulf. Since mid-2006, this program has required observers to record all catch, including targeted catch, bycatch, and incidental catch of all protected resources. The shark bottom longline observer program provides some additional coverage of Gulf reef fish bottom longline sets.

For-Hire Charter Vessels

NMFS created the Marine Recreational Fishery Statistics Survey (MRFSS) in 1979. In the Gulf, MRFSS collected data on fishing catch and effort in the recreational sector, including private, headboat, and charter vessels beginning in 1981. MRFSS included both offsite telephone surveys and onsite interviews at marinas and other points where recreational anglers fish. In 2008, the Marine Recreational Information Program (MRIP) replaced MRFSS to meet increasing demand for more precise, accurate, and timely recreational finfish catch estimates. Recreational catch, effort, and participation are estimated through independent but complementary surveys. Until 2013, these included a telephone surveys of households and for-hire vessel operators that collected information about recreational fishing activity; and an angler intercept survey that collected information about the finfish that were caught.

The MRIP Access Point Angler Intercept Survey (APAIS) began incorporating a new survey design in 2013. APAIS is an in-person intercept survey that collects information from anglers as they complete their fishing trips. It is conducted at marinas, boat ramps, beaches, fishing piers, and other publicly accessible fishing sites. Trained samplers interview anglers and collect information about:

- The length, weight, and species of finfish caught.
- The number and species of finfish released (bycatch).
- Information about the fishing trip, including the length and mode (i.e., shore, private boat, charter boat, or headboat).

Effort data is collected through the For-Hire Survey (FHS); a telephone survey that collects information from for-hire operators. The FHS samples for-hire operators from a list of known for-hire vessel contacts. It asks operators to report vessel-fishing activity during a one-week reference period and to recount details from each trip. This information includes:

- The number of anglers who fished from the boat.
- The hours spent fishing, method of fishing, and area fished.
- The species targeted.

Data are collected on a weekly basis during two-month sampling periods known as "waves," and are paired with data collected through charter and headboat APAIS intercepts to estimate total for-hire catch. The program does not collect data on sea turtle interactions. In the Gulf, MRIP is currently used in Alabama, Mississippi, and west Florida.

In January 2021, NMFS implemented the Southeast For-Hire Electronic Reporting Program (SEFHIER), which requires electronic reporting of for-hire (charter, headboat) vessel catch data for over 3,000 vessels in the Gulf and South Atlantic. Vessel operators are required to report all catch and bycatch (including sea turtles and ESA-listed fish) that occurs on each trip that is taken. The purpose of SEFHIER is to provide more accurate and reliable fisheries information about for-hire catch, effort, and discards.

For-Hire Headboats

Harvest from the approximately 70 federally permitted headboats in the Gulf and South Atlantic has been monitored by NMFS by the SEFSC Beaufort Laboratory since 1986 through the Southeast Regional Headboat Survey. In 2004, the headboat survey added a discard category to the logbook form for the Gulf and South Atlantic. Daily records (trip logs) of catch and discards (does not include sea turtles) are filled out by the headboat operators; or, in some cases, by NOAA Fisheries-approved headboat samplers based on personal communication with the captain or crew. In addition, samplers subsample headboat trips for data regarding species lengths and weights. Biological samples (scales, otoliths, spines, gonads, and stomachs) are taken as time permits. In 2013, the electronic reporting requirements for Headboat landings and discards replaced the paper logbooks.

In addition, as with charter vessels, all headboats vessel operators are required to report all catch and bycatch (including sea turtles and ESA-listed fish) on each trip taken through the SEFHIER program.

Private Recreational Fishing Vessels

Finfish bycatch in the private recreational sector has been consistently monitored (through MRFSS/ MRIP/APAIS/FES; see Section 2.2.2.2 above) since 1979. In the Gulf, MRIP/APAIS/FES are currently used in Alabama, Mississippi, and west Florida. The survey has used a combination of random-digit-dialed telephone intercepts of coastal households or mail in surveys and dockside intercepts to statistically estimate the catch and bycatch by species (not including sea turtles) for each sub-region, state, mode, primary area, and wave. Bycatch is enumerated by a disposition code for each fish landed but not kept. See NOAA Fisheries website (https://www.fisheries.noaa.gov/recreational-fishing-data/about-marine-recreational-information-program) for an explanation of precision goals in bycatch monitoring surveys.

2.2.4 Characteristics of Bycatch

Amount and Type of Bycatch

Commercial Sector

The Gulf reef fish fishery is characterized by moderately high discards, especially of red grouper and red snapper (**Table 2.2.4.1**). In the Gulf commercial portion of the reef fish fishery, harvest of groupers and tilefishes is managed under the Grouper-Tilefish Individual Fishing Quota (GT-IFQ) program, and harvest of red snapper is managed under the Gulf Red Snapper IFQ (RS-IFQ) program. Although red snapper and groupers are the primary species targeted in the Gulf commercial reef fish fishery, many other species may be targeted, captured, kept as incidental catch, or discarded while targeting IFQ species.

Table 2.2.4.1: Top ten species for each gear type with mean estimated Gulf commercial discards (number of fish) on any trip targeting reef fish species with reported discards, sorted

from largest to smallest, by gear, for the (2015-2019) period. The "Other" gear is comprised of cast nets, gill nets, and traps (these are not allowable gear types for reef fish harvest).

Vertical Line		LONGLINE		OTHER	
Stock	**Mean discards (numbers)/year**	**Stock**	**Mean discards (numbers)/year**	**Stock**	**Mean discards (numbers)/year**
Red Snapper	25,712	**Red Grouper**	30,835	**Red Snapper**	5
Red Grouper	12,020	**Red Snapper**	14,420	**Red Grouper**	3
Vermilion Snapper	8,130	**Blueline Tilefish**	545	**Gag**	NA
Gray Triggerfish	3,508	**Gag**	241	**Hogfish**	NA
Gag	1,627	**Golden Tilefish**	71		
Yellowtail Snapper	542	**Yellowedge Grouper**	46		
Greater Amberjack	507	**Greater Amberjack**	38		
Lane Snapper	264	**Scamp**	33		
Scamp	214	**Gray Snapper**	31		
Gray Snapper	170	**Lane Snapper**	31		

Source: SEFSC Discard Logbook (accessed May 2021).

Individual Fishing Quota (IFQ) Programs

Under these programs, anyone commercially fishing for grouper, tilefish, or red snapper must possess IFQ allocation and follow established protocols. These IFQ programs comprise the majority of commercial reef fish catch using both vertical line gear and longline gear. In the GT-IFQ program, discards are largely driven by size, other regulations (including requiring allocation), and market conditions (Pulver & Stephen, 2019). The most discards in the GT-IFQ program originate from the vertical line sector (which includes spearfish and buoy gear, although these gears are associated with low discards). The longline sector is responsible for relatively low discards (NMFS 2021a). The ratio of commercial landings to commercial discards is not discussed for the GT-IFQ program because commercial landings are reported in pounds and discards are reported in numbers of fish. In the RS-IFQ program, all discards are assumed to be due to a lack of allocation or price differentials based on size (e.g., retaining more valuable market sized categories). LL trips capture larger red snapper between the 20 to 30 inch (total length) TL size bins. In recent years, this size bin has begun to expand to 32 inch TL. Discards are less common using longline than the vertical line gear; the discarded:landed ratio average 0.56 (vertical line) and 0.132 (longline), and confidence intervals of mortality rates of discarded fish generally overlapped for these gear types since 2007 (**Figure 2.2.4.1**; NMFS 2021b).

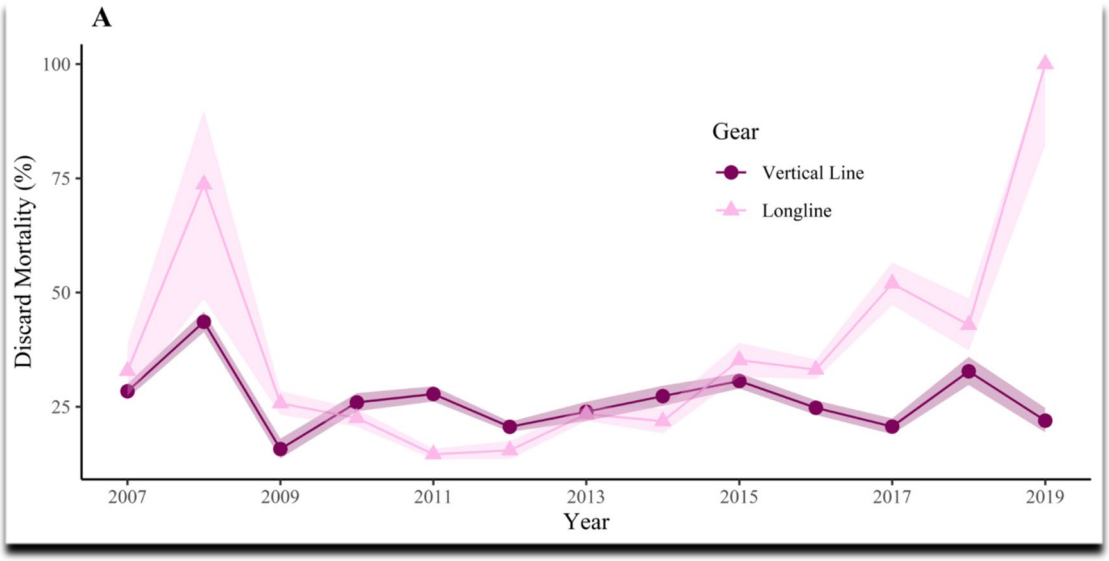

Figure 2.2.4.1. Immediate discard mortality by gear
Data from the Reef Fish Observer Program accessed as of 5/17/2021.
Note: Insufficient data were available to include 2020 due to the pandemic.

The patterns of catch in the RS-IFQ and GT-IFQ programs indicate that there are different classes of fishermen harvesting IFQ species: those that target red snapper, grouper, or tilefish (≥ 76% of landings for that species), those that supplement landings with red snapper, grouper, or tilefish (26-75% of landings), and those that incidentally land red snapper, grouper, or tilefish (≤ 25% of landings) (NMFS 2021a; NMFS 2021b). When IFQ species make up lower percentages of catch, it indicates that they were captured incidentally and landed, although they were likely not the primary target. Changes in the ratios over time indicate a change in catch composition and/or fishermen behavior. Prior to the RS-IFQ program, red snapper was the principal species caught (76-100% of total catch) for vertical line trips (**Table 2.2.4.2**). However, from 2015-2019, only 36-41% of vertical line trips in the RS-IFQ program had red snapper accounting for more than 75% of the catch, as fishermen spread out the landings of red snapper throughout the year compared to pre RS-IFQ. This decline indicates that red snapper are not the targeted species on the majority of reef fish vertical line trips, or that they are only targeted for a small portion of the trip (NMFS 2021b).

Gag made up 25% or less of the total catch for trips using either vertical or longline gear from 2015-2019, just as it did pre-IFQ. Red grouper catch on vertical line trips pre-IFQ was bimodal in relation to total catch, with red grouper catch generally being below 25% or greater than 75% of the total landed catch. This trend continued after the IFQ program was implemented until recent years, when the percentage of vertical line trips catching greater than 75% red grouper declined significantly, while the percentage of trips catching less than 25% red grouper increased proportionally. For trips using longline gear, red grouper generally was greater than 75% of the total catch landed on most trips pre-IFQ, but in recent years (2018-2020), there has been a precipitous decline in the amount of trips where red grouper made up more than 75% of the landed catch, with a low of 36.3% of trips in 2019. For both the vertical line and longline gear, the decline in red grouper catch is due to lower red grouper stocks and the subsequent reduction in red grouper catch limits that have recently been implemented.

Table 2.2.4.2: Percentage of trips by ratio of red snapper (RS), red grouper (RG) and gag grouper (GG) landed to total reef fish landed.

Vertical Line (includes spearfishing, buoy, and other type gear)												
Year	0-25%			26-50%			51-75%			76-100%		
	RS	RG	GG	RS	RG	GG	RS	RG	GG	RS	RG	GG
2015	27.2	37.6	80.2	18.0	15.8	8.9	12.8	10.2	4.2	42.0	36.4	6.6
2016	33.0	43.8	74.6	19.8	16.5	13.5	10.9	13.7	6.5	36.4	25.9	5.4
2017	27.3	43.2	77.9	20.1	16.3	14.1	13.7	13.5	4.9	38.9	27.0	3.0
2018	21.2	51.7	77.4	23.6	18.3	13.0	16.9	12.9	5.7	38.3	17.2	3.8
2019	20.5	55.6	78.2	20.6	18.3	14.8	17.9	9.8	4.6	41.0	16.3	2.4
Longline Gear												
2015	93.5	8.8	93.6	5.4	14.7	6.4	1.2	17.7	0.0	0.0	58.8	0.0
2016	97.2	7.4	89.5	2.1	10.8	9.7	0.5	23.9	0.8	0.2	57.8	0.0
2017	91.8	10.8	96.9	6.7	9.7	3.1	1.5	25.9	0.0	0.0	53.6	0.0
2018	78.0	13.1	95.4	17.7	18.5	4.4	3.8	22.2	0.2	0.5	46.2	0.0
2019	67.9	17.7	93.7	27.0	20.8	5.4	4.2	25.2	0.9	0.9	36.3	0.0

Data from the SEFSC Coastal Logbook records as of 5/7/2021.

In the RS-IFQ and GT-IFQ programs, the percentage of catch that was discard varied greatly by species from 2012-2018, as did the reason for discards (GMFMC, 2021). Red grouper had a relatively high number (**Table 2.2.4.1** above) and rate (**Table 2.2.4.3**) of discards. Nearly all of red grouper were regulatory discards (97.0%); they were not of legal size to keep. Red snapper were also discarded in high numbers, but a much lower percentage of catch (18.7%) was discarded. Red snapper were generally discarded due to lack of available allocation. Gag had a similar discard ratio to red snapper (20.2%) but was discarded in much lower numbers. Tilefishes were also generally discarded at a high rate, with blueline tilefish having both a relatively high number of discards and a high discard rate (43.4% discards), mostly due to market conditions.

Table 2.2.4.3: The number of captures and percentage for each disposition observed by the RFOP from 2012 through 2018 for Red Snapper IFQ and GT-IFQ species by share category.

Species/Group	Percent Kept	Percent Discarded	Primary Reason For Discards*
Red Snapper	82.7	18.7	No Allocation (60.8%)
Red Grouper	64.9	35.1	Not legal size (97.0%)
Gag	79.8	20.2	Not legal size (54.3%)
Shallow Water Grouper			
Scamp	94.5	5.5	Not legal size (89.2%)
Black Grouper	87.6	12.4	Other Regulations (52.90%)
Yellowmouth Grouper	91.6	8.4	(Reason not available)
Yellowfin Grouper	90.9	9.1	(Reason not available)
Deep Water Grouper			
Yellowedge Grouper	98.7	1.3	Not legal size (53.3%)
Snowy Grouper	98.7	1.3	Not legal size (68.5%)
Speckled Hind	88	12	Other Regulations (95.1%)
Warsaw Grouper	100	0	Not legal size (50.0%)
Tilefishes			
Golden Tilefish	81.3	18.7	Not legal size (52.1%)
Blueline Tilefish	56.6	43.4	Market Conditions (68.3%)
Goldface Tilefish	39.4	60.6	(Reason not available)

Data from SEFSC Reef Fish Observer Program (2019).
*Data from Supplemental Discard Logbook for 2012-2018.

Commercial Reef Fish (Aggregate)

Any commercial fisherman who does not have IFQ allocation (or have IFQ allocation available) cannot retain any IFQ species, but may still fish for non-IFQ managed species. Non-IFQ managed species are generally targeted with vertical line gear (for data processing, includes spearfishing and buoy gear), although many are captured incidentally on bottom longline gear. Commonly targeted non-IFQ species include vermilion snapper, gray triggerfish, and greater amberjack, among others. Because there is no clear way to differentiate trips based on the type of reef fish targeted, the following bycatch data are based on all reef fish trips (including both IFQ and non-IFQ trips). Note that although bycatch includes all fish species captured, including non-reef fish species and species not managed by the Gulf Council. Gulf Council managed reef fish species comprised the top ten in reported discards in all categories.

On all commercial reef fish trips, discards were dominated by red grouper and red snapper (**Figure 2.2.3.1**), with estimated expanded yearly discards of nearly 250,000 individual red grouper and nearly 200,000 red snapper. Commercial discards of non-IFQ species were highest for vermillion snapper (~50,000 fish) and gray triggerfish (~15,000). When using vertical line gear, non-IFQ discards were dominated by gray triggerfish (primary discarded due to other regulations) and vermilion snapper (not legal size), while yellowtail snapper (not legal size) and greater amberjack (size/ out of season) were also commonly discarded (**Table 2.1.4.1** above). The bottom longline portion of the reef fish fishery discarded almost exclusively IFQ species, although a very small percentage of the discards were of non-IFQ species including gray

triggerfish, greater amberjack, lane snapper, and gray snapper. Other gear-types examined had very small catches of either IFQ or non-IFQ species.

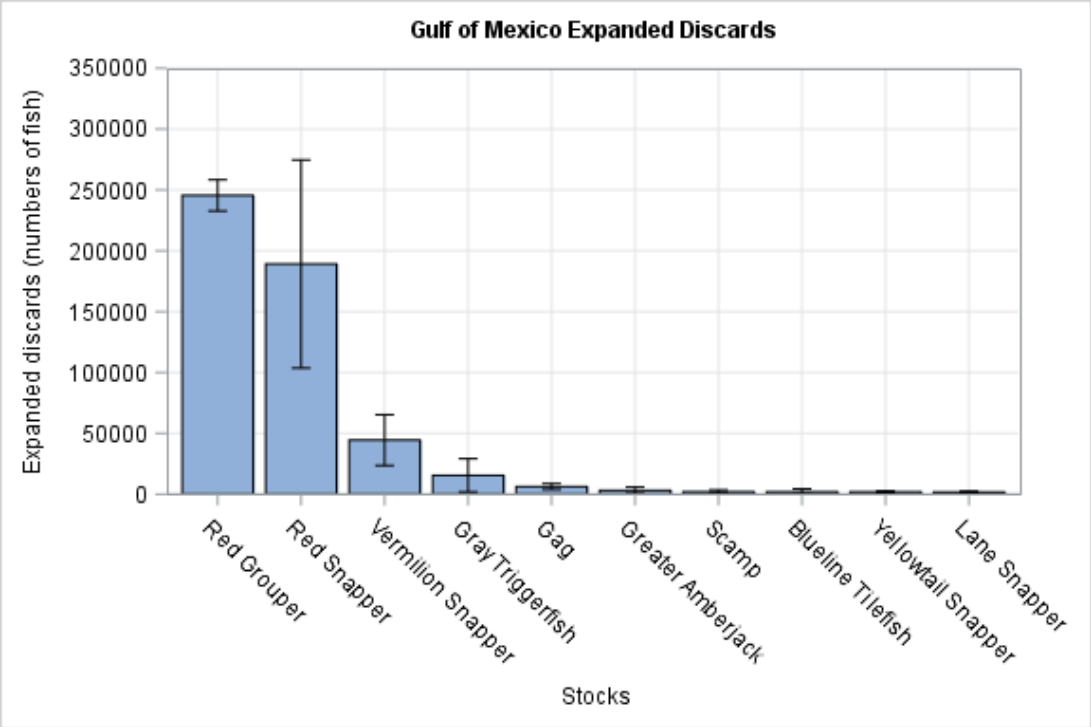

Figure 2.2.4.2. Expanded self-reported commercial discards (numbers of fish) for Gulf reef fish with 95% confidence limits, by stock, for handline/electric rig trips (What year/years is this?).

For most reef fish species, the most common reason cited for discard by fishermen was "not legal size" (**Table 2.2.4.4**). For species with seasonal closures, such as greater amberjack, fishermen were likely to attribute a high percentage of discards to "closed season." It should be noted that because these are self-reported data, fishermen might record reasons for discard differently, even if the reason is actually the same. For example, by law, there were no allowable landings for goliath grouper from 2015-2019. However, 6% of goliath grouper discards were recorded as "not legal size," 8% were recorded as "out of season," and 85% were recorded as "other regulations." Therefore, although these numbers help to clarify reasons for discards by species, the exact numbers should be viewed with some skepticism.

Table 2.2.4.4: The percentage of unexpanded discards for each discard reason out of the total number of self-reported discards reported to the Supplemental Discard Logbook in the Gulf of Mexico from 2015 through 2019.

Stock	Not Legal Size	Out Of Season	Market Conditions	Other Regulations
Almaco Jack	63%		14%	24%
Banded Rudderfish	1%		78%	21%
Black Grouper	97%	1%	1%	
Blackfin Snapper		91%		9%

Blueline Tilefish	34%		56%	10%
Gag	97%	<1%	<1%	3%
Goliath Grouper	6%	8%	<1%	85%
Gray Snapper	93%		2%	5%
Gray Triggerfish	20%	24%	1%	55%
Greater Amberjack	37%	45%		18%
Hogfish	80%		2%	18%
Lane Snapper	83%	<1%	4%	13%
Lesser Amberjack	79%		18%	3%
Mutton Snapper	85%	3%		12%
Red Grouper	98%	<1%	<1%	2%
Red Snapper	30%	1%	6%	63%
Scamp	98%			2%
Silk Snapper	100%			
Snowy Grouper	100%			
Speckled Hind	50%			50%
Vermilion Snapper	96%	<1%	1%	3%
Warsaw Grouper	75%		25%	
Yellowedge Grouper	55%			45%
Yellowtail Snapper	97%			3%

Source: SEFSC Supplemental Commercial Discard Logbook (May 2021).

Participants in the Gulf reef fish fishery occasionally incidentally captures sea turtles, giant manta ray, Nassau grouper, and smalltooth sawfish. A 2011 BiOp on the fishery describes the best available information on past sea turtle and smalltooth sawfish interactions with longlines and vertical lines. Interactions with sea turtles and ESA-listed fish are currently believed to be rare in the reef fish fishery (**Table 2.2.4.5**). From 2015-2019, only 13 sea turtles were captured on observed reef fish trips in the Gulf. In that same time period, only one ESA listed fish (i.e., a giant manta ray) was captured on an observed trip. The actual rate of bycatch in the reef fish fishery is estimates to be substantially higher than these observed catches as observed captures make up only a small percentage of estimated total captures (NMFS 2021c).

Table 2.2.4.5: Sea turtle and ESA Listed Fish Interactions on Observed Reef Fish Trip, 2015-2019

Year	Sea Turtles	Giant Manta Ray	Sturgeon	Smalltooth Sawfish	Nassau Grouper
2015	6	1	0	0	0
2016	4	0	0	0	0
2017	1	0	0	0	0
2018	0	0	0	0	0

2019	2	0	0	0	0
Total	13	0	0	0	0

Recreational Sector

Recreational discards of several Gulf reef fish species are substantial in certain modes (headboat, charter, private), and discard of some species are very high across all recreational modes (**Table 2.2.4.6**). Red grouper, gag, gray triggerfish, and black grouper have discard estimates that exceed landings estimates in all three modes. Discards of these species in most cases greatly exceeded landings (e.g. gray triggerfish combined estimated discards were more than 15 times greater than estimated landings). The magnitude of private mode discards (~3.5:1 ratio) across all snapper-grouper species is much higher than for the headboat (~0.5:1) or charter (1:1) modes.

Table 2.2.4.6. Gulf of Mexico reef fish headboat, charter, and private mean annual estimates of landings and discards (2015-2019). N=number; D:L = Discarded fish to landed fish.

Species	Headboat			Charter			Private		
	Landings (N)	Discards (N)	Ratio (D:L)	Landings (N)	Discards (N)	Ratio (D:L)	Landings (N)	Discards (N)	Ratio (D:L)
Almaco Jack	5,165	157	3%	14,063	708	5%	20,160	20,034	99%
Banded Rudderfish	3,355	405	12%	14,498	259	2%	2,993	1,258	42%
Black Grouper	16	17	110%	1,799	3,341	186%	7,856	42,943	547%
Blackfin Snapper	12	0	0%	40	0	0%	3	0	0%
Blueline Tilefish	664	21	3%	1,623	240	15%	6,077	1,146	19%
Cubera Snapper	14	0	1%	190	0	0%	385	605	157%
Gag	2,945	18,520	629%	20,914	110,376	528%	245,047	2,189,313	893%
Goldface Tilefish	15	0	0%	0	0	—	0	0	—
Goliath Grouper	0	10	—	0	2,213	—	0	37,183	—
Gray Snapper	35,481	4,453	13%	267,734	282,211	105%	3,329,217	14,263,980	428%
Gray Triggerfish	6,547	100,554	1536%	29,798	339,474	1139%	114,530	1,899,331	1658%
Greater Amberjack	1,689	5,297	314%	24,847	53,586	216%	59,715	292,574	490%
Hogfish	1,807	1,205	67%	11,363	6,057	53%	191,443	62,645	33%
Lane Snapper	79,542	8,993	11%	127,097	60,815	48%	766,134	1,194,051	156%
Lesser Amberjack	132	63	48%	39	292	744%	3,862	5,437	141%
Mutton Snapper	579	30	5%	15,847	12,173	77%	73,642	260,824	354%
Queen Snapper	217	1	<1%	107	0	0%	970	0	0%
Red Grouper	3,900	63,633	1631%	60,137	282,609	470%	307,054	2,399,889	782%
Red Snapper	114,903	105,804	92%	280,425	489,298	174%	1,899,771	5,988,316	315%
Scamp	2,733	2,137	78%	14,925	7,578	51%	52,890	68,088	129%
Silk Snapper	48	0	0%	1,509	7	<1%	0	0	—
Snowy Grouper	278	2	1%	1,304	215	16%	2,315	1,942	84%
Speckled Hind	44	8	19%	248	138	55%	739	2,728	369%
Tilefish	131	0	0%	352	0	0%	8,489	27,894	329%
Vermilion Snapper	437,785	35,099	8%	591,361	58,817	10%	1,052,692	498,151	47%
Warsaw Grouper	37	0	0%	129	48	37%	745	0	0%
Wenchman	0	0	—	47	0	0%	0	0	—

Yellowedge Grouper	214	2	1%	1,161	70	6%	2,076	0	0%
Yellowfin Grouper	8	0	3%	3	0	0%	0	60	—
Yellowmouth Grouper	23	1	6%	169	0	0%	0	0	—
Yellowtail Snapper	6,455	1,544	24%	238,109	104,622	44%	555,493	1,280,989	231%

Sources: SEFSC Recreational MRIP-FES Annual Catch Limit (ACL) Dataset (September 2020), SEFSC Headboat Logbook CRNF files (expanded; July 2020).
Note: Discards from Louisiana (2015-2018) and Texas are not included in charter and private modes.

In headboat and charter modes, red snapper was the most commonly discarded species, followed by gray triggerfish and red grouper (**Table 2.2.4.7**). Gray snapper also had high discards in the charter sector, but was not in the ten most bycaught species by headboat vessels. In the private recreational mode, gray snapper and red snapper were the dominant species discarded.

Table 2.2.4.7. From 2015 through 2019, the top ten species, by mode, with discards reported on trips capturing a reef fish species by recreational mode. Species are sorted by number of total discards for each mode.

Rank	Headboat		Charter		Private	
	Species	Discards (N)	Species	Discards (N)	Species	Discards (N)
1	Red Snapper	529,019	Red Snapper	2,433,963	Gray Snapper	35,147,074
2	Gray Triggerfish	502,772	Gray Triggerfish	1,697,364	Red Snapper	29,732,201
3	Red Grouper	318,163	Gray Snapper	1,410,469	White Grunt	14,947,624
4	White Grunt	233,022	Red Grouper	1,382,765	Spotted Seatrout	13,342,152
5	Tomtate	203,268	White Grunt	828,794	Red Grouper	11,866,531
6	Vermilion Snapper	175,496	Gag	547,919	Gray Triggerfish	9,453,931
7	Gag	92,599	Tomtate	543,468	Gag	9,210,652
8	Black Sea Bass	86,144	Spotted Seatrout	381,422	Hardhead Catfish	8,180,634
9	Sand Perch	52,012	Common Snook	331,188	Scaled Sardine	6,649,217
10	Lane Snapper	44,963	Lane Snapper	304,076	Common Snook	6,558,745

Sources: Recreational MRIP-FES survey data, available at https://www.st.nmfs.noaa.gov/st1/recreational/MRIP_Survey_Data/. [Accessed October 2, 2020], SEFSC Headboat Logbook CRNF files (expanded; July 2020). Note: Discards from LA and TX and not included in charter and private modes.

Recreational interactions with sea turtles and ESA listed fish are self-reported. Self-reported interactions of these species are likely not an accurate portrayal of the true number of interactions with sea turtles and ESA listed fish. Species identification may be difficult for ESA listed fish and sea turtles that are rarely captured, especially when they are too large to pull close to the vessel. There also may be reluctance to report interactions with ESA listed species due to fear that the fishermen who captured these species have broken a law and they (or the fishery in general) may face repercussions. For these reasons, reports of sea turtles and ESA listed fish bycatch are rare in the recreational reef fish fishery. When captured in the recreational fishery, ESA listed fish should be reported through MRFSS/MRIP/APAIS/FES (private anglers), the Southeast Regional Headboat Survey (headboats), the Southeast For-Hire Electronic Reporting Program (headboats, charter vessels), the FWC Fisheries Dependent Monitoring At-Sea Observer Program, and the LA Creel survey (private, for-hire). The Texas Creel survey does not collect any information on fish that are discarded including ESA listed fish. No private angler recreational reporting mode collects data on sea turtle captures. Because the methods of fishing are similar between commercial fishermen using vertical lines and the recreational sector, bycatch of sea turtles and ESA listed fish in the recreational sector are best estimated using commercial vertical line data and stratifying for season, area fished, and effort.

2.2.5 Importance of Bycatch in Estimating Fishing Mortality for Reef Fish / Effect of Bycatch on Ecosystems

If not properly managed and accounted for, bycatch mortality could potentially reduce stock biomass of bycatch species (including turtles and ESA-listed fish) to an unsustainable level and possibly limit recovery of ESA-listed species. Release mortality rates for species in the Gulf reef fish fishery are widely variable, and are dependent on species, sector, and fishing mode (**Table 2.2.5.1**). For instance, red snapper discards in the recreational sector from 2007-2016 outnumbered landed red snapper by a 3:1 ratio. In addition, discards of red snapper in the Gulf shrimp fishery are a large source of mortality from bycatch that must be accounted for in management decisions and in stock assessments (SEDAR 52, 2018).

Discard mortality estimates for reef-fish species are often species dependent, variable, and highly uncertain. Immediate discard mortality is positively correlated with increased depths, seasons associated with warmer water temperatures, and external evidence of barotrauma. Bottom longline gear also increases the predicted probability of immediate mortality compared to vertical line gear for most species (Pulver, 2017). Delayed discard mortality is more difficult to estimate, but may be substantial. Gulf fishermen are encouraged to have a descending device or venting tool aboard the vessel when fishing for Gulf reef fish, and having one of these devices on board will become mandatory for all fishermen on January 13, 2022, under the implementation of the Direct Enhancement of Snapper Conservation and the Economy through Novel Devices Act of 2020 (Descend Act). These devices have been shown to reduce immediate mortality for many species. However, this may not always improve survival for these released fishes. For example, Campbell et al. (2014) found that venting of red snapper upon release decreased immediate mortality but increased delayed mortality. Much research is being conducted to examine methods to reduce both immediate and long-term mortality of discards.

ESA-listed species can also be injured or killed when caught and/or mishandled when caught. Like discard mortality estimates for reef fish species, mortality estimates for ESA-listed species caught during reef fish fishing are also variable and highly uncertain. The 2011 BiOp estimates 45 % of sea turtles caught on bottom longlines targeting reef fish in the Gulf may be released dead. Of those that are released alive, an estimated 30 % may die later injuries sustained at the time of capture or from exacerbated trauma from fishing hooks or lines that were ingested, entangling, or otherwise still attached when they were released (NMFS 2011). Listed species caught in vertical line portion of the reef fish fishery are almost invariably released alive, but may also experience post-release mortality. NMFS has identified ways to reduce the stress for hook-and-line caught and released sea turtles and smalltooth sawfish. These measures, if followed, can increase the chance of survival for these species. Vessels with commercial or for-hire federal reef fish permits are required to have gear on board to allow for safe release of incidentally caught sea turtles. Vessels also must possess onboard a copy of the most recent version of the document entitled "Careful Release Protocols for Sea Turtle Release with Minimal Injury", and the NMFS issued placard for sea turtle handling and release guidelines. There are also hook-and-line careful release guidelines for smalltooth sawfish and giant manta rays.

Table 2.2.5.1: Percentage of Gulf of Mexico commercial trips that discarded species and expanded commercial discards of select commercially important species from 2015-2019.

Species	Percentage Of Trips That Discarded Species	Total Discards	Release Mortality	Dead Discards
Red Grouper	19.51%	818	19%	164
Gag	7.47%	5,918	25%	2,367
Scamp	1.81%	1,132	Unknown	Unknown
Greater Amberjack	1.64%	4,300	20%	860
Red Snapper	21.89%	24,131	38%	9,170
Vermilion Snapper	6.76%	24,527	15%	10,056
Gray Triggerfish	9.11%	15,236	5%	1,905

Note: Computed using mean discard rates (2015-2016) of vertical line and longline from commercial discard logbook applied to overall commercial effort reported to commercial logbook. Discard logbook and commercial logbook data provided by SEFSC May 2021.

2.3 Feasibility of the SBRM

The SBRM final rule (82 FR 6317, January 17, 2017) implores the use of a variety of methods to assess and monitor bycatch. Some of the SBRMs specified in the Reef Fish FMP include observer coverage on vessels, paper logbooks, electronic logbook, MRFSS (now MRIP-FES), state cooperation, and grant funded projects. The outlined methods in the Reef Fish FMP provide information to quantify bycatch effects on the different fisheries. Electronic reporting is now in place for the federally permitted for-hire sector through the SEFHIER program, and the Gulf Council is considering requiring electronic logbooks for the commercial sector. These new technologies could improve timeliness and accuracy of bycatch reporting.

Feasibility

What is the feasibility of the bycatch methodology from cost, technical and operational perspectives?

The SBRM currently in use for the private recreational sector of the fishery consists of port sampling and mail surveys through MRIP/FES. Since Louisiana has their own state recreational survey methods (LA Creel) and do not use MRIP, they are relied on for bycatch information through their data collection programs. Texas also has its own recreational data collection survey (TPWD Creel) and does not use MRIP. TPWD Creel does not collect data on bycatch, so estimates of bycatch in Texas waters must be generated through other means, including estimates based on federal commercial vertical line effort and catch. These SBRMs implemented and in use are feasible from a cost, operational, and technical standpoint.

2.4 Data Uncertainty Resulting from the SBRM

Data collected from the GRFOP are considered the most reliable method for estimating bycatch if coverage is adequate to avoid large sampling errors and there is little "observer effect" (where fishing operations are altered in the presence of an observer). Observed rates on commercial reef fish trips ranged from 0.9% to 4.3% between 2015 and 2019, and depended largely on available funding. When observer data are combined with reliable estimates of total fishing effort that can be inexpensively obtained from the Coastal Fisheries Logbook Program, bycatch rates from observer data can be used to reliably estimate total bycatch levels in a fishery.

Data Uncertainty

Can the uncertainty associated with bycatch data be described, quantitatively or qualitatively?

The Supplemental Discard And Gear Interaction Trip Report Form is used to compute discard levels for commercial reef fish species by gear. Uncertainty in self-reported discard rates can be quite high (with coefficient of variation routinely exceeding 100%), particularly for species that are caught in small numbers or are of little economic interest (particularly of bycatch of protected species, including sea turtles and ESA listed fish). It is noted that side-by-side comparisons of self-reported discard data and GRFOP data have consistently indicated that discard rates estimated from the self-reported data are lower than those estimated from the observer reported data (SEDAR 33 2014). It is also noted that only one gear can be listed per species on a trip, and errors in form completion or gear assignment may lead to some uneven results when expanding to the fishery as a whole. Non-reporting is a known issue – captains can submit a form with a 'no discards' box checked and still be in compliance. This happens at a high rate in the Gulf (over 50% of trips) on reef fish trips (SEFSC, personal communication). Discards are not always identified to species. Although information is collected on turtle and ESA listed fish interactions, they are not considered reliable due to infrequency of reports.

As described above, all recreational bycatch data are self-reported. The SEFHIER program, which in 2021 began requiring mandatory electronic reporting of for-hire vessel catch data (including discards of all catch, including sea turtles and ESA listed fish) for all charter vessels and headboats, is expected to improve information on discards from charter and headboat vessels in the Gulf. All recreational data sources have a high level of uncertainty because self-reported data are not considered as reliable and not all recreational fishermen are surveyed. Currently, data uncertainty is provided by proportional standard errors (PSE) from the MRIP survey (**Table 2.4.1**). The smaller the PSE, the better the estimate. In general, the PSE for the most common recreationally caught Gulf reef-fish range between about 10% and 32%. However, SEFHIER is expected to improve estimates of catch and bycatch for federally permitted for-hire vessels.

Table 2.4.1. Mean annual PSE of discards (B2-caught and released alive) for selected species in the Gulf of Mexico estimated by the MRIP-FES Survey from 2015-2019. Texas and Louisiana data are not included in this table because MRIP-FES does not operate in these two states.

Species	For-Hire	Private
Cobia	32.2	24.1
Gag	19.2	17.1
Gray Snapper	16.1	11.4
Gray Triggerfish	15.7	23.6
Greater Amberjack	21.2	24.0
King Mackerel	26.9	29.2
Red Grouper	15.2	18.5
Red Snapper	11.8	14.8
Spanish Mackerel	23.8	22.3
Vermilion Snapper	30.9	32.0

Source: https://www.fisheries.noaa.gov/data-tools/recreational-fisheries-statistics-queries

2.5 Data Use to Assess Bycatch

Data Use

How are the data resulting from a SBRM used to assess the amount and type of bycatch occurring in the fishery?

The SBRM provides the bycatch data for the region that are routinely used in many aspects of fishery management. The SEFSC uses these data in stock assessments to incorporate bycatch into estimates of total fishing mortality. Bycatch data are used to estimate impacts on ESA-listed species and to authorize the amount of allowable incidental take. The Gulf Council use SBRM-derived bycatch information to determine if new management measures are necessary, to develop these measures, and/or to evaluate the potential impacts of measures. The Gulf Council's Scientific and Statistical Committee uses this information as they review the status of the fisheries and develop acceptable biological catch recommendations. All aspects of fishery management in the region that have bycatch implications use data from the SBRM.

CHAPTER 3. FISHERY MANAGEMENT PLAN FOR THE SHRIMP FISHERY OF THE GULF OF MEXICO REGION

3.1 Current Standardized Bycatch Reporting Requirement

The shrimp fishery is managed by the Gulf of Mexico (Gulf) Fishery Management Council (Council) in federal waters off all Gulf states, including Alabama, Florida, Louisiana, Mississippi, and Texas. Bycatch in the Gulf shrimp fishery has a long history of impacting finfish and sea turtle stocks.

Since the early 1990s, bycatch reduction devices (BRD) and turtle excluder devices (TED) in otter trawls have been developed and modified to reduce this bycatch. A voluntary component to the shrimp observer program was set up (and continues to this day) to modify and advance the efficacy of BRDs and TEDs in reducing bycatch. BRDs and TEDs are required for use in federal waters of the Gulf. TEDs were recently also required in skimmer trawl vessels 40 feet and greater in length (84 FR 70048, 86 FR 16676). No TEDS or BRDs are required on smaller skimmer trawls, but tow times are limited to minimize bycatch mortality (Scott-Denton et al., 2020).

Bycatch practicability for the Gulf shrimp fishery was first addressed in the Generic Sustainable Fisheries Act Amendment (SFA Amendment; GMFMC 1999). The SFA Amendment discussed standardized bycatch reporting methodologies (SBRM) for all of the Council's Fishery Management Plans (FMP) including the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico (Shrimp FMP). As part of the reporting requirements for each of the FMPs, the SBRM as specified in the SFA amendment authorized National Marine Fisheries Service (NMFS) to collect bycatch information using the most practical reporting requirements and methodology. That amendment contained a bycatch practicability analysis and evaluated the biological, ecological, social, economic, and administrative impacts associated with a wide range of alternatives, including those required for achieving the bycatch mandates of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). Amendment 10 to the Shrimp FMP (GMFMC 2002) included an SBRM for the shrimp fishery to estimate shrimp fishing effort and obtain annual estimates of total finfish and invertebrate bycatch. Amendment 10 to the Shrimp FMP proposed the use of data from the SEAMAP program to characterize the type of bycatch occurring in the shrimp fishery. Amendment 13 to the Shrimp FMP (GMFMC 2005) modified the SBRM to improve the shrimping effort data by requiring that selected shrimp vessels operating in the exclusive economic zone (EEZ) participate in an electronic logbook (ELB) program administered by NMFS that records vessel position and is used to determine the amount and location of effort that is occurring in the shrimp fishery.

The Gulf shrimp fishery generally targets either four types of shrimp: red, pink, brown or royal red. Because fishing occurs with trawls, certain species (fish and invertebrates) that co-occur in areas where shrimp are targeted can be caught. In most cases, this catch is discarded and thus is considered bycatch. A bycatch practicability analysis was last completed for the Gulf shrimp fishery in Amendment 17B to the Shrimp FMP (GMFMC 2017), and concluded that bycatch

currently has been reduced to the extent practicable in the Gulf shrimp fishery through the use of BRDs, TEDs, and reduced effort.

3.2 Current Bycatch Reporting

Electronic Logbook for Gulf of Mexico Shrimp Effort

Data collected by the ELB is used by the Gulf Council and NMFS for annual shrimp stock assessments. Vessels selected to participate must carry data recording devices, which are simple time-stamped global positioning system units, also known as GPS units, that record and store a vessel's location at 10-minute time intervals. From these time-stamped locations, vessel speed between points (i.e., stopped, towing, moving between towing points) can be estimated and then evaluated with mathematical algorithms. The ELB program is also a key component in the Gulf Council's red snapper rebuilding plan, as accurate estimates of juvenile red snapper mortality attributable to the shrimp fishery are essential to the rebuilding plan. Vessels selected to participate must carry data recording devices, which are simple time-stamped global positioning system units that record and store a vessel's location at 10-minute time intervals. From these time-stamped locations, vessel speed between points (i.e., stopped, towing, moving between towing points) can be estimated and then evaluated with mathematical algorithms. Thus, effort by location can be calculated for a given fishing trip. Shrimp catch data are then used to estimate catch-per-unit-effort for the trip at various fishing locations. Shrimp effort estimates for various locations, time periods, and vessels are provided to NMFS each trimester (i.e., 4-month time period). Vessels selected for the program must also provide the size and number of shrimp trawls deployed for each set and the type of BRD and TED used. NMFS will not allow renewal of permits for vessels that are selected but do not participate in the ELB program.

This program included the cellular ELB (cELB) until December 2020, which was a newer, more efficient version of the ELB originally developed in 2007. The cELB used cellular data networks to transmit data back to NMFS where it was analyzed. However, the cELB program relied on a 3G network that has become obsolete and does not function anymore, the cELB program is currently not functioning through the cellular network, although the data are still being collected and provided to NMFS via mail. The Gulf Council is currently considering options to update the cELB program.

Gulf of Mexico Shrimp Observer Program

The shrimp fishery operates year round in the Gulf, with the highest effort occurring from May through December. Trawls catch brown shrimp off the coasts of Texas and Louisiana, white shrimp in the same areas, pink shrimp off southwestern Florida in the winter months, and rock shrimp off the east coast of Florida. Currently, there are 1,467 federally permitted shrimp vessels in the Gulf.

Because catch of finfish in shrimp trawls was affecting finfish stocks (e.g., red snapper) as well as protected sea turtle species, federal management actions sought to find ways to limit bycatch by vessels trawling for shrimp. A voluntary observer program is in place for scientists and gear specialists to develop and evaluate the efficacy devices aimed at reducing this bycatch. To date,

over 150 such devices have been tested. Catch rates of finfish and shrimp in nets equipped with BRDs and TEDs are compared to nets equipped with TEDs only.

The Gulf Council also requires observer coverage of federally permitted shrimp vessels. The continuing objectives of the mandatory observer programs are to provide quantitative biological, vessel, and gear-selectivity information for the southeastern shrimp fishery including:

- general fishery bycatch characterization and catch rates for shrimp and bycatch species by area and targeted shrimp species; and
- estimates of protected species (i.e., species meeting the definition of fish, marine mammals, and seabirds) bycatch levels.

Observer coverage in the Gulf averaged 2.2% between 2015 and 2019 (Scott-Denton et al., 2020).

Additional Information

The Southeast Fisheries Science Center (SEFSC) cooperates with states in their effort to monitor shrimp fishing effort. The SEFSC continues to coordinate the Sea Turtle Strandings and Salvage Network and maintains a database of all sea turtle strandings in the Gulf and South Atlantic. The SEFSC also continues to use observer data, strandings data, and other data to monitor sea turtle mortalities resulting from fishery interactions. For example, The SEFSC notifies the Southeast Regional Office when increased numbers of strandings occur, which is typically in March/April each year in the Gulf.

3.2.1 Characteristics of Bycatch

Most of the bycatch in the shrimp fishery are discards of no value to the vessel, with a limited amount being regulatory discards. Scott-Denton et al. (2020) found that about 27.4% of catch in the Gulf penaeid shrimp fishery was targeted shrimp (i.e. brown, white, pink). The majority of catch and bycatch was composed of unspecified fish, Atlantic croaker, other arthropods and invertebrates, and sea trout (**Table 3.2.1.1**). In the Gulf skimmer trawl portion of the shrimp fishery, brown and white shrimp comprised about 42% of catch, while unspecified fish and Atlantic croaker made up the majority of bycatch. In the Gulf rock shrimp portion of the shrimp fishery, 35.6 % of catch was targeted rock shrimp, and penaeid shrimp made up an additional 3% of catch. Unspecified fish again dominated bycatch, followed by benthic species including inshore lizardfish (7.2%), longspine swimming crab (5.9%), and dusky flounder (5.7%).

Table 3.2.1.1.: Most common catch and important bycatch species in Gulf of Mexico shrimp fisheries from 2011-2016.

Common Name	Scientific Name	Gulf Penaeid Mandatory Obs Percentage	Gulf Mandatory Rock Shrimp Percentage	Gulf Mandatory Skimmer Percentage
Fish (Unspecified)	Pisces	31.8	22.0	32.7
Atlantic Croaker	*Micropogonias undulatus*	15.7	0.3	10.6
Brown Shrimp	*Farfantepenaeus aztecus*	12.6	1.3	32.5
White Shrimp	*Litopenaeus setiferus*	11.4	0.0	9.6
Arthropod Other	Crustacea	6.2	3.9	4.2
Seatrout	*Cynoscion* spp.	5.4	0.1	1.5
Invertebrates	Invertebrate	5.2	7.6	0.6
Pink Shrimp	*Farfantepenaeus duorarum*	3.4	1.7	-
Longspine Porgy	*Stenotomus caprinus*	3.1	-	-
Rock Shrimp	*Sicyonia* spp.	0.3	35.6	-
Other Important Species				
Red Snapper	*Lutjanus campechanus*	0.3	0.0	0.0
Spanish Mackerel	*Scomberomorus maculatus*	0.2	0.0	0.3
Red Drum	*Sciaenops ocellatus*	0.2	-	0.0
Lane Snapper	*Lutjanus synagris*	0.2	0.0	0.0

From January 2011 through December 2016 (most recent complete data available), 131 sea turtles (61 Kemp's Ridley, 32 loggerhead, 20 green, 14 unidentified hardshell, 3 leatherback, and 1 unknown) were captured in otter and skimmer shrimp trawls (**Table 3.3.1.2**) with most documented from May to August. Of the 131 sea turtles, 45 were captured in skimmer trawl nets. The remaining sea turtles (86) were caught in the otter trawl fishery. Most (73%) of the 131 sea turtles were released alive and conscious (Scott-Denton et al., 2020).

Table 3.2.1.2: Sea turtle interactions by net type, species, capture condition, and project for all tows based mandatory observer coverage of the U.S. southeastern shrimp fishery from January 2011 through December 2016.

Common Name	Scientific Name	Gulf Mandatory Penaeid Trawl		Gulf Mandatory Rock Shrimp Trawl		Gulf Mandatory Skimmer Trawl	
		Total Turtles Captured	Hours Fishing/ Turtle Captured	Total Turtles Captured	Hours Fishing/Turtle Captured	Total Turtles Captured	Hours Fishing/Turtle Captured
Standard Net							
Green	*Chelonia mydas*	11	9313	-	-	4	788
Kemps Ridley	*Lepidochelys kempii*	16	6830	-	-	36	88
Leatherback	*Dermochelys coriacea*	3	34148	-	-	-	-
Loggerhead	*Caretta caretta*	0	0	-	-	4	788
Unidentified Hardshell	Chelonioidea	7	14635	-	-	1	3153
Try Net							
Green	*Chelonia mydas*	5	6288	-	-	-	-
Kemps Ridley	*Lepidochelys kempii*	9	3493	-	-	-	-
Leatherback	*Dermochelys coriacea*	-	-	-	-	-	-
Loggerhead	*Caretta caretta*	25	1258	3	227	-	-
Unidentified Hardshell	Chelonioidea	6	5240	-	-	-	-
Unknown	Chelonioidea	1	31441	-	-	-	-
Total		**83**		**3**	**227**	**45**	

Although comprehensive data on sea turtle and protected fish bycatch is not yet available for 2015 through 2019, there were 110 sea turtle captures reported by observers, indicating a similar rate of interaction to the data for 2011-2016 (**Table 3.2.1.3**). In addition, a total of 8 giant manta rays, 2 sturgeon, 0 Nassau grouper, and 7 smalltooth sawfish captures were reported by observers from 2015-2019. The actual catch of bycatch in the shrimp fishery is estimates to be substantially higher than these observed catches as observed captures make up only a small percentage of estimated total captures (NMFS 2021c). However, this rate is still indicative of a relatively low interaction rate across species for protected fish in the shrimp fishery (Babcock et al (2018); Carlson et al. (2020)).

Table 3.2.1.3: Percent observer coverage and interactions with sea turtles and ESA listed fish, 2015-2019

Year	Percent Coverage	Sea Turtle	Giant Manta Ray	Nassau Grouper	Sturgeon	Smalltooth Sawfish
2015	2.1	14	0	0	0	1
2016	2.5	27	0	0	2	1
2017	2.3	39	0	0	0	2
2018	2.2	14	0	0	0	1
2019	1.9	16	8	0	0	2
Total	2.2	110	8	0	2	7

NMFS SEFSC Observer database, 2021.

On April 26, 2021, NMFS completed a new BiOp on its implementation of the existing sea turtle conservation regulations under the ESA, and authorization of federal shrimp trawling under the Magnuson-Stevens Act (both the Gulf and South Atlantic Shrimp FMPs) for all listed species. The BiOp represents the best available information on interactions between ESA-listed species and shrimp fisheries (NMFS 2021c). The 2021 BiOp includes total anticipated bycatch for sea turtles (i.e., direct observed bycatch estimated in Babcock et al. (2018) combined with anticipated post interaction mortality). The 2021 BiOp also includes bycatch estimates for smalltooth sawfish and giant manta rays based on Carlson et al. (2020).

3.3 Feasibility of SBRM

Feasibility

What is the feasibility of the bycatch methodology from cost, technical and operational perspectives?

The permitting and data collection requirements in the Shrimp FMP provide information to quantify bycatch effects on the fishery. All shrimp trawl vessels are required to provide information on fishing effort and incidental take of protected species through logbooks. The Gulf Council is exploring moving commercial logbooks to an electronic format. However, shrimp trawl logbooks are not useful in reporting bycatch of species that are caught in large numbers. Logbook programs in the shrimp trawl fishery are better utilized in recording information on infrequently caught species and providing estimates of total effort by area and season that can then be combined with observer data to estimate total bycatch.

Approximately 2.2% of total shrimp trips have observer coverage. Data collected from at-sea observer programs are considered to be the most reliable method for estimating bycatch if coverage is adequate to avoid large sampling errors and there is little "observer effect" (where fishing operations are altered in the presence of an observer).

The cELB program currently in place in the Gulf is used to determine fishing effort. This program is currently under review and will be updated in 2022. In summary, the SBRM currently in use for the shrimp fishery consists of randomly selected mandatory observer

coverage and logbooks. These SBRMs implemented and in use are feasible from a cost, operational, and technical standpoint.

3.4 Data Uncertainty Resulting from the SBRM

The uncertainty of the data resulting from the SBRM has been evaluated through analyses associated with amendments implementing the Shrimp FMP. Data collected from at-sea observer programs are considered to be the most reliable method for estimating bycatch when coverage is adequate to avoid large sampling errors and there is little "observer effect" (where fishing operations are altered in the presence of an observer). When observer data are combined with reliable estimates of total fishing effort that can be inexpensively obtained from logbooks, bycatch rates from observer data can be used to more reliably estimate total bycatch levels in a fishery.

Data Uncertainty

Can the uncertainty associated with bycatch data be described, quantitatively or qualitatively?

To make this estimate, a statistically valid subset of vessels, determined from the universe of vessels identified though the requirement for a federal shrimp permit, would be required to complete a logbook that included information on vessel and gear detail. For each tow, information would be recorded on date, location, time, catch in pounds and nature of catch (tails or heads on). In addition, information would be collected on all protected species (i.e., species meeting the definition of fish (including sea turtles), marine mammals, and seabirds) interactions. The key advantage of logbooks is the ability to use them to cover all fishing activity relatively inexpensively. Biases associated with logbooks primarily result from inaccuracy in reporting of species that are caught in large numbers or are of little economic interest (particularly of bycatch species and protected species), and from low compliance rates. Logbook programs are more useful in recording information on infrequently caught species and providing estimates of total effort by area and season that can then be combined with observer data to estimate total bycatch.

Analysis of observer data collected on the shrimp fishery indicates that bycatch rates are generally accurate for common bycatch species. Scott-Denton et al, (2020) found the coefficient of variation (CV; a measure of dispersal about the mean) for most bycatch species in the Gulf shrimp fisheries were low (i.e. <0.2). Only two species of uncommonly captured sharks (finetooth shark, *Carcharhinus isodon* and Florida smoothhound shark, *Mustelus norrisi*) had CVs greater than 0.2. Based on this analysis, it appears that uncertainty surrounding data collected in the Gulf shrimp fishery is minimal and that estimates of bycatch are putatively accurate. Some progress has been made via Bayesian modeling to improve sea turtle bycatch estimates using the observer data (i.e., Babcock et al. 2018). However, data analyses of the more rarely caught ESA-listed species (i.e. smalltooth sawfish and giant manta ray) produce highly variable and uncertain estimates (Carlson et al. 2020).

3.5 Data Use to Assess Bycatch

SBRM provides the bycatch data for the region that is routinely used in many aspects of fishery management. The SEFSC uses these data in stock assessments to incorporate bycatch into estimates of total fishing mortality. Bycatch data are used to estimate impacts on ESA listed species and to authorize the amount of allowable incidental take. The Gulf Council uses SBRM-derived bycatch information to assess if new management measures are necessary, to develop measures, and/or to evaluate the potential impacts of measures. The Gulf Councils' Scientific and Statistical Committee uses this information as they review the status of the fisheries and develop acceptable biological catch recommendations. All aspects of fishery management in the region that have bycatch implications use data from the SBRM.

Data Use

How are the data resulting from an SBRM used to assess the amount and type of bycatch occurring in the fishery?

CHAPTER 4. FISHERY MANAGEMENT PLAN FOR SPINY LOBSTER IN THE GULF OF MEXICO AND SOUTH ATLANTIC

4.1 Standardized Bycatch Reporting Requirement

The Gulf of Mexico Fishery Management Council (Gulf Council) and South Atlantic Fishery Management Council (South Atlantic Council) jointly manage spiny lobster in federal waters from Texas to North Carolina. The commercial fishery for spiny lobster and most of the recreational fishery occur off South Florida, primarily in the Florida Keys. To streamline a management process that involves both state and federal jurisdictions, a protocol was developed that allows the state of Florida to adopt proposed rules through their management process. The standardized bycatch reporting methodology (SBRM) for the Fishery Management Plan (FMP) for Spiny Lobster in the Gulf of Mexico and the South Atlantic (Spiny Lobster FMP) was implemented through the final rule for the Comprehensive Sustainable Fishery Act Amendment (Amendment 6 to the Spiny Lobster FMP; SAFMC 1998, 64 FR 59126, November 2, 1999).

4.2 Current Bycatch Reporting

Commercial landings and discards are monitored by Florida Fish and Wildlife Conservation Commission (FWC) and the Southeast Fisheries Science Center (SEFSC). Both commercial and recreational spiny lobster landings are monitored by FWC. SEFSC coordinates the Sea Turtle Strandings and Salvage Network (STSSN) and maintains a database of all sea turtle strandings in the Gulf of Mexico (Gulf) and Atlantic.

4.3 Characteristics of Bycatch

4.3.1 Amount and Type of Bycatch

Commercial Sector

The commercial component of the fishery is prosecuted primarily by traps, but some commercial fishers harvest spiny lobster by SCUBA diving and a small percentage (1-2%) use bully nets or hoop nets, primarily in state waters, to harvest lobsters. Studies have documented low bycatch and bycatch mortality of finfish by the commercial trap fishery for wooden, wire reinforced wood, wire, and plastic traps (Matthews et al. 2005, Matthews and Donahue 1997, Matthews et al., 2005). Most of the finfish caught in commercial spiny lobster traps are juveniles and all escape within 48 hours (Matthews and Donahue 1997). However, the study concluded that the type of trap used by fishermen was important, as wire reinforced traps caught more fish than wooden traps when fished in the same area. In another study, wire traps– which were used only in deep waters where no other types of traps were used– caught 10 times more fish than other types of traps (Matthews et al., 2005). Stone crabs were the most dominant species caught in two studies of lobster traps (Matthews et al. 2005, Matthews and Donahue 1997). Legal sized

snapper and grouper were observed in approximately 0.5% of observed traps. In studies of deeper waters (>23.5 m) that were often in the federal exclusive economic zone, porgies, lionfish, and grunts were the most common bycatch species (Akins et al., 2012, Lazarre et al., 2013). Lionfish bycatch has become increasingly more common in deeper water lobster traps since this species was first documented in Florida Keys waters in 2009. The total discard rate of finfish and invertebrates for the spiny lobster fisheries is generally between 8-15% and it is unlikely any one species comprises more than 5% of the catch (Seafood Watch 2015). Mortality of commercially and recreationally important finfish is negligible (Matthews and Donahue 1997).

Ghost fishing, which occurs when lost or abandoned traps continue to capture and cause lethal or sublethal impacts to lobster and bycatch species, is also a source of bycatch mortality. Uhrin et al. (2014) surveyed the waters around the Florida Keys and estimated that there were approximately 85,548 (Standard Deviation [SD] 23,387) ghost fishing lobster traps. Although biodegradable escape vents are required for lobster traps, Butler and Matthews (2015) determined that new wooden traps used in the fishery remained intact and continued to fish for over a year after being lost, resulting in an estimated 637,622 (SD 74,367) dead lobsters in ghost traps in Florida each year. This averages about 10% of the commercial catch per lobster season (2,721,554 kg; Florida Fish and Wildlife Conservation Commission 2017.). Butler and Matthews (2015) suggested that the critical point for lobsters confined in a trap is approximately 2 weeks, after which mortality risk is very high. Lobster mortality is also high due the practice of baiting traps with live, sublegal sized lobsters, which not only attract other lobsters, but are themselves subjected to similar long-term confinement and starvation effects (Matthews 2001, Butler and Matthews, 2015).

A 2009 biological opinion on the Spiny Lobster FMP describes the best available information on past and present interactions with endangered and threatened species (NMFS 2009). The commercial spiny lobster trap fishery, as it currently operates, may adversely affect sea turtles, coral, and smalltooth sawfish, but is not likely to jeopardize their continued existence. Adverse effects on sea turtles and smalltooth sawfish are from occasional entanglement in trap buoy lines. Traps and/or trap lines can adversely affect corals via fragmentation or abrasion when traps or trap lines contact *Acropora* coral species during storm events or normal fishing activities. Protected areas where use of traps is prohibited reduces incidence of trap interactions with protected coral species.

Recreational Sector

The recreational component of the fishery generally harvests spiny lobster by diving (free diving and SCUBA) and typically uses allowable equipment, such as tickle sticks and hand nets, and the required underwater measuring devices to meet minimum size limit requirements. In the recreational sector, bycatch primarily consists of undersized spiny lobsters. Because the gear types used by divers targeting spiny lobster are considered highly selective for spiny lobster, very little bycatch of non-target species is expected in the recreational sector of the spiny lobster fishery. Parsons and Eggleston (2005) demonstrated that recreational sport-divers can increase the frequency of injured lobsters (through attempting to catch and/or catching and releasing; i.e.

bycatch), alter shelter choice behavior, and increase predation-induced mortality of injured lobsters.

4.3.2 Importance of Bycatch in Estimating Fishing Mortality / Effect of Bycatch on Ecosystems

If not properly managed and accounted for, bycatch mortality could potentially reduce stock biomass to an unsustainable level. Stone crab caught in lobster traps are usually sold and recorded as commercial landings. Mortality of commercially and recreationally important finfish is negligible (Matthews and Donahue 1997). Little is known about the status of many finfish (e.g., grunts, cowfish, porgies) and invertebrate (e.g., spider crabs, urchins) species that are bycatch in lobster traps in the greatest numbers. Lionfish are invasive and considered a nuisance species, so their capture as bycatch is encouraged. None of these species have undergone (or are likely to undergo) formal stock assessments, because most are not targeted in commercial or recreational fisheries.

4.4 Feasibility of the Standardized Bycatch Reporting Methodology

The Gulf and South Atlantic Councils have specified SBRMs in the Spiny Lobster FMP to account for bycatch, and the effects of bycatch mortality on stock abundances and management decisions. The commercial vessel reporting requirement is achieved through logbooks and monitoring of discards. This includes efforts of FWC to validate bycatch estimates and NMFS via the STSSN to estimate sea turtle interactions with gear. Because of the highly selective gear used to capture lobsters in the recreational sector, bycatch is estimated to be negligible. The SBRMs implemented and in use are feasible from a cost, operational, and technical standpoint.

4.5 Data Uncertainty / Data use Resulting from the SBRM

The uncertainty of the data resulting from the SBRM has been evaluated through analyses associated with regulatory and FMP amendments implementing the Spiny Lobster FMP. Bycatch levels are low for both sectors. The Southeast Fisheries Science Center uses these data in stock assessments to incorporate bycatch into estimates of total fishing mortality. The Gulf and South Atlantic Councils use SBRM-derived bycatch information to assess if new management measures are necessary, to develop measures, and/or to evaluate the potential impacts of measures. The Gulf and South Atlantic Councils' Scientific and Statistical Committees uses this information as they review the status of the fisheries and develop acceptable biological catch recommendations. All aspects of fishery management in the region that have bycatch implications use data from the SBRM.

CHAPTER 5. FISHERY MANAGEMENT PLAN FOR COASTAL MIGRATORY PELAGIC RESOURCES IN THE GULF OF MEXICO AND ATLANTIC REGION

5.1 Standardized Bycatch Reporting Requirement

The South Atlantic Fishery Management Council (South Atlantic Council) and Gulf of Mexico (Gulf) Fishery Management Council (Gulf Council) jointly manage coastal migratory pelagic (CMP) species (i.e., king mackerel, Spanish mackerel, and cobia). The South Atlantic Council's jurisdiction extends from the east coast of Florida through New York for king mackerel and Spanish mackerel. The South Atlantic Council's jurisdiction for cobia includes only the east coast of Florida, with cobia in Atlantic waters north of Florida managed by Atlantic States Marine Fisheries Commission (ASMFC) and the National Marine Fisheries Service (NMFS). The Gulf Council's jurisdiction extends from the west coast of Florida through the southern border of Texas, except for king mackerel, where the Gulf's jurisdiction goes around to the east coast of Florida. The standardized bycatch reporting methodology (SBRM) for the Fishery Management Plan (FMP) for Coastal Migratory Pelagic Resources in the Gulf of Mexico and Atlantic Region (CMP FMP) was put in place through the Comprehensive Sustainable Fishery Act Amendment, which was implemented in 1999 (Amendment 11 to the CMP FMP; SAFMC 1998, 64 FR 59126, November 2, 1999).

5.2 Current Bycatch Reporting

For the commercial sector, the vessel reporting requirement is achieved through logbooks. Fishermen with a Commercial Spanish Mackerel Permit, King Mackerel Permit, and/or Gillnet for King Mackerel Permit, who are selected by the Science and Research Director, are required to maintain and submit fishing records through the Southeast Fisheries Science Center (SEFSC) Coastal Fisheries Logbook Program (CFLP). Discard data are collected using the Supplemental Discard Logbook that is sent to a 20% stratified random sample of the active commercial permit holders in the fishery. In addition to the number of self-reported discards per trip and gear, the SEFSC Supplemental Discard and Gear Interaction Trip Report Form attempts to quantify the reason why discarding occurs using four codes.[1] Fishermen can specify multiple reasons for a species discarded on the same trip and gear.

1) Regulation – Not legal size: Animals that would have been sold, however local or federal size limits forbid it.
2) Regulation – Out of season: Animals that would have been sold, however the local or federal fishing season is closed.
3) Regulation – Other: Animals that would have been sold, however a local or federal regulation other than size or season, forbids it (Other than size or season; e.g., protected species, not properly permitted).
4) Market conditions: Animals that have no market value (rotten, damaged).

[1] More information on the discard logbook is available here https://www.fisheries.noaa.gov/southeast/resources-fishing/southeast-recordkeeping-and-reporting-forms.

There is no commercial observer program for the CMP fishery; however, the gillnet component is observed via the Southeast Gillnet Observer Program. In the Gulf, observers are deployed year round on active fishing vessels reporting gillnet effort (anchored (sink, stab, set), strike, or drift gillnet fishing), regardless of species targeted. From 2015-2018, strike gillnets (targeting king mackerel) were the only type of gillnet used/observed in the Gulf CMP fishery. All observed sets in this time period occurred in federal waters off of south Florida. Texas, Louisiana, Mississippi, Alabama, and Florida prohibit the use of gillnets, with limited exceptions, in state waters.

For the recreational sector, estimates of discards from private recreational and charter fishermen are collected through the Marine Recreational Information Program (MRIP)/Fishing Effort Survey (FES). The Southeast Region Headboat Survey, which includes limited headboat observer sampling, collects discard information from headboat vessels. The headboat survey also collects discards as part of their logbook. In addition, in January 2021, NMFS implemented the Southeast For-Hire Electronic Reporting Program (SEFHIER), which requires mandatory electronic reporting of for-hire vessel catch data for over 3,000 vessels in the Gulf and South Atlantic. The purpose of SEFHIER is to provide more accurate and reliable fisheries information about for-hire catch, effort, and discards.

5.3 Characteristics of Bycatch

5.3.1 Amount and Type of Bycatch

Commercial Sector

Mean commercial landings (2015-2019) of Gulf CMP species were highest from trolling gear (44%), handline gear (25%), and net gear (18%). Mean commercial landings (2015-2019) of South Atlantic CMP species were highest from trolling (58%) and net gear (39%). Other gear types, including handline gear, represent 3% of the Atlantic CMP landings.

The Gulf CMP fishery is characterized by low discards of CMP and other species (**Table 5.3.1.1** and **Figure 5.3.1.1**). Most discards are from trolling gear. The Atlantic CMP fishery is also characterized by relatively low discards for all species. Discard levels from gillnet, handline, and trolling gear are roughly equivalent. The ratio of commercial landings to commercial discards is not compared, because commercial landings are reported in pounds and discards are reported in numbers of fish. However, commercial discards appear to be very low relative to landed commercial catch for both regions.

Table 5.3.1.1. Top ten species categories by gear type, with mean estimated commercial discards (number of fish) during CMP trips (defined as trips with >50% of landings from CMP stocks), sorted from largest to smallest, by gear, for the 2015-2019 period. Data are provided separately for the two regions because observer coverage and management measures for the two regions are determined separately.

A. Gulf of Mexico

Species Category	Gillnet	Species Category	Handline	Species Category	Trolling
American Shad	272	Red Snapper	136	King Mackerel	725
Sharks Unclassified	108	King Mackerel	128	Crevalle Jack	216
Grass Porgy	74	Spanish Mackerel	94	Red Snapper	141
Sea Catfishes	50	Bluefish	80	Sharks Unclassified	97
Bonnethead Shark	29	Gray Triggerfish	76	Little Tunny	64
Grunts Unclassified	29	Yellow Jack	62	Blacktip Shark	60
Ladyfish	26	Crevalle Jack	58	Cobia	44
Weakfish	25	Blue Runner	47	Red Drum	25
Blacktip Shark	15	Bony Fish Unclassified	24	Amberjacks Unclassified	19
Red Grouper	13	Sharks Unclassified	20	Greater Amberjack	15

B. Atlantic

Species Category	Gillnet	Species Category	Handline	Species Category	Trolling
Menhaden	7,117	King Mackerel	1,238	King Mackerel	2,787
Sharks Unclassified	337	Red Snapper	527	Sandbar Shark	225
Rudderfish	289	Vermilion Snapper	249	Red Snapper	185
Porgies Unclassified	217	Red Porgy	142	Amberjacks Unclassified	163
Rays Unclassified	206	Black Sea Bass	117	Sharks Unclassified	154
Bony Fish Unclassified	196	Sharks Unclassified	102	Atlantic Sharpnose Shark	107
Atlantic Sharpnose Shark	192	Grunts Unclassified	101	Barracudas	105
Bluefish	118	Blue Runner	95	Little Tunny	91
Skates Unclassified	82	Barracudas	88	Remoras	82
Sandbar Shark	75	Snappers Unclassified	85	Cobia	56

Source: SEFSC Coastal Logbook (accessed May 2020) and Discard Logbook (accessed May 2020).

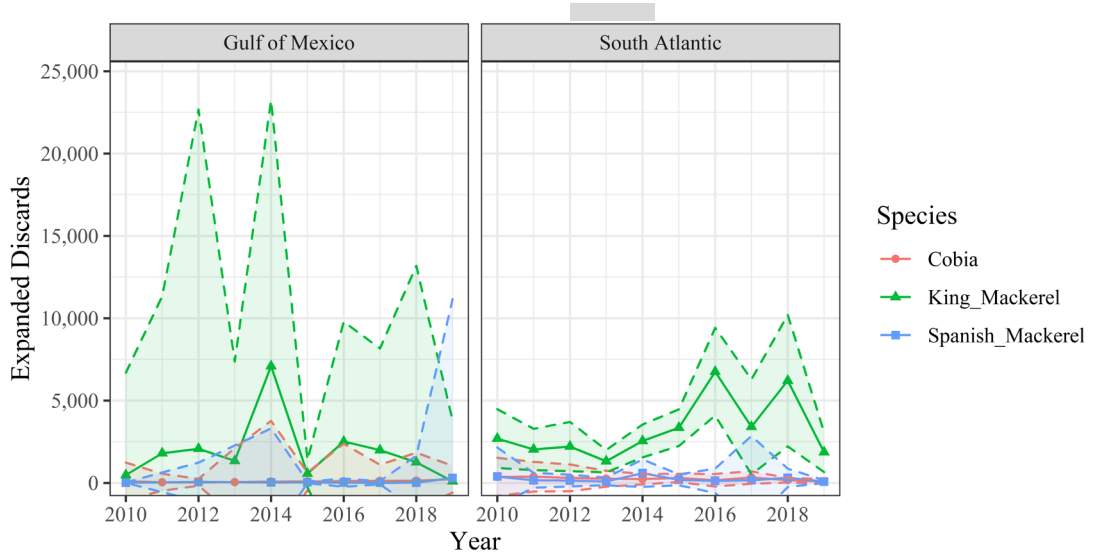

Figure 5.3.1.1. Annual expanded discard estimates for CMP species (number of fish) by year and region from 2010 through 2019 with 95% confidence interval (dotted line). Source: SEFSC Coastal Logbook (accessed May 2020) and Discard Logbook (accessed May 2020).

Of the four discard codes, not legal size and market conditions were the most common reasons selected for CMP species based on the number of self-reported discards, depending on the species and region (**Table 5.3.1.2**). The minimum size limit appears to be the primary driver of commercial discards for all CMP species in the Gulf and for cobia and Spanish mackerel in the Atlantic. Market conditions appear to be the primary driver of discards for Atlantic king mackerel. Commercial harvest in the CMP fishery via the gillnet component can result in the bycatch of sea turtles, Atlantic sturgeon, smalltooth sawfish, and giant manta ray. However, incidental take of these species appears to be a rare occurrence based on observer data. For example, no sea turtles or ESA listed fish were captured on observed gillnet trips in the Gulf or Atlantic from 2015 through 2018 (Mathers et al. 2015; Mathers et al. 2016; Mathers et al. 2017; Mathers et al. 2018). However, because observers only cover a small portion of CMP trips, the actual catch numbers of some or all these species are likely much higher. A June 18, 2015 Biological Opinion (Biop), amended on November 18, 2017, via a memorandum and attachment, comprises the most recent completed Section 7 consultation on the operation of the CMP fishery in the Gulf of Mexico and South Atlantic (NMFS 2015). The 2015 Biop, as amended, describes the best available information on past and present interactions with sea turtles, Atlantic sturgeon, and smalltooth sawfish and concludes that the proposed action may adversely affect but is not likely to jeopardize the continued existence of listed species. NMFS is currently consulting on the effects of the fishery on oceanic whitetip sharks and giant manta rays. Data indicate interactions between CMP fishing and these species are rare.

Table 5.3.1.2. The percentage of unexpanded discards for each discard reason out of the total number of self-reported discards reported to the Supplemental Discard Logbook in the Gulf and Atlantic for CMP species (2015-2019).

A. Gulf of Mexico

Species	Not Legal Size	Out of Season	Other Regulations	Market Conditions
Cobia	78%	0%	13%	8%
King Mackerel	65%	32%	2%	0%
Spanish Mackerel	77%	0%	17%	6%

B. Atlantic

Species	Not Legal Size	Out of Season	Other Regulations	Market Conditions
King Mackerel	28%	0%	19%	53%
Spanish Mackerel	90%	0%	9%	1%

Source: SEFSC Supplemental Commercial Discard Logbook (May 2020).

Recreational Sector

From 2015 through 2019, the other most discarded species on trips capturing a CMP species in the Gulf was red snapper for both headboat and charter modes (**Table 5.3.1.3**). From 2015 through 2019, the most discarded species on trips capturing a CMP species in the South Atlantic was black sea bass for headboat and charter modes (**Table 5.3.1.3**). In both regions, red snapper, blue runner, gray triggerfish, and Spanish mackerel were in the top ten for most modes. Recreational discards of CMP species are much lower than the landings for most modes of fishing (**Table 5.3.1.4**); however, private and charter discards of cobia are relatively high. Across all of the CMP species, the magnitude of private mode discards is much higher compared to the headboat or charter modes.

Table 5.3.1.3. From 2015 through 2019, the top ten species with discards reported on trips capturing a CMP species by recreational mode and region. Species are sorted by number of total discards for each mode from 2015-2019.

A. **Gulf of Mexico**

Rank	HEADBOAT		CHARTER		PRIVATE	
	Species	**Discards (N)**	**Species**	**Discards (N)**	**Species**	**Discards (N)**
1	Red Snapper	135,074	Red Snapper	879,641	Spotted Seatrout	10,183,221
2	Gray Triggerfish	102,231	Gray Triggerfish	737,277	Ladyfish	6,469,167
3	Red Grouper	52,792	Spanish Mackerel	399,356	Spanish Mackerel	6,031,247
4	White Grunt	37,405	Red Grouper	354,287	Red Snapper	5,545,785
5	Vermilion Snapper	36,140	Spotted Seatrout	281,654	Gray Snapper	3,165,484
6	Tomtate	26,812	White Grunt	256,977	White Grunt	2,631,791
7	Gag	15,837	Blue Runner	243,670	Hardhead Catfish	2,310,774
8	Black Sea Bass	13,881	Gray Snapper	193,107	Blue Runner	2,034,310
9	Sand Perch	9,956	Hardhead Catfish	190,490	Pinfish	1,982,762
10	Greater Amberjack	8,588	Gag	182,702	Scaled Sardine	1,851,526

Note: Charter and private modes do not include data from LA and TX

B. **Atlantic**

Rank	HEADBOAT		CHARTER		PRIVATE	
	Species	**Discards (N)**	**Species**	**Discards (N)**	**Species**	**Discards (N)**
1	Black Sea Bass	324,333	Black Sea Bass	236,568	Spanish Mackerel	3,369,596
2	Vermilion Snapper	185,112	Red Snapper	205,024	Bluefish	3,331,048
3	Tomtate	140,512	Spanish Mackerel	118,850	Black Sea Bass	2,909,537
4	Red Snapper	107,809	Vermilion Snapper	93,064	Red Snapper	2,169,789
5	Gray Triggerfish	64,802	Grunt Family	84,404	Vermilion Snapper	1,232,790
6	Blue Runner	62,187	Blue Runner	78,253	Tomtate	1,113,810
7	Atlantic Sharpnose Shark	43,445	King Mackerel	65,233	Little Tunny	1,093,830
8	Yellowtail Snapper	28,277	Bluefish	64,602	King Mackerel	1,058,777
9	Mutton Snapper	28,075	Tomtate	57,117	Blue Runner	935,603
10	Red Porgy	22,821	Greater Amberjack	55,667	Gray Triggerfish	803,369

Sources: MRIP FES survey data available at https://www.fisheries.noaa.gov/recreational-fishing-data/recreational-fishing-data-downloads; Headboat data from SEFSC Headboat Logbook CRNF files (expanded; July 2020).

Table 5.3.1.4. CMP headboat, charter, and private mean annual estimates of landings and discards (2015-2019) by region. Headboat and MRIP (charter and private) landings and discards are in numbers of fish.

A. Gulf of Mexico

Species	HEADBOAT			CHARTER			PRIVATE		
	Landings (N)	Discards (N)	Ratio (D:L)	Landings (N)	Discards (N)	Ratio (D:L)	Landings (N)	Discards (N)	Ratio (D:L)
Cobia	618	254	41%	6,196	6,909	112%	58,902	145,552	247%
King Mackerel	9,655	153	2%	120,167	35,690	30%	325,221	159,107	49%
Spanish Mackerel	2,438	98	4%	249,887	79,871	32%	1,173,804	1,208,243	103%

B. Atlantic

Species	HEADBOAT			CHARTER			PRIVATE		
	Landings (N)	Discards (N)	Ratio (D:L)	Landings (N)	Discards (N)	Ratio (D:L)	Landings (N)	Discards (N)	Ratio (D:L)
King Mackerel	10,658	1,503	14%	84,702	13,047	15%	489,817	211,757	43%
Spanish Mackerel	6,308	1,059	17%	131,520	23,769	18%	846,372	673,919	80%

Sources: MRIP FES data from SEFSC Recreational Annual Catch Limit (ACL) Dataset (September 2020); Headboat data from SEFSC Headboat Logbook CRNF files (expanded; July 2020).

5.3.2 Importance of Bycatch in Estimating Fishing Mortality / Effect of Bycatch on Ecosystems

If not properly managed and accounted for, bycatch mortality could potentially reduce stock biomass to an unsustainable level. Ecosystem interactions among CMP species in the marine environment are poorly known. The three species are migratory, interacting in various combinations of species groups at different levels on a seasonal basis. With the current state of knowledge, it is difficult to evaluate the potential ecosystem-wide impacts of these species interactions, or the ecosystem impacts from the limited mortality estimated to occur from mackerel fishing effort. However, there is very little bycatch in the Spanish mackerel portion of the CMP fishery with gillnet gear, and the king mackerel portion of the CMP fishery is also associated with a low level of bycatch. Release mortality rates for the CMP fishery are widely variable depending on species and fishing mode ranging from 5% for cobia in the Gulf to 100% for the South Atlantic king mackerel commercial gillnet sector (**Table 5.3.2.1**).

Table 5.3.2.1. Release mortality rates of CMP species from recent stock assessments.

Species	Region	Fishery	Release mortality	Data Source
Cobia	Gulf of Mexico	Recreational	5%	Southeast Data Assessment and Review (SEDAR) 28 Update (2019)
Cobia	Gulf of Mexico	Commercial	5%	SEDAR 28 Update (2019)
King Mackerel	Gulf of Mexico & South Atlantic	Recreational Private & Charter	20%	SEDAR 38 Update (2019)
King Mackerel	Gulf of Mexico & South Atlantic	Recreational Headboat	22%	SEDAR 38 Update (2019)
King Mackerel	Gulf of Mexico	Commercial Handline	25%	SEDAR 38 Update (2019)
King Mackerel	South Atlantic	Commercial Handline	20%	SEDAR 38 Update (2019)
King Mackerel	South Atlantic	Commercial Gillnet	100%	SEDAR 38 Update (2019)
Spanish Mackerel	Gulf of Mexico & South Atlantic	Recreational	20%	SEDAR 28 (2013a)
Spanish Mackerel	Gulf of Mexico & South Atlantic	Commercial Handline	10%	SEDAR 28 (2013b)

5.4 Feasibility of the SBRM

For the CMP FMP, electronic reporting is now in place for the federally permitted for-hire sector under the SEFHIER program, and the Gulf and South Atlantic Councils are exploring electronic logbooks for the commercial sector. These new technologies could improve timeliness of bycatch reporting.

Feasibility

What is the feasibility of the bycatch methodology from cost, technical and operational perspectives?

The SBRM currently in use for the commercial sector of the fishery consists of randomly selected, mandatory discard logbooks. The SBRM currently in use for the recreational sector of the fishery consists of SEFHIER, limited headboat observer coverage, headboat logbooks, mandatory for-hire logbooks, and port sampling and mail surveys through MRIP/FES for for-hire and private anglers. These SBRMs implemented and in use are feasible from a cost, operational, and technical standpoint.

5.5 Data Uncertainty Resulting from the SBRM

The uncertainty of the data resulting from the SBRM has been evaluated through analyses associated with framework and amendments implementing the CMP FMP. Uncertainty in recreational landings is provided by MRIP.

Data Uncertainty

Can the uncertainty associated with bycatch data be described, quantitatively or qualitatively?

Commercial discard levels are computed based on data collected through self-reported logbooks. Assignment to a fishery and/or gear type is based on the fishery comprising greater than 50% of the reported landings on the trip. It is noted that only one gear type can be listed per species on a trip; errors in form completion or gear assignment may lead to some odd results when expanding to the fishery as a whole. Data uncertainty in self-reported discard rates can be quite high, particularly for species that are caught in large numbers or are of little economic interest (particularly of bycatch species); with coefficient of variation routinely exceeding 100%, and that discards are not always identified to species.

For the CMP fishery, a random sample of 20% of all commercial permit holders within a gear type are selected; fishermen are not selected for the next four years after they submit a discard form for a year. Therefore, over a five-year period, 100% of permit holders in these fisheries will have been required to report in one of the five years. Non-reporting is a known issue – captains can submit a form with a 'no discards' box checked and still be in compliance. This happens at a high rate in the Gulf (over 50% of trips) on reef fish trips. Although information is collected on sea turtle and ESA listed fish interactions, they are not considered reliable due to infrequency of reports. Uncertainty in self-reported discard rates can be quite high; with coefficient of variation routinely exceeding 100%, and discards are not always identified to species. It is noted that side-by-side comparisons of self-reported discard data and the Gulf Reef Fish Observer Program data have consistently indicated that discard rates estimated from the self-reported data are lower than those estimated from the observer reported data (SEDAR 2014; Smith et al. 2018). This indicates that self-reported discards in the CMP fishery are also likely underestimated.

For the recreational sector, estimates of discards from private recreational and charter fishermen are collected through MRIP, which includes dockside surveys. The Southeast Region Headboat Survey, which includes limited headboat observer sampling, collects discard information from headboat vessels. Discards are also collected through the headboat logbook.

As described above, all recreational bycatch data is self-reported. These self-reported data from the SEFHIER program, which in 2021 began requiring mandatory electronic reporting of for-hire vessel catch data (including discards of all catch, including sea turtles and ESA listed fish) for all charter vessels and headboats, are expected to improve information on discards from charter and headboat vessels in the Gulf. All recreational data sources have a level of uncertainty because self-reported data is not considered as reliable and not all recreational fishermen are surveyed. Data uncertainty is provided by proportional standard errors (PSE) from the MRIP survey (**Table**

5.5.1). The smaller the PSE, the better the estimate. PSEs generally ranged from about 22% to 32% for CMP species. However, SEFHIER is expected to improve estimates of catch and bycatch for federally permitted for-hire vessels.

Table 5.5.1. Mean annual proportional standard error (PSE) of CMP discards (B2) by region estimated by the MRIP-FES Survey from 2015-2019.

Region	Species	Charter	Private
Gulf of Mexico	Cobia	32.2	24.1
Gulf of Mexico	King Mackerel	26.9	29.2
Gulf of Mexico	Spanish Mackerel	23.8	22.3
South Atlantic	King Mackerel	31.7	23.8
South Atlantic	Spanish Mackerel	24.4	25.5

Source: https://www.fisheries.noaa.gov/data-tools/recreational-fisheries-statistics-queries/

5.6 Data Use to Assess Bycatch

Data Use

How are the data resulting from a SBRM used to assess the amount and type of bycatch occurring in the fishery?

The SBRM provides the bycatch data for the region that is routinely used in many aspects of fishery management. The Southeast Fisheries Science Center uses these data in stock assessments to incorporate bycatch into estimates of total fishing mortality. When available, the size composition of discards/bycatch is used to inform assessment models of fishing mortality by size or age and for bycatch estimation in weight. The Gulf and South Atlantic Councils use SBRM-derived bycatch information to assess if new management measures are necessary, to develop measures, and/or to evaluate the potential impacts of measures. The Gulf and South Atlantic Councils' Scientific and Statistical Committees uses this information as they review the status of the fisheries and develop acceptable biological catch recommendations. Bycatch data are used to evaluate the effects of the fishery on sea turtles and ESA-listed fish under Section 7 of the ESA. All aspects of fishery management in the region that have bycatch implications use data from the SBRM.

CHAPTER 6. FISHERY MANAGEMENT PLAN FOR RED DRUM IN THE GULF OF MEXICO

6.1 Standardized Bycatch Reporting Requirement

The Gulf of Mexico Fishery Management Council (Gulf Council) manages red drum in federal waters of the Gulf from Texas to Florida. Harvest of red drum in or from the Gulf exclusive economic zone (EEZ) is prohibited. Red Drum that are captured in the EEZ must be released immediately with as little harm done to the animal as possible. The Generic Sustainable Fisheries Act Amendment (SFA Amendment; GMFC 1999) discussed standardized reporting methodologies (SBRM) for all of the Gulf Council's Fishery Management Plans (FMP) including the FMP for Red Drum in the Gulf of Mexico (Red Drum FMP). The amendment stated that there is no allowable catch and thus no federal fishery for red drum, and the vast majority of red drum harvest occurs in state waters. As part of the reporting requirements for each of the FMPs, the SBRM in specified in the SFA amendment authorized NMFS to collect bycatch information using the most practical reporting requirements and methodology. The SFA Amendment indicated that state programs could be used such as the Florida and Louisiana trip ticket programs for collection of commercial fishery statistics, and the National Marine Fisheries Service Marine Recreational Fishery Statistics Survey, which has been replaced by the Marine Recreational Information Program (MRIP).

6.2 Current Bycatch Reporting

Red drum bycatch is captured by the MRIP program, Southeast Fisheries Science Center Headboat Survey, the new Southeast For-Hire Integrated Electronic Survey, and the commercial coastal logbook program and discard logbook for reef fish and coastal migratory pelagic species.

6.3 Characteristics of Bycatch

6.3.1 Amount and Type of Bycatch

Red drum are targeted in state waters and captured as bycatch in other Gulf fisheries in federal waters. The vast majority of harvest and discards occurs in state waters. Although the harvest of red drum is prohibited in federal waters, Table 6.3.1 shows that a small amount of recreationally caught red drum does occur there. The reason for this harvest is unknown, although it is possible that due to the way catch is reported, anglers may fish in separate areas for multiple species on the same trip, but only report the area where the majority of fishing took place. Thus, a red drum captured in state waters could be recorded as caught in federal waters if the majority of that fishing trip took place in federal water. It is also possible that some anglers are unaware that harvest in federal waters is prohibited.

Table 6.3.1. Mean annual landings and discards (in number of fish), proportional standard error (PSE) of red drum in state and federal waters of the Gulf of Mexico estimated by the MRIP-FES Survey from 2015-2019.

Year	State Waters				Federal Waters			
	Landed	Landed PSE	Released	Released PSE	Landed	Landed PSE	Released	Released PSE
2015	9,719,338	10.6	8,005,654	11.6	270,051	40.3	58,689	44.4
2016	8,609,605	9.8	7,067,826	11.3	81,995	46.7	60,072	47.1
2017	8,318,072	11.3	6,915,261	12.7	266,695	37.7	158,720	43.1
2018	9,493,766	9.2	8,106,615	10.7	4,850	46.3	96,805	51.3
2019	13,030,678	10	11,579,466	11.2	60,710	35.6	91,561	53

6.3.2 Importance of Bycatch in Estimating Fishing Mortality / Effect of Bycatch on Ecosystems

The bycatch effects in federal waters are small when compared to state waters. Bycatch information is important for any stock assessments conducted by the states as well as for state management. The Red Drum FMP requires the release of red drum captured in federal waters, no matter the fishery or method of capture. The Red Drum FMP therefore relies on data collected from other fisheries to produce estimates of red drum bycatch.

6.4 Feasibility of the Standardized Bycatch Reporting Methodology

The existing SBRM is feasible approach for determining the amount of bycatch in the EEZ.

6.5 Data Uncertainty / Data Use Resulting from the SBRM

As mentioned above, because there is no allowable targeting or harvest of red drum in federal waters, the Red Drum FMP relies on data collected from other fisheries to produce estimates of red drum bycatch. Therefore, the uncertainty estimates would be similar to those estimated for the reef fish and CMP fisheries, which are most likely to capture red drum. Data uncertainty is provided by proportional standard errors from the MRIP survey. The smaller the PSE, the better the estimate. **Table 6.3.1** reveals that estimates and landings and discard are estimated with greater certainty in state waters than federal waters. Because red drum are not allowed to be targeted in federal waters, there are no sea turtles or ESA-listed fish impacted by this FMP.

CHAPTER 7. FISHERY MANAGEMENT PLAN FOR CORAL AND CORAL REEFS OF THE GULF OF MEXICO

7.1 Standardized Bycatch Reporting Requirement

The Gulf of Mexico Fishery Management Council (Gulf Council) manage corals in federal waters of the Gulf from Texas to Florida. Management of coral resources was originally established with the joint Gulf Council and South Atlantic Fishery Management Council Coral FMP (GMFMC & SAFMC 1982). The Secretary of Commerce provided authority in December 1994 for separate Coral FMPs for each Council's jurisdiction, and since that time, each Council has independently amended the plans. The Generic Sustainable Fisheries Act Amendment (SFA Amendment; GMFMC 1999) discussed standardized reporting methodologies (SBRM) for all of the Gulf Council's Fishery Management Plans (FMP) including the FMP for Coral and Coral Reefs of the Gulf of Mexico (Coral FMP). As part of the reporting requirements for each of the FMPs, the SBRM in specified in the SFA amendment authorized NMFS to collect bycatch information using the most practical reporting requirements and methodology.

7.2 Current Bycatch Reporting

All directed harvest of corals is prohibited in the Gulf of Mexico (Gulf), and all harvested coral must be returned to the sea immediately. If there is incidental take of corals, selected commercial fishermen with a Gulf Commercial Reef Fish and/or a Coastal Migratory Pelagics Permit must report bycatch in logbooks (20% of all commercial permit holders within a gear type; See section 2.2 and 5.2 above).

7.3 Characteristics of Bycatch

All directed harvest of corals is prohibited in the Gulf, and all harvested coral must be returned to the sea immediately. Coral and coral reefs habitats are protected from fishery interactions (bottom longline, bottom trawl, trap/pot) through designation of habitat areas of particular concern and essential fish habitat. Fishing in areas of known coral aggregations is limited to gear types that do not interact with the bottom. However, anchors and fishing gear that may get entangled with or abrade coral are often still permitted to be used in coral aggregation areas and may cause substantial damage.

7.4 Feasibility of the SBRM

All directed harvest of corals is prohibited in the Gulf, and all coral incidentally harvested must be returned to the sea immediately. Current bycatch reporting required for other fisheries is appropriate and feasible for reporting any incidentally caught corals.

7.5 Data Uncertainty / Data Use Resulting from the SBRM

Due to no directed harvest and protected areas in place to minimize interactions with coral and coral habitat, bycatch is considered low to zero; thus very little to no data are collected on bycatch of corals in the Gulf.

CHAPTER 8. LIST OF INTERDISCIPLINARY PLAN TEAM (IPT) MEMBERS

Name	Agency/Division	Title
Daniel Luers	SERO/SF	IPT Lead/Fishery Biologist
John Froeschke	GMFMC	IPT Lead/Deputy Director
Carrie Simmons	GMFMC	Executive Director
Jennifer Lee	SERO/PR	Fish Biologist
Jeff Pulver	SERO/SF	Data Analyst
Alisha Gray	SERO/SF	Data Analyst
Mike Larkin	SERO/SF	Data Analyst
Mara Levy	NOAA GC	General Counsel
Peter Hood	SERO/SF	Gulf of Mexico Branch Chief
Kevin McCarthy	SEFSC	Fishery Biologist

GMFMC = Gulf of Mexico Fishery Management Council, SERO = Southeast Regional Office, SF = Sustainable Fisheries Division, PR = Protected Resources Division, NOAA = National Oceanic and Atmospheric Administration, GC = General Counsel, SEFSC=Southeast Fisheries Science Center

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