

Puerto Rico Fishery Management Plan: Regulatory Flexibility Act Analysis

1. Introduction

The purpose of the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act, is to fit regulatory requirements to the scale of the businesses, organizations, and governmental jurisdictions subject to the regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that small entities have been given the opportunity to participate in the rulemaking process. The RFA does not contain any decision criteria; instead, the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of the alternatives contained in the fishery management plan (FMP) or amendment (including framework management measures and other regulatory actions) and to ensure that the agency considers alternatives that minimize the expected impacts while meeting the goals and objectives of the FMP and applicable statutes.

With certain exceptions, the RFA requires agencies to conduct a formal regulatory flexibility analysis for each proposed rule. The regulatory flexibility analysis is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts.¹ The following regulatory flexibility analysis was conducted to assess the direct compliance costs and benefits of the proposed rule on small entities, determine if the proposed rule would have a significant economic impact on a substantial number of small entities or not, and explore regulatory alternatives to reduce significant economic impact on a substantial number of such entities, if any.² Any methods that small businesses may engage in to reduce the adverse impacts of direct compliance costs or enhance the beneficial impacts of direct compliance benefits are discussed at the end of Section 5.

¹ The RFA requires an agency to perform a regulatory flexibility analysis of small entity impacts only when a rule directly regulates small entities. 5 U.S.C. 605(b), 604(b)(3). Under the RFA, agencies evaluate the direct compliance costs and benefits of the proposed rule on the regulated small entities.

² Direct compliance costs of an action include, but are not limited to, losses of revenues due to the legal inability of small businesses to continue all or part of their operations, such as small commercial fishing businesses having to cease fishing for and landings of a particular stock/stock complex because the fishing season for that stock/stock complex has closed for the remainder of the fishing year. Direct compliance benefits include, but are not limited to, increases in revenues due to the legal ability of small businesses to expand all or part of their operations, such as small fishing businesses increasing fishing for and landings of a particular stock/stock complex because the annual catch limit for that stock/stock complex has been increased.

2. Statement of the need for, objective of, and legal basis for the proposed rule

The Caribbean Fisheries Management Council (Council) has managed federal fisheries in the U.S. Caribbean Exclusive Economic Zone (EEZ) under the following four U.S. Caribbean-wide FMPs for decades: the FMP for the Reef Fish Fishery of Puerto Rico and the U.S. Virgin Islands (USVI) (Reef Fish FMP), the FMP for the Spiny Lobster Fishery of Puerto Rico and the USVI (Spiny Lobster FMP), the FMP for the Queen Conch Resources of Puerto Rico and the USVI (Queen Conch FMP), and the FMP for the Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the USVI (Coral FMP). Fishermen, fishing community representatives, and local governments of Puerto Rico and the USVI have commented that the Caribbean-wide approaches to federal fisheries management in the EEZ do not adequately consider the natural, economic and social environmental differences among Puerto Rico and the island areas of the USVI, and they have requested an alternative island-based approach that better conserves the unique attributes of the fishery resources and better serves the communities that are dependent on those resources in Puerto Rico and the island areas of the USVI. The proposed, “Comprehensive Fishery Management Plan for the Puerto Rico Exclusive Economic Zone” (Puerto Rico FMP), is an island-based approach to federal fisheries management in the EEZ off Puerto Rico (Puerto Rico EEZ) that responds to those comments and requests by taking better account of Puerto Rico’s unique natural, economic and social environments.

Federal fishery management is conducted under the authority of the Magnuson-Stevens Act Fishery Conservation and Management (Magnuson-Stevens Act; 16 U.S.C. 1801 et seq.). The Magnuson-Stevens Act claims sovereign rights and exclusive fishery management authority over most fishery resources within the EEZ, an area extending from the seaward boundary of each coastal state to 200 nm from shore, as well as authority over anadromous species that spawn in fresh or estuarine waters of the U.S. and migrate into ocean waters and continental shelf resources that occur beyond the EEZ. Responsibility for federal fishery management decision-making in the Puerto Rico EEZ is divided between the U.S. Secretary of Commerce and the Council, and the Council is responsible for preparing, monitoring, and revising management plans for fisheries needing management within their jurisdiction.

3. Identification of federal rules which may duplicate, overlap or conflict with the proposed rule

No federal rules have been identified that duplicate, overlap or conflict with the proposed rule.

4. Description and estimate of the number of small entities to which the proposed action would apply

The rule concerns recreational and commercial fishing in the Puerto Rico EEZ. Anglers (persons who engage in recreational fishing) are not considered small entities as that term is defined in 5 U.S.C. 601(6), whether fishing from for-hire fishing, private or leased vessels. Therefore, estimates of the number of anglers and any impacts on them are not provided here.³

Businesses that operate in the commercial fishing industry and particularly, those that operate commercial fishing vessels that harvest marine resources in the Puerto Rico EEZ would be directly affected. In 2016, there were 1,074 licensed commercial fishermen in Puerto Rico (CFMC 2019), 811 submitted catch reports and 383 of those who submitted reports operated in federal waters (SERO Caribbean Branch logbook data 2020).

In Puerto Rico, licensed commercial fishermen are either captains or helpers. This analysis assumes those who submit catch reports are captains, and each captain represents a unique business. It is unknown how the 2017 hurricane season and more recent economic conditions have affected the numbers of both active licensed captains and those that are fishing in the Puerto Rico EEZ as of August 2020. Nonetheless, we assume an annual average of 383 licensed commercial fishermen, which represent 383 commercial fishing businesses, would be directly affected by the proposed rule.

A business in the commercial fishing industry (NAICS code 11411) is a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates) and its combined annual receipts are no more than \$11 million for all of its affiliated operations worldwide. Dockside revenue from all landings of finfish and shellfish in Puerto Rico has been less than \$11 million. In 2016, for example, total dockside revenue from all landings in Puerto Rico, whether from commonwealth or federal waters, was \$5,641,528 (NMFS 2017) therefore, the average revenue per small business (i.e., commercial fishing business) for 811 commercial fishing businesses operating in all waters off Puerto Rico) was \$6,956. When adjusted for inflation, the average revenue is \$7,433 at January 2020 prices (Bureau of Labor Statistics [BLS], Consumer Price Index [CPI] Inflation Calculator). Therefore, all of the commercial fishing businesses operating in all waters off Puerto Rico, including federal waters, are small.

The following percentages and figures are from Matos-Caraballo and Agar (2011), except where noted, and are assumed to apply to the estimated 383 average annual number of small businesses

³ Under the RFA, “small entities” include small businesses, small governmental jurisdictions, and small (non-profit) organizations. Persons are not small entities under the RFA.

that operate in federal waters off Puerto Rico unless explained otherwise. Note that Matos-Caraballo and Agar (2011) do not distinguish between fishing in Commonwealth and federal waters and information specific to fishing activities in federal waters is not available. Matos-Caraballo and Agar (2011) reported that 77.3% of persons fishing in waters off Puerto Rico targeted reef fish, and this analysis assumes that the same percentage applies to the 383 licensed captains/small businesses that fish in federal waters annually.

It is important to note that most of the small businesses not only catch fish, but they also construct and repair their gear, repair their boats and equipment, and market their fish. In any given week, the average Puerto Rico fisherman spends a total of 45.1 hours per week engaged in fishing and fishing-related activities: 30.5 hours fishing, 5.1 hours maintaining and repairing the boat and engine, 5.1 hours maintaining and repairing fishing gear, and 4.4 hours marketing the catch. That is a total of 45.1 hours per week, and for each hour of fishing, the average fisherman spends approximately half an hour engaged in other fishing-related (non-fishing) activities.

From those average weekly hours, it follows that a large majority of the small businesses are full-time businesses. Approximately 75% are full-time fishermen, while the remaining 25% fish part-time. Those percentages change as Puerto Rico's economic conditions change, especially as the number of jobs change. As the number of jobs declines, more fish full-time.⁴ In 2008, there were 1.00 million non-farm jobs in Puerto Rico, but as of January 2020 there were 0.88 million non-farm jobs, a 12% drop (BLS, Local Area Statistics). Despite the decline in the civilian labor force during that time, the falling number of jobs suggests the percentage of licensed fishermen who are fishing full-time may have increased above 75% since 2008.⁵

Prices of fuel, boats, gears and other fishing-related equipment are significantly higher in Puerto Rico than on the U.S. mainland. For example, during January 2020, the average price of a liter of regular gasoline in Puerto Rico was \$0.85 (GlobalPetrolPrices.com), which translates to \$3.22 per gallon. On the U.S. mainland, the average price of a gallon of regular gas at that time was \$2.55. The higher prices discourage Puerto Rico's small businesses from buying bigger boats, taking longer and more trips and/or buying more gear, while they encourage them to repair their boats and gear and maintain the duration and numbers of weekly trips.⁶

The small businesses in Puerto Rico do not have large vessels. The average small business owns one fishing vessel that is 20 feet long with a single outboard motor of 80 horsepower. Such a

⁴ In the early 2000s, the percentage of licensed fishermen who fished full time increased as the unemployment rate increased (Matos-Caraballo and Agar 2011).

⁵ Revenues taken in by fishing account for a substantial portion of the average fisherman's household income. Approximately 61% derive all of their household income from fishing, while approximately 16% derive from zero to less than half of their household income from fishing. The percentage of fishermen who derive most to all of their household income from fishing may have increased under more recent economic conditions.

⁶ Unless loss of household income from wage labor motivates them to increase fishing activity despite higher prices of fuel, gear and other fishing-related goods and services.

vessel has a relatively small capacity for storing gear, bait and catch and can only have a small number of helpers on board. During a fishing trip, there is usually the captain and one helper.⁷

Hook-and-line gear is the most popular gear because of its relatively low cost and effectiveness for catching reef fish and pelagic species. It is also the most productive gear type used. The average small business has 12 units of hook-and-line gear, of which seven are handlines, two are troll lines, one is rod and reel, and the other is bottom line. That does not mean all of those gear are used during a trip. SCUBA and skin diving gear are the second most productive gear type used. Approximately 44% of small businesses use SCUBA and skin diving gear, and the average diver has one spear, two tanks, one snare and two gaffs. SCUBA and skin diving gear are used primarily to harvest queen conch and spiny lobster. Traps and pots are the third most productive gear type used. The average small business has five fish traps, four lobster traps and one deep-water snapper trap. The chevron or arrowhead style fish trap is the most popular. In 2004, the average price of an arrowhead trap was \$94, which would be \$127 as of January 2020 when adjusted for inflation (BLS CPI Inflation Calculator).

Puerto Rico’s fishermen tend to target multiple categories of fish and shellfish, and the most popularly targeted category is reef fish (Figure 1). Approximately 77% of small businesses target reef fish, and approximately 56% target deep-water snapper. Note that although over 30% target queen conch, fishing for or possession of queen conch in the Puerto Rico EEZ is prohibited. Less than 2% target ornamental fish and those who do tend to be part-timers and operate in shallow waters off beaches. Small businesses target species that they know they can sell at prices they expect.

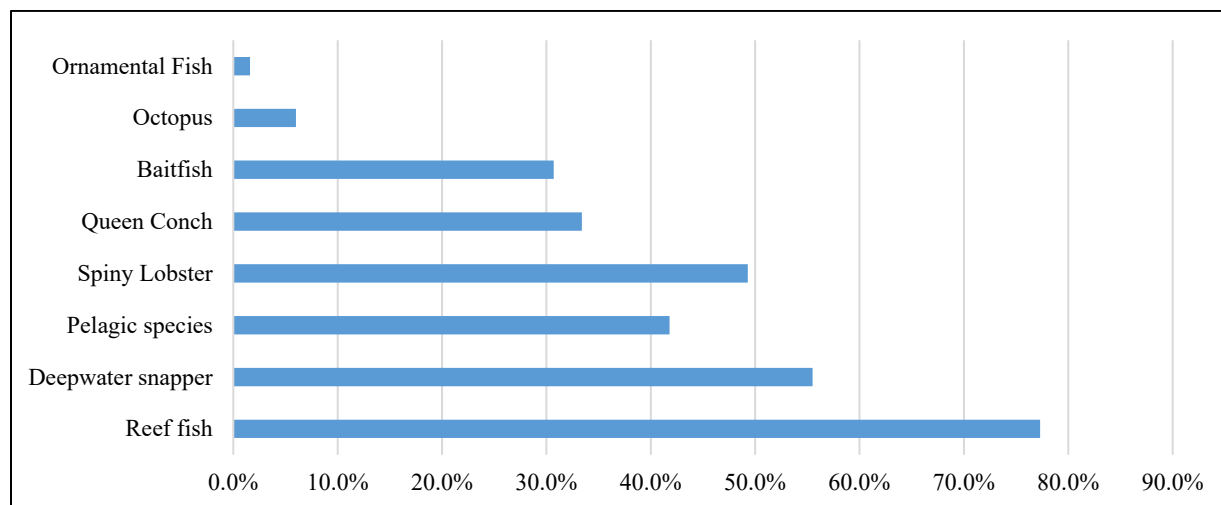


Figure 1. Percent of licensed captains/small businesses that target fish/shellfish categories.

Source: Matos-Caraballo and Agar (2011).

⁷ The helper is paid with a share of the catch, which is usually a third (Griffith et al. 2007).

5. Description and economic impacts of the compliance requirements of the proposed rule

Action 1, Preferred Alternative 2, would repeal the U.S. Caribbean-wide Reef Fish FMP, Spiny Lobster FMP, Queen Conch FMP, and Coral FMP as they apply to the Puerto Rico EEZ and replace them with a Puerto Rico FMP to manage fishery resources in the Puerto Rico EEZ.⁸ Presently the combined Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs include 81 species of reef fish, 58 species of aquarium trade fish, spiny lobster, queen conch, 94 species or genera of corals, and 63 species or genera of aquarium trade invertebrates. Under this action, the Puerto Rico FMP would incorporate all fishery management measures presently included in the Spiny Lobster, Reef Fish, Queen Conch, and Coral FMPs that are applicable to the Puerto Rico EEZ. **Action 1, Preferred Alternative 2**, which creates the Puerto Rico FMP, would not change any existing regulations and would have no direct compliance cost or benefit.

Action 2, Preferred Alternative 2, has five criteria that are used to select the list of species included in the Puerto Rico FMP created by Action 1. From a list of species for which landings data are available, the Council applied a set of criteria to determine whether to manage the species. *First*, it would include those species that are presently classified as overfished, have harvest prohibitions or have associated seasonal closures or size limits (Criterion A).⁹ *Second*, excluding those included by Criterion A, it would exclude those species that have been determined to not or infrequently occur in the Puerto Rico EEZ (Criterion B). *Third*, excluding those included by Criterion A or excluded by Criterion B, it would include species that are biologically vulnerable, constrained to a specific habitat that renders them particularly vulnerable, or have an essential ecological value (Criterion C). *Fourth*, excluding those included by Criteria A and C or excluded by Criterion B, it would include species that are economically important to the national or Puerto Rico economy and those representing an important component of bycatch (Criterion D). *Fifth*, from the remaining species, it would include any other species that the Council determines are in need of conservation and management.

After the application of the five criteria of **Action 2, Preferred Alternative 2**, the Puerto Rico FMP would include a total of two species of shellfish (spiny lobster and queen conch), 63 species of finfish, and all species of sea cucumbers, sea urchins, and corals that are found in the Puerto Rico EEZ. Eighteen species of finfish would be new to management, as would the

⁸ The U.S. Caribbean-wide FMPs defined a Puerto Rico management area (50 CFR Appendix E to Part 622, Table 1), and that same area is identified as the Puerto Rico EEZ in the Puerto Rico FMP.

⁹ This Criterion retains all corals in the Coral FMP. However, the Council agreed to also add any new species of coral found to occur in the Puerto Rico EEZ, so this Criterion would bring all species of coral under management.

species of sea cucumber, sea urchin and coral found in the Puerto Rico EEZ that are not managed under the Coral FMP.¹⁰

Neither the inclusion of species currently managed under the Reef Fish, Spiny Lobster, Queen Conch and Coral FMPs nor the inclusion of species new to federal management would have a direct impact on small businesses; however, the addition of species not currently managed under those FMPs would prompt additional actions that could directly affect small commercial fishing businesses, such as establishing annual catch limits (ACL) (Action 4) and accountability measures (AM) (Action 5) to ensure compliance with the ACLs. Similarly, any modification to the ACLs (Action 4) and AMs (Action 5) for stocks currently managed could have direct impacts on small businesses that target these stocks.

Federal regulations have very little to no impact on small businesses that harvest species that infrequently or do not occur in federal waters. Therefore, removal of species currently managed under the Reef Fish and Coral FMPs that are not found or infrequently occur in the Puerto Rico EEZ would have very little to no direct compliance benefits.¹¹

Action 3, Preferred Alternative 3, would establish stocks/stock complexes for those species selected for management under Action 2, Preferred Alternative 2. Compared to the baseline stocks/stock complexes (those included in the Reef Fish, Spiny Lobster, Queen Conch and Coral FMPs), **Preferred Alternative 3** would result in some of the same stock/stock complexes, with the same species composition, as those under the Caribbean-wide FMPs (e.g., Snapper 1 of the Puerto Rico FMP is the same as Snapper Unit 1 of the Reef Fish FMP), but would result in a different species composition for others (e.g., Snapper 3 of the Puerto Rico FMP is different than Snapper Unit 3 of the Reef Fish FMP). Where applicable, **Preferred Alternative 3** also would create new stock/stock complexes for species new to management (e.g., dolphin and pompano dolphin). It would have no direct impact on small businesses; however, it would prompt additional actions that change existing and add new regulations, such as the establishment of new ACLs and AMs to ensure compliance with those ACLs.

Action 3, Preferred Sub-alternative 4a, would assign and **Preferred Sub-alternative 4b** would not assign an indicator stock to a stock complex based on scientific analyses. An indicator stock is one that can be used to help manage and evaluate more poorly known stocks that are in a stock complex. Under **Preferred Sub-alternative 4a**, for stock complexes for which harvest is allowed and for which one or more indicator stocks is or are assigned, landings

¹⁰ The 18 finfish species new to federal management include: cubera snapper, yellowmouth grouper, gray triggerfish, crevalle jack, African pompano, rainbow runner, great barracuda, tripletail, dolphin, pompano dolphin, little tunny, blackfin tuna, king mackerel, cero mackerel, wahoo, giant manta ray, spotted eagle ray, and southern stingray.

¹¹ The Spiny Lobster and Queen Conch FMPs only managed the respective single species, which were both included for management under Criterion A.

of the indicator stock(s) would be monitored and stocks in the stock complex would be subject to the AM as a group based on the ACL established for the stock complex based on information about the indicator stock(s). Under **Preferred Sub-alternative 4b**, for stock complexes for which harvest is allowed, stocks in the complex would be subject to the AM as a group based on the ACL for the stock complex established based on information about all of the stocks in the stock complex.¹² There would be no direct impact on small businesses; however, **Action 3**, **Preferred Sub-alternatives 4a** and **4b** would have an indirect impact by affecting how ACLs for each stock complex are established (Action 4) and how landings of a stock complex are evaluated relative to its ACL, which affects if landings of the stock complex trigger its AM or not (Action 5).

Action 4 would specify the status determination criteria (SDC) and management reference points for each of the proposed stocks and stock complexes included in the Puerto Rico FMP. The SDC and management reference points specified in the Council's acceptable biological catch (ABC) control rule would be set at the stock/stock complex level, while the ACLs specified by the Council would be specified by sector (i.e., commercial, recreational) where applicable.¹³ **Action 5** would specify the AMs and triggers of the AMs for each stock/stock complex for which management is continued, and establish AMs and AM triggers for stocks/stock complexes new to management. An AM is an action taken to prevent landings from exceeding the ACL, and if triggered, the AM can mitigate or correct an overage of landings.

Direct compliance costs and benefits of Actions 4 and 5: Stocks/stock complexes for which proposed management is comparable to current management

Five stocks (Queen Conch, Spiny Lobster, Grouper 1 [Nassau grouper], and Grouper 2 [goliath grouper], Snapper 5 [yellowtail snapper]) and three stock complexes (Parrotfish 1 [blue, midnight, rainbow parrotfish], Angelfish [queen, gray, French angelfish], and Surgeonfish [blue tang, ocean surgeonfish, doctorfish]) resulting from **Action 3, Preferred Alternative 3** would have the same species composition as stocks/stock complexes under current regulation (in the U.S. Caribbean-wide FMPs). These stocks/stock complexes are managed with ACLs for the stocks/stock complexes under the current Caribbean-wide FMPs and would continue to be managed as such, without an indicator stock, under the Puerto Rico FMP. Therefore, the direct costs and benefits of the management would be directly comparable.

Commercial landings data are obtained from commercial catch reports, which are adjusted by Puerto Rico's Department of Natural and Environmental Resources to account for reporting

¹² The following six stock complexes would have one or more indicator stocks: Snapper 1, Snapper 2, Snapper 4, Grouper 3, Grouper 6, Triggerfish, and Dolphinfish.

¹³ For queen conch and spiny lobster, recreational landings data are not available, and reference points are set at the stock level.

errors. Recreational landings data are collected in Puerto Rico for finfish species through effort and catch surveys conducted by NOAA's Marine Recreational Information Program. Throughout this RFA, all management reference points (ACLs and ACTs) and landings data are reported in pounds whole weight (lbs).

Action 4, Preferred Sub-alternative 3e would set the ACLs for Queen Conch, Spiny Lobster, Grouper 1, Grouper 2, and Snapper 5 at 95% of their respective ABCs (Table 5.1). **Action 4, Preferred Sub-alternative 3g** would set the ACLs for Parrotfish, Angelfish, and Surgeonfish at 85% of their respective ABCs. The ABCs for Queen Conch, Grouper 1, Grouper 2, and Parrotfish 1 were set equal to zero by the SSC; thus, the proposed ACLs for those stocks and stock complexes would be zero. Under the 2010 Caribbean ACL Amendment, the ACLs for Nassau grouper (Grouper 1), goliath grouper (Grouper 2), midnight, blue, and rainbow parrotfish (Parrotfish 1), and Queen Conch in Puerto Rico were also set equal to zero.

Under **Action 5, Preferred Alternative 5**, the harvest prohibition for Queen Conch, Grouper 1, Grouper 2, and Parrotfish 1 would serve as the AM consistent with the approach under current management. Therefore, the ACLs and AMs that would be specified by **Actions 4 and 5**, respectively, for Queen Conch, Grouper 1, Grouper 2, and Parrotfish 1 are consistent with ACLs and AMs established under the Reef Fish and Queen Conch FMPs and would have no direct compliance costs or benefits on small businesses.

Under **Action 5, Preferred Alternative 2**, the AM and trigger for the AM for Spiny Lobster is the same as the AM and AM trigger under current management (Spiny Lobster FMP), with the exception of the specification of years of landings data used to evaluate whether the AM is triggered or not. Under both the current and proposed AM for this stock, the AM would be triggered if landings exceed the ACL,¹⁴ unless NMFS' SEFSC determines the overage occurred because data collection or monitoring improved rather than because catch increased.

Under **Action 5, Preferred Alternative 2**, the AM and trigger for the AM that would apply to those fishing commercially for Snapper 5, Angelfish, and Surgeonfish is similar to the AM and AM trigger under current management (under the Reef Fish FMP). Under both the current and proposed AM, for these stock complexes, the AM would be triggered if commercial landings exceed the commercial ACL and the total landings (combined commercial and recreational) exceed the total ACL, unless NMFS' SEFSC determines the overage occurred because data collection or monitoring improved rather than because catch increased. However, under **Action 5, Preferred Alternative 2**, if applicable landings for one sector are not available, that sector

¹⁴ Information on spiny lobster is not collected during recreational catch surveys and therefore sector-specific landings data are not available. The AM would be triggered when the average of the most recent three years of commercial landings exceeds the ACL established for the stock, which is based on the available commercial landings. The AM, once triggered, would apply equally to the commercial and recreational fishing sectors.

would not be managed with its sector-specific ACL. Instead, the ACL for the sector with available data would be the applicable ACL for the stock/stock complex. When landings exceed the applicable ACL for that stock/stock complex, the AM would be triggered, unless NMFS' SEFSC determines that the overage occurred because data collection or monitoring improved rather than because catch increased.

Under **Action 5, Preferred Sub-alternative 2d**, the estimate of landings compared to the ACL for Spiny Lobster, Snapper 5, Angelfish, and Surgeonfish would be a single year of applicable landings, using landings from 2018; then a single year of applicable landings, using landings from 2019; then a two-year average of applicable landings from 2019 and the subsequent year (2019-2020); then a three-year average of applicable landings from those two years and the subsequent year (2019-2021); and thereafter a progressive running three-year average (2020-2022, 2021-2023, etc.). The Regional Administrator (RA) in consultation with the Council could deviate from the specific time sequences based on data availability. Under both the current regulation and the proposed FMP, once triggered, NMFS would reduce the length of the fishing season for the applicable stock/stock complex the year following the overage determination by the amount necessary to ensure (to the greatest practicable extent) landings do not again exceed the ACL in the year of application.

For the purposes of this analysis, to determine whether there would be AM-based fishing reduction under the proposed action, the average commercial and total landings of spiny lobster, Snapper 5, Angelfish, and Surgeonfish from 2014 through 2016 are compared to the current and proposed commercial and total ACLs (Table 5.1).

Table 5.1. Current and proposed commercial and total (commercial + recreational) ACLs and resultant AMs triggered based on average commercial and total (commercial + recreational) landings reported for stocks/stock complexes in Puerto Rico for which proposed management is directly comparable to current management. Note: recreational landings data are not collected for Spiny Lobster, thus, the ACLs and average landings are based on commercial landings data only.

Stock/ Stock Complex	Current Commercial ACL (lbs)	Current Total ACL (lbs)	Proposed Commercial ACL (lbs)	Proposed Total ACL (lbs)	Average Commercial Landings (2014-2016)	Average Total Landings (2014-2016)	AM Triggered under Current ACL	AM Triggered under Proposed ACL
Spiny Lobster	N/A	327,920	N/A	527,232	413,250	413,250	Yes	No
Snapper 5 ¹ (yellowtail snapper)	373,295	401,804	315,806	339,794	186,235	210,997	No	No
Angelfish (queen, gray, French angelfish)	8,984	13,476	137	2,985	49	49	No	No
Surgeonfish (blue tang, ocean surgeonfish, doctorfish)	7,179	10,769	147	860	57	57	No	No

¹ Yellowtail snapper is managed as Snapper Unit 4 under the Reef Fish FMP.

Average commercial landings (2014-2016) for Snapper 5 (yellowtail snapper), Angelfish, and Surgeonfish would not exceed either the current or proposed commercial ACLs and no AMs would be triggered for the commercial sector (Table 5.1). Therefore, no direct impacts on small businesses that harvest those species, as listed in Table 5.1, would be expected.

The proposed decreases in the commercial and total ACLs for Snapper 5 (yellowtail snapper), Angelfish, and Surgeonfish would negatively impact small businesses if landings were to substantially increase beyond 2014-2016 levels in the future. However, such an increase cannot be predicted.

Under current management, the 2014-2016 average landings of Spiny Lobster in Puerto Rico exceeded the ACL¹⁵ by 85,330 lbs. However, fishing activities in the U.S. Caribbean were severely curtailed in 2017 due to impacts of Hurricanes Irma and Maria, the effects of which continued into the 2018 fishing season. Thus, when evaluating whether to implement an AM in the 2018 fishing season based on the landings from 2014-2016, the RA determined that an AM-based reduction to the Spiny Lobster fishing season in Puerto Rico in 2018 was not necessary to prevent a future overage.

Under proposed management, the 2014-2016 average landings of Spiny Lobster in Puerto Rico would not exceed the ACL. Therefore, at those landings levels, an AM would not be triggered and the length of the Spiny Lobster fishing season in Puerto Rico would not be reduced. Since the length of the Spiny Lobster fishing season was not reduced under current management and would also not be reduced under the proposed management, there would be no change in the effect of fishery management and no direct impact to small businesses that harvest spiny lobster in Puerto Rico. The potential impact of the proposed increase in the ACL for Spiny Lobster under the Puerto Rico FMP is dependent on the extent that future landings recover from the 2017 hurricane season and the extent to which AMs are needed to prevent future overages of the current and proposed ACLs

Direct compliance costs and benefits of Actions 4 and 5: Stocks/stock complexes new to management

Based on proposed **Action 2**, 18 finfish species would be new to management under the Puerto Rico FMP (cubera snapper, yellowmouth grouper, gray triggerfish, crevalle jack, African pompano, rainbow runner, giant manta ray, spotted eagle ray, southern stingray, little tunny, blackfin tuna, king mackerel, cero mackerel, wahoo, tripletail, great barracuda, dolphin, pompano dolphin), along with multiple sea urchins, sea cucumbers, and corals that are not

¹⁵ As previously stated, recreational landings data are not available for spiny lobster, and the management reference points and ACLs are based on commercial landings. Any AM triggered for spiny lobster would apply to both commercial and recreational fishermen.

managed under the Coral FMP. Following **Action 3**, cubera snapper (Snapper 6), crevalle jack, African pompano, rainbow runner, giant manta ray, spotted eagle ray, southern stingray, wahoo, tripletail, and great barracuda would each be managed as individual stocks; yellowmouth grouper would be managed in the Grouper 4 stock complex with black, red, tiger, and yellowfin grouper; gray triggerfish would be managed in the Triggerfish stock complex with ocean and queen triggerfish; little tunny and blackfin tuna would be managed together in the Tuna stock complex; king mackerel and cero mackerel would be managed together in the Mackerel stock complex; dolphin and pompano dolphin would be managed together in the Dolphinfish stock complex; all sea urchin species and sea cucumber species in Puerto Rico federal waters would be managed in new Sea Urchin stock complex and Sea Cucumber stock complex; and all coral species¹⁶ in Puerto Rico federal waters would be managed in the Corals stock complex.

As unmanaged species, there are no regulations in place under the Reef Fish FMP or the Coral FMP that directly limit fishing for and landing of these species.

Action 4, Preferred Sub-alternative 3e, would set the commercial and total ACLs at 95% of the respective ABCs for the stocks/stock complexes new to federal management. The ABC recommendations for the Rays 1 (giant manta ray), Rays 2 (spotted eagle ray), Rays 3 (southern stingray), Sea Urchins, Sea Cucumbers, and Corals stocks/stock complexes were set equal to zero by the SSC and the ACLs for those stocks/stock complexes would be zero.

Action 5, Preferred Alternative 2 and Preferred Sub-alternative 2d would set the AM and AM trigger for cubera snapper, yellowmouth grouper, gray triggerfish, crevalle jack, African pompano, and rainbow runner (Table 5.2). For these individually managed stocks (cubera snapper, crevalle jack, African pompano, rainbow runner) the AM would be triggered for the commercial sector if commercial landings exceed the commercial ACL for the stock and if total landings (commercial + recreational) exceed the total ACL for the stock. For yellowmouth grouper and gray triggerfish, which would be managed in the Grouper 4 and Triggerfish stock complexes, an AM would be triggered for the commercial sector if commercial landings of all stocks in stock complex exceed the commercial ACL for the stock complex and if total landings (commercial + recreational) of all stocks in the stock complex exceed the total ACL for the stock complex. In either case, an AM will not be triggered if NMFS' SEFSC determines the overage of either the commercial ACL or total ACL occurred because data collection/monitoring improved rather than because catch increased. Once triggered, NMFS would reduce the length of the fishing season for stock/stock complex the year following the overage determination by the amount necessary to ensure (to the greatest practicable extent) landings do not again exceed

¹⁶ Corals included in the Puerto Rico FMP include the phylum Cnidaria (formerly Coelenterata) 1) Class Hydrozoa, Sub-Class Hydroidolina, Order Anthoathecata, Family Milleporidae and Family Stylasteridae; 2) Class Anthozoa, Subclass Octocorallia (soft corals, gorgonians, sea pansies, sea pens), Order Alcyonacea (soft corals), Order Pennatulacea (sea pens), Subclass Hexacorallia, Order Scleractinia (stony corals), and Order Anthipatharia (black corals).

the ACL in the year of application. The AM would be applied to the sector(s) that exceeded its sector-specific ACL. However, under **Action 5, Preferred Alternative 2**, if applicable landings for one sector are not available, that sector would not be managed with its sector-specific ACL. Instead, the ACL for the sector with available data would be the applicable ACL for the stock/stock complex. When landings exceed the applicable ACL for that stock/stock complex, the AM would be triggered, unless NMFS' SEFSC determines that the overage occurred because data collection or monitoring improved rather than because catch increased.

Action 5, Preferred Sub-alternative 2d, would use a single year of applicable landings, using landings from 2018; then a single year of applicable landings, using landings from 2019; then a two-year average of applicable landings from 2019 and the subsequent year (2019-2020); then a three-year average of applicable landings from those two years and the subsequent year (2019-2021); and thereafter a progressive running three-year average (2020-2022, 2021-2023, etc.). The Regional Administrator (RA) in consultation with the Council could deviate from the specific time sequences based on data availability. It would apply to the above six individually managed stocks (cubera snapper, yellowmouth grouper, gray triggerfish, crevalle jack, African pompano).

Action 5, Preferred Alternative 3, would apply a two-step process to establish an annual catch target (ACT) for pelagic stocks/stock complexes that would be used as the AM trigger. **Action 5, Preferred Sub-alternative 3a** would establish commercial ACTs at 90% of the applicable¹⁷ ACL for Great Barracuda, Tripletail, and Wahoo stocks, and Dolphinfinch, Tuna, and Mackerel stock complexes (Table 5.3). **Action 5, Preferred Sub-alternative 3g** would use the same year sequences specified above for **Action 5, Preferred Sub-alternative 2d** for evaluating whether landings exceed the AM trigger (i.e., the ACT). An AM would be triggered if the applicable landings exceed the ACT for the stock/stock complex. If an AM is triggered, the Council in consultation with the SEFSC would determine if corrective action is necessary.

Action 5, Preferred Alternative 5, would establish the harvest prohibition as the AM for the Rays 1, Rays 2, Rays 3, Sea Urchins, Sea Cucumbers, and Corals stocks/stock complexes.

¹⁷ The applicable ACL would either be the sector-specific ACL, where landings data are available to manage by sector, or the ACL for the sector with available landings, which, per Action 4, Alternative 2, becomes the fishery ACL when landings in the other sector are not available.

Table 5.2. Proposed commercial and total ACLs and resultant AMs triggered based on average commercial and total landings reported for reef fish stocks new to management in Puerto Rico. Note: under current management, no ACLs exist for these stocks.

Stock	Proposed Commercial ACL (lbs)	Proposed Total ACL (lbs)	Average Commercial Landings (2014-2016)	Average Total Landings (2014-2016)	Commercial ACL Exceeded	Total ACL Exceeded	AM Triggered
Cubera Snapper	119	6,567	3,156	5,990	Yes	No	No
Yellowmouth Grouper	2,492 ¹	8,359 ¹	549 ¹	12,343 ¹	No	N/A ²	No
Gray Triggerfish	83,099 ³	90,552 ³	69,701 ³	92,124 ³	No	N/A ²	No
Crevalle Jack (Jacks 1)	46	41,940	0	45,590	No	N/A ²	No
African Pompano (Jacks 2)	1,052	6,771	1,005	5,921	No	N/A ²	No
Rainbow Runner (Jacks 3)	913	9,005	240	240	No	N/A ²	No

¹ Based on the Grouper 4 aggregate (black, red, tiger, yellowfin, and yellowmouth grouper).

² Because the commercial ACL was not exceeded, an AM would not be triggered for the commercial sector, even if the total ACL was exceeded.

³ Based on the Triggerfish indicator stock (queen triggerfish), applicable to the Triggerfish stock complex (queen, ocean, and gray triggerfish).

Table 5.3. Proposed commercial ACLs and commercial ACTs and resultant AMs triggered based on average commercial landings reported for pelagic stocks/stock complexes new to management in Puerto Rico. Note: under current management, no ACLs or ACTs exist for these stocks/stock complexes.

Stock/Stock Complex	Proposed Commercial ACL (lbs)	Proposed Commercial ACT (lbs)	Average Commercial Landings (2014-2016)	Commercial ACT Exceeded	AM Triggered
Tripletail	270	243	74	No	No
Great Barracuda	495	445	0	No	No
Tuna stock complex (Little Tunny, Blackfin Tuna)	82,779	74,501	45,782	No	No
Mackerel stock complex (King Mackerel, Cero Mackerel)	232,422	209,180	60,705	No	No
Dolphinfish stock complex (Dolphin, Pompano Dolphin)	232,173 ¹	208,956 ¹	118,466 ¹	No	No
Wahoo	25,911	23,320	18,110	No	No

¹ Based on the Dolphinfish indicator stock (dolphin), applicable to the Dolphinfish stock complex (dolphin, pompano dolphin).

Small businesses that target the 18 finfish new to federal management would be accountable to ACLs or ACTs under the Puerto Rico FMP where currently no management limits are in place. As seen in Table 5.2, when using the 3-year average landings during the 2014-2016 period, commercial landings did not exceed the commercial ACLs applicable to yellowmouth grouper (Grouper 4), gray triggerfish (Triggerfish), crevalle jack (Jacks 1), African pompano (Jacks 2), and rainbow runner (Jacks 3). Because the commercial sector did not exceed its ACL, no AMs for the commercial sector would be triggered, and there would be no direct impact on small businesses that fish for these species. The future impact of managing these species depends on the extent to which landings could increase and if future AMs are triggered and applied; however, such increases cannot be predicted.

For cubera snapper (Snapper 6), the 2014-2016 average commercial landings would exceed the proposed commercial ACL, but the 2014-2016 average total landings would not exceed the proposed total ACL (Table 5.2). Thus, for cubera snapper, an AM would not be triggered for the commercial sector, and there would be no direct costs to small businesses that fish for this species. However, if future recreational landings for cubera snapper are not available, the commercial ACL would become the ACL applicable to the stock. In this scenario, if commercial landings remain the same, an AM would be triggered for all of those fishing for cubera snapper, including the commercial sector, as the commercial landings were above the proposed commercial ACL (3,037 ACL overage). Recreational data collection in Puerto Rico was suspended following the 2017 hurricane season and has not yet re-started, though efforts are underway to resume collection.

Assuming recreational data are not available when the Puerto Rico FMP is in place, small businesses fishing for cubera snapper would incur a fishing season reduction to account for the 3,037 lb ACL overage under the proposed management, unless NMFS SEFSC determined the overage was caused by improved data collection/monitoring rather than increased catch. As a currently unmanaged stock, there are no currently no limits on cubera snapper landings. The average price of a snapper, including cubera snapper, was \$2.50 per pound in 2011 (Matos-Caraballo 2012), and is estimated to be \$2.86 as of January 2020 (BLS CPI Inflation Calculator). A reduction in landings of cubera snapper by the amount of the overage (3,037 lbs; Table 5.2) would have an associated loss of annual revenue of \$8,686 and an average direct compliance cost of \$29 per small business for the 77.3% of small businesses that target reef fish in federal waters (77.3% of 383 small businesses operating in federal waters = 296 small businesses targeting reef fish; $\$8,686/296 = \29 per small business). The average direct compliance cost (\$29) would represent approximately 0.4% of the estimated average annual revenue of a small commercial fishing business in Puerto Rico. Consequently, **Actions 4 and 5** would generate an average direct compliance cost of \$29 per small business for the small businesses that target cubera snapper, unless NMFS determined there the overage was caused by improved data collection/monitoring rather than increased catch. The future impact of managing cubera

snapper depends on availability of recreational data and the extent to which landings could increase and if future AMs are triggered and applied; however, such an increase cannot be predicted.

For the pelagic stocks/stock complexes that would be new to management, commercial landings would not exceed the proposed commercial ACTs for Tripletail, Great Barracuda, little tunny and blackfin tuna (Tuna stock complex), king and cero mackerel (Mackerel stock complex), dolphin and pompano dolphin (Dolphinfish stock complex), and Wahoo (Table 5.3). Therefore, no AMs would be triggered for the commercial sector of those fishing for these stocks/stock complexes, and there would be no direct costs to small businesses that fish for these species as a result of including them in federal management. The future impact of managing these species depends on the extent to which landings could increase and if future AMs are triggered and applied. Such increases, however, cannot be predicted.

For the newly managed giant manta ray (Rays 1), spotted eagle ray (Rays 2), and southern stingray (Rays 3), the harvest prohibition would operate as the AM, whereas currently harvest of these species is not federally managed. There were no commercial landings of these species from 2014-2016, so prohibiting their harvest should not have any direct compliance costs on small businesses.

Likewise, for species new to federal management in the Sea Urchins, Sea Cucumbers, and Corals stock complexes, harvest would be prohibited, whereas currently harvest, if any, of these species is not federally managed. No landings were reported for species that would be new to or are currently in these three stock complexes from 2014-2016; thus, there should be no direct compliance costs to small businesses from managing these species. Sea cucumbers cannot be harvested from Puerto Rico commonwealth waters (Puerto Rico Administrative Order 2016-08), and no information has been uncovered to date to indicate there is or has been local demand for or commercial harvest of either sea urchins (or their roe) or sea cucumbers from the Puerto Rico EEZ since the Administrative Order was issued.^{18,19} Similarly, no information has been uncovered to date to indicate that there was or is commercial harvest of coral from the Puerto Rico EEZ. Therefore, it is expected that **Actions 4** and **5** would have no direct impact on small businesses as a result of managing additional species of sea urchins, sea cucumbers, or corals.

¹⁸ There were reports of commercial harvests of sea cucumbers in shallow Commonwealth waters from 2011 to 2013 for exportation (Miguel et al. 2013).

¹⁹ Global consumers of sea urchin and sea urchin roe prefer those found in colder waters, not the species present in the U.S. Caribbean and for which harvest would be prohibited under the Puerto Rico FMP.

Direct compliance costs and benefits of Actions 4 and 5: Stocks/stock complexes for which proposed management is not directly comparable to current management

For the remaining stocks/stock complexes proposed for management under the Puerto Rico FMP, comparing the effects of the proposed and current regulations is complicated by how management would change under the proposed regulations. Current management of most reef fish species in Puerto Rico is based on ACLs that were established at the family level (e.g., Groupers, Wrasses), with the exception of the 14 managed snapper species, which were split into four management units (i.e., stock complexes, Snapper Units 1-4 under current management). For some species that would continue to be managed under the Puerto Rico FMP (e.g., hogfish), the proposed ACLs specified in Action 4 would not be specified at the family level (e.g., Groupers, Wrasses), as under current management, but rather at multiple sub-levels (e.g., hogfish would be managed as an individual stock under the Wrasses 1 ACL), preventing a direct comparison. Additionally, management under the Puerto Rico FMP proposes to use indicator stocks to govern some of the reef fish families and sub-families (e.g., Snapper 1, Snapper 2). For stock complexes where an indicator stock was selected, the proposed ACL for the stock complex specified under **Action 4** would be based on and evaluated with respect to landings of the indicator stock(s) only, rather than on the combined landings of all the stocks within the stock complex. Thus, even if the composition of some of these stock complexes would remain the same, current versus proposed ACLs are not directly comparable. Even where management would continue at the same level without indicators, following Action 2 and Action 3, some currently managed reef fish species would not be managed under the Puerto Rico FMP (e.g., Parrotfish and Grunts), and so the proposed ACLs would not be comparable to the current ACLs because the species that make up the complex have changed.

For the proposed Snappers (1-4)²⁰, Groupers (3-6)²¹, Grunts, Triggerfish, Wrasses (1-2), Sea Urchins, Sea Cucumbers, and Corals stocks/stock complexes, **Preferred Sub-alternative 2e** would specify ACLs as 95% of their respective ABCs. For the Parrotfish 2²² stock complex, **Action 4, Preferred Sub-alternative 2g** would specify the ACL as 85% of the respective ABC. Table 5.4 below shows current management (e.g., ACLs) of reef fish species under the Reef Fish FMP and coral reef resources under the Coral FMP compared to proposed management under the Puerto Rico FMP.

²⁰ Snapper 5 (yellowtail snapper) was described in a previous section, as current and proposed management for the species would be the same (i.e., individual stock ACL). Snapper 6 (cubera snapper) is new to management and was described in the previous section.

²¹ Grouper 1 (Nassau grouper) and Grouper 2 (goliath grouper) stocks were described in a previous section, as current and proposed management for those species would be the same (i.e., harvest is prohibited).

²² The Parrotfish 1 (midnight, blue, and rainbow parrotfish) stock complex was described in a previous section, as current and proposed management for these species would be the same (i.e., harvest is prohibited).

Action 5, Preferred Alternative 2 and Preferred Sub-alternative 2d, would establish an AM and AM trigger for the proposed Snapper 1-4, Groupers 3-5, Grunts, Triggerfish, and Wrasses 1-2. For stock complexes managed with an indicator stock, landings of the indicator stock(s) would be monitored. An AM would be triggered for the commercial sector if commercial landings of the indicator stock(s) exceed the commercial ACL and if total landings of the indicator stock(s) (commercial + recreational) exceed the total ACL. For stock complexes managed without an indicator stock, an AM would be triggered for the commercial sector if the aggregate commercial landings of stocks within the stock complex exceed the commercial ACL and if aggregate total landings (commercial + recreational) of stocks within the stock complex exceed the total ACL. In either case, the AM would be applied to all stocks in the stock complex, unless NMFS' SEFSC determines the overage of either the commercial ACL or the total ACL occurred because data collection or monitoring improved rather than because catch increased. Once triggered, NMFS would reduce the length of the fishing season for the commercial sector the year following the overage determination by the amount necessary to ensure (to the greatest practicable extent) landings do not again exceed the ACL in the year of application. However, under **Action 5, Preferred Alternative 2**, if applicable landings for one sector are not available, that sector would not be managed with its sector-specific ACL. Instead, the ACL for the sector with available data would be the applicable ACL for the stock/stock complex. When landings exceed the applicable ACL for that stock/stock complex, the AM would be triggered, unless NMFS' SEFSC determines that the overage occurred because data collection or monitoring improved rather than because catch increased.

Under **Action 5, Preferred Sub-alternative 2d**, the estimate of landings compared with the ACL(s) for these stocks/stock complexes would be a single year of applicable landings, using landings from 2018; then a single year of applicable landings, using landings from 2019; then a two-year average of applicable landings from 2019 and the subsequent year (2019-2020); then a three-year average of applicable landings from those two years and the subsequent year (2019-2021); and thereafter a progressive running three-year average (2020-2022, etc.).

Where allowable, the following analysis will estimate direct costs and benefits of **Actions 4 and 5** for the stocks/stock complexes listed in Table 5.4. For the purpose of this analysis, to determine whether there would be an AM-based fishing season reduction triggered, the average landings from 2014 through 2016 are compared to the current and proposed ACLs (Table 5.4).

Table 5.4. Comparison of current management (species managed, species groupings, commercial and total ACLs) under the Reef Fish and Coral FMPs to proposed management under the Puerto Rico FMP. For stock complexes that would be managed with an indicator stock under the proposed Puerto Rico FMP, the proposed indicator and the proposed ACLs and average landings are marked with an asterisk (*) to indicate that the values are based on indicator stock information. Shaded landings values exceeded the corresponding ACL for the managed stocks. **Note:** this list does not reflect the entirety of species managed under the Reef Fish and Coral FMPs or the Puerto Rico FMP. All other species proposed for management under the Puerto Rico FMP are analyzed above.

Species	Current Management Unit for ACL purposes	Proposed Management Stock/Complex	Current Commercial ACL (lbs)	Current Total ACL (lbs)	Average Commercial Landings (2014-2016) for Comparison to Current Commercial ACL (lbs)	Average Total Landings (2014-2016) for Comparison to Current Total ACL (lbs)	Proposed Commercial ACL (lbs)	Proposed Total ACL (lbs)	Average Commercial Landings (2014-2016) for Comparison to Proposed Commercial ACL (lbs)	Average Total Landings (2014-2016) for Comparison to Proposed Total ACL (lbs)
Black snapper	Snapper Unit 1	Snapper 1	284,685	380,211	220,551	248,767	424,009*	535,951*	194,130*	209,915*
Blackfin snapper	Snapper Unit 1	Snapper 1								
Silk snapper*	Snapper Unit 1	Snapper 1								
Vermilion snapper	Snapper Unit 1	Snapper 1								
Wenchman	Snapper Unit 1	Snapper 1								
Queen snapper*	Snapper Unit 2	Snapper 2	145,916	180,726	159,341	165,550	257,236*	282,210*	144,983*	151,191*
Cardinal snapper	Snapper Unit 2	Snapper 2								
Lane snapper	Snapper Unit 3	Snapper 3	345,775	428,933	154,205	244,859	244,376	265,979	114,929	132,090
Mutton snapper*	Snapper Unit 3	Snapper 4					116,434*	193,059*	39,201*	98,901*
Dog snapper	Snapper Unit 3	Snapper 4								
Schoolmaster	Snapper Unit 3	Snapper 4								

Species	Current Management Unit for ACL purposes	Proposed Management Stock/Complex	Current Commercial ACL (lbs)	Current Total ACL (lbs)	Average Commercial Landings (2014-2016) for Comparison to Current Commercial ACL (lbs)	Average Total Landings (2014-2016) for Comparison to Current Total ACL (lbs)	Proposed Commercial ACL (lbs)	Proposed Total ACL (lbs)	Average Commercial Landings (2014-2016) for Comparison to Proposed Commercial ACL (lbs)	Average Total Landings (2014-2016) for Comparison to Proposed Total ACL (lbs)			
Gray snapper	Snapper Unit 3	Not managed					N/A	N/A	N/A	N/A			
Mahogany snapper	Snapper Unit 3	Not managed					N/A	N/A	N/A	N/A			
Coney*	Groupers	Grouper 3	177,513	254,726	65,453	96,249	23,890*	43,524*	4,417*	10,528*			
Graysby	Groupers	Grouper 3											
Black grouper	Groupers	Grouper 4											
Red grouper	Groupers	Grouper 4											
Tiger grouper	Groupers	Grouper 4								2,492 ¹	8,359 ¹	549 ¹	4,480 ¹
Yellowfin grouper	Groupers	Grouper 4											
Misty grouper	Groupers	Grouper 5											
Yellowedge grouper	Groupers	Grouper 5								15,327	19,553	5,190	5,190
Red hind*	Groupers	Grouper 6											
Rock hind	Groupers	Grouper 6								121,729*	156,222*	55,305*	76,039*
White grunt	Grunts	Grunts	182,396	187,424	4,103	19,900	177,923	180,384	3,958	6,586			
Bluestriped grunt	Grunts	Not managed								N/A	N/A	N/A	N/A
Margate	Grunts	Not managed								N/A	N/A	N/A	N/A
Tomtate	Grunts	Not managed								N/A	N/A	N/A	N/A
French grunt	Grunts	Not managed								N/A	N/A	N/A	N/A
Porkfish	Grunts	Not managed								N/A	N/A	N/A	N/A
Princess parrotfish	Parrotfish	Parrotfish 2	52,737	68,000	48,804 ²	59,764	147,774	164,826	48,804 ²	59,764			

Species	Current Management Unit for ACL purposes	Proposed Management Stock/Complex	Current Commercial ACL (lbs)	Current Total ACL (lbs)	Average Commercial Landings (2014-2016) for Comparison to Current Commercial ACL (lbs)	Average Total Landings (2014-2016) for Comparison to Current Total ACL (lbs)	Proposed Commercial ACL (lbs)	Proposed Total ACL (lbs)	Average Commercial Landings (2014-2016) for Comparison to Proposed Commercial ACL (lbs)	Average Total Landings (2014-2016) for Comparison to Proposed Total ACL (lbs)
Queen parrotfish	Parrotfish	Parrotfish 2								
Redtail parrotfish	Parrotfish	Parrotfish 2								
Stoplight parrotfish	Parrotfish	Parrotfish 2								
Redband parrotfish	Parrotfish	Parrotfish 2								
Striped parrotfish	Parrotfish	Parrotfish 2								
Redfin parrotfish	Parrotfish	Not managed					N/A	N/A	N/A	N/A
Queen triggerfish*	Triggerfish & Filefish	Triggerfish					83,099* ³	90,552* ³	69,701* ³	92,124* ³
Ocean triggerfish	Triggerfish & Filefish	Triggerfish								
Sargassum triggerfish	Triggerfish & Filefish	Not managed					N/A	N/A	N/A	N/A
Scrawled filefish	Triggerfish & Filefish	Not managed	58,475	80,404	69,701	92,258	N/A	N/A	N/A	N/A
Whitespotted filefish	Triggerfish & Filefish	Not managed					N/A	N/A	N/A	N/A
Black durgon	Triggerfish & Filefish	Not managed					N/A	N/A	N/A	N/A
Hogfish	Wrasses	Wrasses 1					70,140	78,402	56,234	78,676
Puddingwife	Wrasses	Wrasses 2								
Spanish hogfish	Wrasses	Wrasses 2	54,147	59,197	56,234	72,030	20,126	25,499	0	835
Corals	Corals	Corals	0	0	0	0	0	0	0	0

Species	Current Management Unit for ACL purposes	Proposed Management Stock/Complex	Current Commercial ACL (lbs)	Current Total ACL (lbs)	Average Commercial Landings (2014-2016) for Comparison to Current Commercial ACL (lbs)	Average Total Landings (2014-2016) for Comparison to Current Total ACL (lbs)	Proposed Commercial ACL (lbs)	Proposed Total ACL (lbs)	Average Commercial Landings (2014-2016) for Comparison to Proposed Commercial ACL (lbs)	Average Total Landings (2014-2016) for Comparison to Proposed Total ACL (lbs)
Sea urchins	Aquarium Trade	Sea Urchins	N/A	8,155 ⁴	0	0	0	0	0	0
Sea cucumbers	Aquarium Trade	Sea Cucumbers					0	0	0	0

¹ Along with black, red, tiger, and yellowfin grouper, the proposed Grouper 4 stock complex includes yellowmouth grouper, a species new to management.

² Landings of parrotfish during the 2014-2016 period were reported as unspecified species. For purposes of this analysis those unspecified landings were assumed to be the managed parrotfish species for which harvest is allowed.

³ Along with queen and ocean triggerfish, the proposed Triggerfish stock complex includes gray triggerfish, a species new to management.

⁴ The Aquarium Trade ACL applies to all reef fish and coral resource species included in the management unit across the entire U.S. Caribbean EEZ.

Snappers

Under the Reef Fish FMP, 14 species of snappers are managed under four ACLs: Snapper Unit 1 – Snapper Unit 4. Under the proposed Puerto Rico FMP, management would continue for 12 of those species. With the exception of yellowtail snapper, which would continue to be managed as an individual stock (currently Snapper Unit 4 and proposed Snapper 5, see previous section), the management of these snapper species would change under the Puerto Rico FMP. Specifically, the Snapper 1 (black, blackfin, silk, vermilion, and wenchman snapper; Snapper Unit 1 under the Reef Fish FMP) and Snapper 2 (queen and cardinal snapper; Snapper Unit 2 under the Reef Fish FMP) stock complexes would each be managed via an indicator stock (silk snapper and queen snapper, respectively). Snapper Unit 3 under the Reef Fish FMP would be split into one stock (Snapper 3; lane snapper) and one stock complex (Snapper 4; mutton, dog, and schoolmaster snapper), which would be managed with an indicator stock (mutton snapper). Two species managed in Snapper Unit 3 under current management, gray snapper and mahogany snapper, would not be managed under the Puerto Rico FMP.

Each proposed stock/stock complex would be managed with a commercial ACL and a total (commercial + recreational) ACL under the Puerto Rico FMP. Where indicator stocks were selected, the commercial ACL and total ACLs for those stock complexes are based on landings of the indicator stock(s) only rather than on combined landings of all stocks within the stock complex. The revised management modifications prevent a direct comparison of the current and proposed commercial and total ACLs for these snapper complexes. Therefore, the analysis of potential costs and benefits looks at whether an AM would be triggered and applied under current versus proposed management for the various snapper species. The proposed AM would work in a similar manner to the current AM, comparing recent landings to the commercial and total ACLs for the stocks/stock complexes and preventing overages through future fishing season reductions. For the commercial sector to be subject to an AM, commercial landings must exceed the commercial ACL, and total landings must exceed the total ACL. If commercial landings do not exceed the commercial ACL, the commercial sector will not be subject to an AM, even if total landings exceed the total ACL. No action would be taken if NMFS' SEFSC determines an overage occurred because data collection/monitoring improved rather than because catch increased. As discussed above, if landings data for one sector are not available, then the ACL for the sector with available data would become the ACL for the stock/stock complex, and any AM triggered would apply to both sectors. In addition, where appropriate, the analysis considers whether the proposed commercial and total ACLs could allow for expansion of landings or could require its contraction, noting any potential consequences to small businesses.

Small commercial fishing businesses that fish for black, blackfin, silk, vermilion, wenchman, queen, cardinal, lane, mutton, dog, and schoolmaster snappers (Table 5.4) would not be subject to an AM under either the current or the proposed management. For all but queen and cardinal snapper, pertinent average commercial landings (2014-2016) do not exceed either the current

commercial ACL or the proposed commercial ACL. For queen and cardinal snappers, however, average combined commercial landings (2014-2016) of queen and cardinal snappers exceed the commercial Snapper Unit 2 ACL under current management, although total landings did not exceed the total Snapper Unit 2 ACL. Therefore, an AM for Snapper Unit 2 was not triggered under current management. Likewise, an AM would not be triggered under proposed management as commercial landings of the indicator stock (queen snapper) do not exceed the commercial ACL for the Snapper 2 complex. Therefore, no direct costs or benefits to small businesses that harvest these snapper species would be expected. Any direct impacts on small businesses that harvest the snapper species in Table 5.4 that would not be managed under the Puerto Rico FMP (i.e., gray and mahogany snapper) were discussed above in Action 2.

The proposed changes to the commercial and total ACLs for black, blackfin, silk, vermilion, wenchman snapper (proposed Snapper 1), queen, and cardinal snapper (proposed Snapper 2) could potentially allow for additional commercial landings of these species, which could potentially benefit small businesses that target these species. For black, blackfin, silk, vermilion, and wenchman snapper (proposed Snapper 1) and queen and cardinal snapper (proposed Snapper 2), the proposed commercial and total ACLs, which were based on and would be evaluated respect to the indicator stocks (silk and queen snapper, respectively), are greater than the current commercial and total ACLs for Snapper Unit 1 (same species as proposed Snapper 1) and Snapper Unit 2 (same species as proposed Snapper 2) under the Reef Fish FMP, which are established for and evaluated with respect to all species in the unit. These increases could allow for future expansion of snapper commercial landings, although such future increases cannot be predicted. The impact of the increases in the ACLs is dependent on the extent that landings increase and the extent to which AMs are needed to prevent future overages. As small commercial fishing businesses in Puerto Rico continue to recover from the 2017 hurricane season, landings are expected to increase to closer previous landings levels. Moreover, the increases in ACLs for snapper stocks/stock complexes would allow for landings to increase beyond current limits, although such increases cannot be predicted at this time. Similarly, decreases in ACLs for snapper stocks/stock complexes would not allow landings to reach previously allowed levels, and could have a negative impact on small businesses. However, that depends on the extent that landings recover and if they exceed previously levels in the future, but that cannot be predicted at this time.

Groupers

Under the Reef Fish FMP, 10 grouper species are managed under the Groupers ACL (Table 5.4). Under the Puerto Rico FMP, those 10 species and an additional species new to management (yellowmouth grouper) would be managed under four separate ACLs for four separate stock complexes (Grouper 3-6). The ACLs for two of those proposed stock complexes would be specified based on landings data for indicator stocks only (coney grouper for the proposed Grouper 3 stock complex, and red hind grouper for the proposed Grouper 6 stock complex).

Each proposed stock complex would be managed with a commercial ACL and a total (commercial + recreational) ACL under the proposed Puerto Rico FMP. However, the revised management modifications prevent a direct comparison of the current and proposed commercial and total ACLs for these grouper stock complexes. Therefore, the analysis of potential costs and benefits looks at whether an AM would be triggered and applied under current versus proposed management for the stock/stock complexes of which they are currently or proposed to be part of. The proposed AM would work in a similar manner to the current AM, comparing recent landings to the commercial and total ACLs for the stocks/stock complexes and preventing overages through future fishing season reductions. For the commercial sector to be subject to an AM, both commercial landings must exceed the commercial ACL and total landings must exceed the total ACL. If commercial landings do not exceed the commercial ACL, the commercial sector will not be subject to an AM, even if total landings exceed the total ACL. No action would be taken if NMFS' SEFSC determines an overage occurred because data collection/monitoring improved rather than because catch increased. As discussed above, if landings data for one sector are not available, then the ACL for the sector with available data would become the ACL for the stock/stock complex, and any AM triggered would apply to both sectors. In addition, where appropriate, the analysis considers whether the proposed commercial and total ACLs could allow for expansion of landings or require its contraction, noting any potential consequences to small businesses.

The commercial sector of those fishing for coney, graysby, red hind, rock hind, black, red, tiger, yellowfin, misty, and yellowedge grouper (Table 5.4) would not be subject to an AM under either the current or proposed management. This is because the pertinent average commercial landings (2014-2016) for these grouper species would not exceed either the current commercial ACL or the proposed commercial ACLs. Therefore, no direct impacts on small businesses that harvest these grouper species would be expected.

Grunts and Parrotfish

Under both the current Reef Fish FMP and the proposed Puerto Rico FMP, species of grunts and parrotfish would be managed at the family level. However, the species managed under these plans are not the same (Table 5.4). Under the Reef Fish FMP, white grunt, margate, tomtate, bluestriped grunt, French grunt, and porkfish are managed as the Grunts unit, with commercial and total ACLs based on landings of all species that comprise the unit. Under the Puerto Rico FMP, only white grunt would be managed (Grunts stock), with the commercial and total ACLs based only on landings of white grunts. Under the Reef Fish FMP, princess, queen, redfin, redtail, redband, stoplight, and striped parrotfish are managed under the commercial and total ACLs for Parrotfish. Under the Puerto Rico FMP, only six of these species (all but redfin parrotfish) would be managed in the Parrotfish 2 stock complex.

The proposed Grunts stock and proposed Parrotfish 2 stock complex each would be managed with a commercial ACL and a total (commercial + recreational) ACL under the proposed Puerto Rico FMP. The revised management modifications prevent a direct comparison of the current and proposed commercial and total ACLs for the current versus proposed stock complexes. Therefore, the analysis of potential costs and benefits looks at whether an AM would be triggered and applied under current versus proposed management for the stocks that make up the current versus proposed complexes. The proposed AM would work in a similar manner to the current AM, comparing recent landings to the commercial and total ACLs for the stock/stock complex and preventing overages through future fishing season reductions. For the commercial sector to be subject to an AM, both commercial landings must exceed the commercial ACL and total landings must exceed the total ACL. If commercial landings do not exceed the commercial ACL, the commercial sector will not be subject to an AM, even if total landings exceed the total ACL. No action would be taken if NMFS' SEFSC determines the overage occurred because data collection/monitoring improved rather than because catch increased. As discussed above, if landings data for one sector are not available, then the ACL for the sector with available data would become the ACL for the stock/stock complex, and any AM triggered would apply to both sectors. Where appropriate, the analysis considers whether the proposed commercial and total ACLs could allow for expansion of landings or require its contraction, noting any potential consequences to small businesses.

The commercial sector of those fishing for white grunt, princess, queen, redband, stoplight, redband, striped parrotfish would not be subject to an AM under either the current or proposed management (Table 5.4). This is because pertinent average commercial landings (2014-2016) do not exceed either the current commercial ACL or the proposed commercial ACL. Therefore, no direct impacts on small businesses that harvest white grunt, princess, queen, redband, stoplight, redband, and striped parrotfish would be expected. Effects to small businesses that harvest the grunt and parrotfish species that would not be managed under the Puerto Rico FMP (i.e., bluestriped grunt, margate, tomtate, French grunt, porkfish, and redfin parrotfish) were discussed above in Action 2.

The proposed commercial and total ACLs for Parrotfish 2, which would be based on and would apply to landings for one fewer parrotfish species than under current management, are greater than the commercial and total ACLs for Parrotfish under current management (Table 5.4). Small commercial fishing businesses in Puerto Rico continue to recover from the 2017 hurricane season, landings are expected to increase to closer previous landings levels. Moreover, the increases in the ACLs that apply for the stocks that make up Parrotfish 2 would allow for landings to increase beyond current limits; however, such increases cannot be predicted at this time.

Triggerfish and Wrasses

Under the Reef Fish FMP, six species of triggerfish and filefish are managed under the Triggerfish & Filefish commercial and total ACLs (queen triggerfish, ocean triggerfish, sargassum triggerfish, scrawled filefish, whitespotted filefish, and black durgon). Under the proposed Puerto Rico FMP, queen triggerfish and ocean triggerfish would be managed in a stock complex with gray triggerfish, a species new to management. For the proposed Triggerfish stock complex, queen triggerfish was selected as the indicator stock and so the commercial and total ACLs would be specified and evaluated based on landings of queen triggerfish only, rather than on landings of all three stocks that would make up the stock complex, although the AM would apply to fishing for all three species.

Under current and proposed management, the managed wrasses species would be the same (i.e., hogfish, puddingwife, Spanish hogfish), but the organization and management of those three species would change under the Puerto Rico FMP. Under current management, these species are managed together in the Wrasses unit. Under proposed management, hogfish would be managed as a single stock (Wrasses 1) and puddingwife and Spanish hogfish would be managed together in the Wrasses 2 stock complex.

Each proposed stock/stock complex would be managed with a commercial ACL and a total (commercial + recreational) ACL under the proposed Puerto Rico FMP. However, the revised management modifications for both triggerfish and wrasses species prevent a direct comparison of the current and proposed commercial and total ACLs of the stock complexes. Therefore, the analysis of potential costs and benefits looks at whether an AM would be triggered and applied under current versus proposed management for the species/stocks that make up the relevant current and proposed stock complexes. The proposed AM would work in a similar manner to the current AM, comparing recent landings to the commercial and total ACLs for the stock/stock complex and preventing overages through future fishing season reductions. For the commercial sector to be subject to an AM, both commercial landings must exceed the commercial ACL and total landings must exceed the total ACL. If commercial landings do not exceed the commercial ACL, the commercial sector will not be subject to an AM, even if total landings exceed the total ACL. No action would be taken if NMFS' SEFSC determines an overage occurred because data collection or monitoring improved rather than because catch increased. As discussed above, if landings data for one sector are not available, then the ACL for the sector with available data would become the ACL for the stock/stock complex, and any AM triggered would apply to both sectors. Where appropriate, the analysis considers whether the proposed commercial and total ACLs could allow for expansion of landings or require its contraction, noting any potential consequences to small businesses.

Under current management, the 2014-2016 average commercial landings of managed triggerfish and filefish in Puerto Rico exceeded the commercial ACL and the total landings exceeded the

total ACL, triggering an AM applicable to the commercial sector (Table 5.4). However, fishing activities in Puerto Rico were severely curtailed in 2017 due to impacts of Hurricane Maria, the effects of which continued into the 2018 fishing season. Thus, when evaluating whether to implement an AM in the 2018 fishing season based on the landings from 2014-2016, the RA determined that an AM-based reduction to the triggerfish and filefish fishing season in Puerto Rico in 2018 was not necessary to prevent a future overage.

Under proposed management, an AM would not be triggered for the commercial sector of those fishing for queen and ocean triggerfish based on comparison of 2014-2016 average commercial landings of the indicator stock (queen triggerfish) to the proposed commercial ACL, as commercial landings of queen triggerfish are below the proposed commercial ACL. Since the length of the commercial fishing season for persons targeting queen and ocean triggerfish was not reduced under current management and would also not be reduced under proposed management, there would be no direct impact on small businesses that harvest queen and ocean triggerfish.

However, the proposed increase in the commercial and total ACLs for those fishing for ocean and queen triggerfish could potentially allow for additional commercial landings of these triggerfish species, which could potentially benefit small businesses. The proposed commercial and total ACLs for the Triggerfish stock complex, which would be set based on and evaluated with respect to landings of the indicator stock (queen triggerfish), would be greater than the current commercial and total ACLs for the Triggerfish & Filefish management unit, which are established for and evaluated with respect to multiple species (Table 5.4). These increases would allow for future expansion of queen and ocean triggerfish landings. The impact of the increase in the commercial and total ACLs for Triggerfish is dependent on the extent that landings recover from the 2017 hurricane season and the extent to which AMs are needed to prevent future overages. Recent data indicates that landings of triggerfish have not yet recovered to the pre-hurricane levels (NMFS unpublished data). Effects to small businesses that harvest the triggerfish and filefish species that would not be managed under the Puerto Rico FMP (i.e., sargassum triggerfish, scrawled filefish, whitespotted filefish, and black durgon) were discussed above in Action 2.

With respect to wrasses under current management (hogfish, puddingwife and Spanish hogfish), the 2014-2016 average commercial landings of Wrasses exceeded the commercial ACL and the average total landings exceeded the total ACL, triggering an AM applicable to the commercial sector (Table 5.4). However, fishing activities in Puerto Rico were severely curtailed in 2017 due to impacts of Hurricane Maria, the effects of which continued into the 2018 fishing season. Thus, when evaluating whether to implement an AM in the 2018 fishing season based on the landings from 2014-2016, the RA determined that an AM-based reduction to the Wrasses fishing season in Puerto Rico in 2018 was not necessary to prevent a future overage.

Under proposed management, an AM would not be triggered for the commercial sector of those fishing for Wrasses 1 (hogfish) or Wrasses 2 (Spanish hogfish and puddingwife) based on comparison of 2014-2016 average commercial landings to the proposed commercial ACLs, as commercial landings are below the proposed commercial ACLs. Since the length of the fishing season for wrasses was not reduced under current management and would not be reduced under the proposed management, there would be no direct impact on small businesses that harvest hogfish, puddingwife, or Spanish hogfish.

The proposed commercial and total ACLs for Wrasses 1 (hogfish) are greater than the current commercial and total ACLs for the Wrasses management unit, which established for and evaluated with respect to hogfish, puddingwife and spanish hogfish (Table 5.4). These increases would allow for hogfish landings to increase beyond the current limit; however, such an increase cannot be predicted at this time as small businesses continue to recover from the 2017 hurricane season.

Corals, Sea Urchins, Sea Cucumbers

Under current management, the managed coral species are defined as “Caribbean prohibited coral” and harvest and possession of those species is prohibited (50 CFR 622.472(b)). For those coral species,²³ that prohibition would continue under the Puerto Rico FMP and no direct compliance costs or benefits would be expected.

Under current management, a select number of sea urchin and sea cucumber species are managed with other invertebrate (e.g., sponges, worms, molluscs) and reef fish (e.g., butterflyfish, gobies, sea horses) species in the Aquarium Trade management unit. The ACL for Aquarium Trade species is 8,155 lbs and applies for the entire U.S. Caribbean EEZ. Under the Puerto Rico FMP, the species of sea urchins and sea cucumbers that are currently managed under the Aquarium Trade unit would be managed in the Sea Urchins and Sea Cucumbers stock complexes, respectively.²⁴ The proposed ACLs for both of those stock complexes would be zero and harvest would now be prohibited. No information has been uncovered to date to indicate there is or has been local demand for or commercial harvest of either sea urchins or sea cucumbers from the Puerto Rico EEZ. Therefore, there are expected to be no direct impacts from setting ACLs and AMs for sea urchins and sea cucumbers on small businesses.

Action 6, Preferred Alternative 2 would describe and identify essential fish habitat (EFH) for the 18 species of finfish that would be new to management (Tables 5.2 and 5.3) and any species

²³ Under Action 2, the Puerto Rico FMP would manage additional species of coral. The effects of adding coral species that would be new to management are discussed earlier; see page 19.

²⁴ Under Action 2, the Puerto Rico FMP would manage additional species of sea urchins and sea cucumbers. The effects of adding species that would be new to management are discussed earlier; see page 19.

of sea cucumbers, sea urchins, and corals found in the Puerto Rico EEZ that are not managed under the Coral FMP. The Magnuson-Stevens Act requires the proposed Puerto Rico FMP to describe and identify EFH for managed fish species, to minimize to the extent practicable adverse effects on such habitat caused by fishing, and to identify other actions to encourage the conservation and enhancement of such habitat. The designation, in and of itself, does not have a direct compliance cost or benefit on small businesses.²⁵ Therefore, **Action 6** would have no direct compliance cost or benefit on small businesses and any indirect impacts would be dependent on future actions.

Action 7, Preferred Alternative 2 would expand the range of management measures that can be implemented by the Council without going through a full plan amendment process. As such, it is an administrative action and has no direct compliance cost or benefit on any small businesses.

Summary of total direct compliance costs and benefits and associated impacts

No direct compliance costs or benefits would be expected from **Action 1**, **Action 2**, **Action 3**, **Action 6**, or **Action 7**. **Action 4** and **Action 5** would have no direct impact on small businesses.

If recreational landings data are not available, the proposed commercial and de-facto total ACLs for cubera snapper (proposed Snapper 6) would be exceeded by average annual (2014-2016) commercial and de-facto total landings of the stock. As more fully described earlier (p. 18), as a currently unmanaged stock, there are no currently no limits on cubera snapper landings. Under the proposed Puerto Rico FMP, a reduction in landings of cubera snapper by the amount of the overage (3,037 lbs; Table 5.2) would have an associated loss of annual revenue of \$8,686 and an average direct compliance cost of \$29 per small business for the 77.3% of small businesses that target reef fish in federal waters. That average direct compliance cost would represent approximately 0.4% of the estimated average annual revenue of a small commercial fishing business in Puerto Rico. Consequently, **Actions 4** and **5** would generate an average direct compliance cost of \$29 per small business for the small businesses that target cubera snapper, unless NMFS determined the overage was due to improved data collection/monitoring rather than increased catch. Small businesses could mitigate for the adverse impact, if any, by shifting effort and increasing landings of stocks that continue to have an open fishing season (have not been limited by the AM).

²⁵ Federal action agencies that fund, permit, or carry out activities that may adversely impact EFH are required to consult with NMFS regarding the potential effects of their actions on EFH, and respond in writing to NMFS or Council recommendations. Likewise, every fishery management plan shall minimize to the extent practicable adverse effects on EFH. Measures taken to avoid impacts to EFH could potentially affect small entities, however, no such measures are proposed at this time.

6. Significance of economic impacts on a substantial number of small entities

From the above, very little to no direct compliance costs or benefits would be expected from any of the actions under the proposed Puerto Rico FMP. Therefore, this proposed rule would not have a significant economic impact on a substantial number of small businesses.

7. References

Caribbean Fishery Management Council (CFMC). 2019. Comprehensive Fishery Management Plan for the Puerto Rico Exclusive Economic Zone Including Environmental Assessment, Regulatory Impact Review, and Fishery Impact Statement. Caribbean Fishery Management Council, San Juan, Puerto Rico.

Griffith, D., M. Valdés-Pizzini, and C. Garcia-Quijano. 2007. Entangled Communities: Socio-economic Profiles of Fishermen, Their Communities and Their Responses to Marine Protective Measures in Puerto Rico. NOAA Series on U.S. Caribbean Fishing Communities, NMFS-SEFSC-556.

Matos-Caraballo, D., and J. Agar. 2011. Census of Active Commercial Fishermen in Puerto Rico: 2008. Department of Natural and Environmental Resources, Final Report to National Marine Fisheries Service, NOAA. 39pp.

Miguel, P., K. Morgan, I. Vlasac, and N. Yuhás. 2013. Evaluation of Sea Cucumber Fishing in Puerto Rico. Interactive Qualifying Project Report completed in partial fulfillment of the Bachelor of Science degree at Worcester Polytechnic Institute, Worcester, MA. Sponsored by and submitted to Puerto Rico Department of Natural and Environmental Resources (DNER).

National Marine Fisheries Service (NMFS). 2017. Fisheries of the United States, 2016. U.S. Department of Commerce, NOAA Current Fishery Statistics No. 2016. Available at: <https://www.st.nmfs.noaa.gov/commercial-fisheries/fus/fus16/index>