Initial Public Review Draft

Environmental Assessment/Regulatory Impact Review/ Regulatory Flexibility Analysis/MSA Analysis

Proposed Regulations to Apply Strict Limits (Hard Caps) for Protected Species in the California/Oregon Large-Mesh Drift Gillnet Fishery Pursuant to the Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species

National Marine Fisheries Service (NMFS) West Coast Region
National Oceanic and Atmospheric Administration (NOAA)
Department of Commerce (DOC)
and the
Pacific Fishery Management Council (Council)

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DRAFT

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1 Introduction

The Pacific Fishery Management Council (Council) originally adopted a proposal in September 2015 to implement a "hard cap" closure regime on the California large mesh drift gillnet (DGN) fishery, which for a variety of reasons was never implemented. Under such a regime, species limits on the takes (defined as observed mortality/injury) of high priority protected species (HPPS), as identified by the Council, would be established. When a threshold for any HPPS is reached the fishery closes.

In March 2020 the Council was briefed on the implementation of its 2015 proposal (through regulations that were later rescinded due to litigation). It asked the National Marine Fisheries Service (NMFS) to report back in more detail on the factors leading to the suspension of rulemaking in 2017. NMFS reported back in November 2020 and the Council directed its Highly Migratory Species Management Team (HMSMT) and HMS Advisory Subpanel to revise its original purpose and need statement and identify alternative hard cap approaches that address NMFS's concerns regarding potential negative economic impacts. These advisory bodies reported back in June 2021. The Council adopted a revised purpose and need statement (see below) and provided further guidance to the HMSMT on the development of a range of alternatives. The Council adopted a range of alternatives at its November 2021 meeting.

The DGN fishery is managed under the Council's Fishery Management Plan for West Coast Fisheries for Highly Migratory Species (HMS FMP).

This document is an Environmental Assessment/Regulatory Impact Review/Regulatory Flexibility Act Analysis/Magnuson-Stevens Act Analysis (EA/RIR/RFAA/MSA). An EA/RIR/RFAA/MSA provides assessments of the environmental impacts of a proposed action and its reasonable alternatives (the EA), the benefits and costs of the alternatives and the distribution of impacts (the RIR), identification of the small entities that may be affected by the alternatives (RFAA), and analysis of how the alternatives align with the National Standards (MSA). This EA/RIR/RFAA/MSA addresses the statutory requirements of the Magnuson Stevens Fishery Conservation and Management Act, the National Environmental Policy Act, Presidential Executive Order 12866, and the Regulatory Flexibility Act. An EA/RIR/RFAA/MSA is a standard document produced by the Pacific Fishery Management Council (Council) and the National Marine Fisheries Service (NMFS) West Coast Region to provide the analytical background for decision-making.

1.1 Proposed Action

The proposed action is to establish hard caps (i.e., limits) on the number of observed mortalities/injuries of HPPS, including sea turtles, Endangered Species Act- (ESA) listed marine mammals, bottlenose dolphins, and short-finned pilot whales caught in DGN fishery. Hard caps may apply to individual vessels or the fishery as a whole. If a limit is met or exceeded, both the observed vessel and any vessels determined to be unobservable would stop fishing, or the DGN fishery as a whole would close for a prescribed time period. Such closures would be applicable to all waters where the fishery may operate.

1.2 Proposed Action Area

The Action Area for this proposed action is the U.S. Exclusive Economic Zone (EEZ) and adjacent high seas waters off the coasts of California and Oregon.[1] The fishery is prohibited in the portion of the U.S. EEZ north of 46°16′ N. latitude (Washington coast) (50 CFR 660.731(d)(8). The effective action area for

[1] 50 CFR § 660.701 defines the action area for the HMS FMP but does not define "adjacent high seas waters." For the purposes of the DGN fishery, adjacent high seas waters is the area where very limited DGN fishing effort has occurred. No high seas fishing effort has been observed after 2000.

the proposed action is further reduced by the combination of state and federal regulations that have influenced where this fishery has occurred in the past and would be expected to occur in the foreseeable future. For the purposes of this proposed action, the range and extent of the DGN fishery that has occurred in this area in the decade to 2021 represents the current state and expected extent of the DGN fishery in the foreseeable future. Figure 1-1 shows a model-based estimate of the distribution of DGN fishing effort, 2013-2019 (Suter*, et al.* 2022). As shown in the figure, most fishing effort has occurred south of Monterey, mainly in the Southern California Bight. The Pacific Leatherback Conservation Area (PLCA), a time-area closure implemented to mitigate take of ESA-listed leatherback sea turtles, has limited fishing effort further north (the boundary of the PLCA is shown in Figure 1-1). No recent management measures have altered the time or area where DGN fishing is allowed.

1.3 Purpose and Need

The purpose of the proposed action is to incentivize fishing practices and tools in an effort to minimize bycatch and bycatch mortality, as well as to conserve other unmarketable non-target species, including ESA-listed species and marine mammals, in the drift gillnet fishery to the extent practicable. The proposed action is needed to ensure that take and bycatch of unmarketable non-target species, including ESA-listed species and marine mammals, in the DGN fishery is minimized to the extent practicable and that such take and bycatch does not result in limitations on the economic viability of the west coast swordfish fishery.

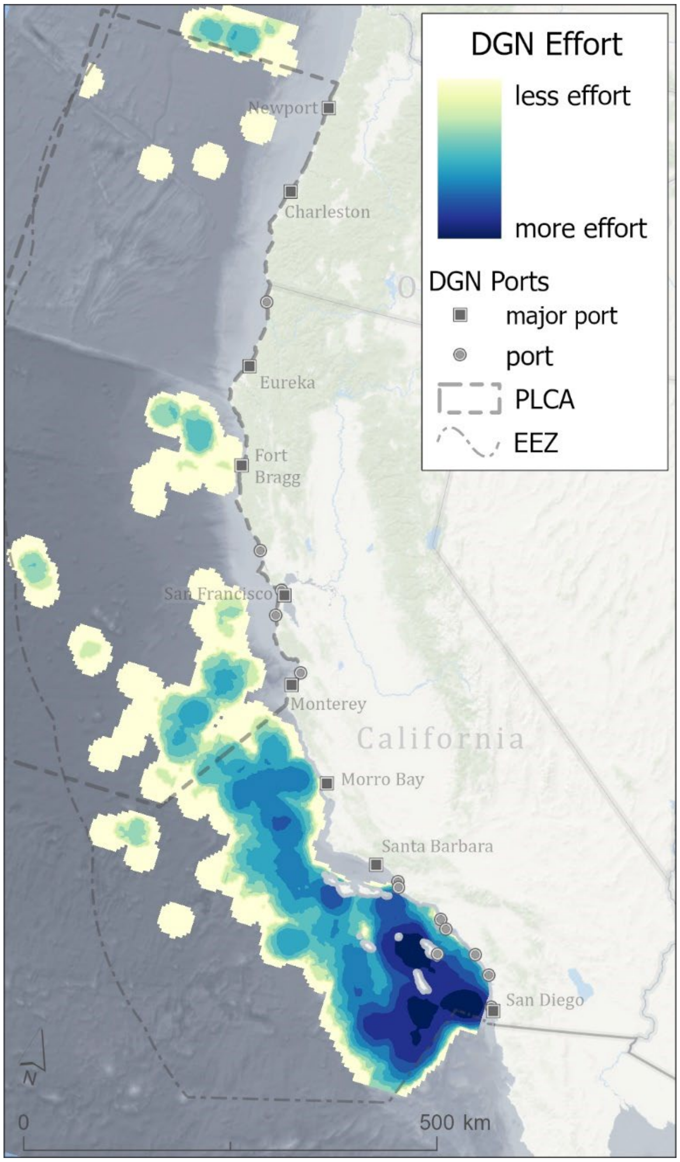

Figure 1-1. Distribution of estimated DGN fishing effort, for six fishing years combined (September 2013 to January 2019). (Source: Suter, *et al.* 2022)

1.4 Background

The Council took final action in September 2015 on a proposal that included "hard caps" for selected protected species taken in the DGN fishery. After Council final action NMFS initiated rulemaking to implement the Council proposal, but in the course of that process withdrew the proposed rule for the action based on its conclusion that the hard caps regulations were inconsistent with National Standard 7 in the Magnuson-Stevens Fishery Conservation and Management Act (MSA), which states "[c]onservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication." (Further explanation of NMFS' rational for this finding may be found in a June 9, 2017, letter to the Council.)

On July 12, 2017, Oceana filed an action in U.S. District Court against NMFS's negative determination and withdrawal of the proposed regulations, arguing that NMFS exceeded its authority under 16 U.S.C. § 1854(b), which requires NMFS to publish final regulations and to consult with the Council on any revisions to the proposed regulations. On October 24, 2018, the Court granted Summary Judgement to the Plaintiffs and remanded to the agency for action consistent with the Order. The Court subsequently found that NMFS had not complied with its Order and on January 8, 2020, ordered NMFS to publish the final rule within 30 days. To comply, NMFS published the final rule on February 7, 2020.

The regulations were then vacated on February 18, 2021, because of further litigation in which the Court concluded that NMFS' original reason for withdrawing the proposed rule was reasonable. NMFS has encouraged the Council to revisit its proposal to address the deficiencies identified in its June 9, 2017, letter.

The Final Environmental Assessment (EA) prepared by NMFS in 2017 (NMFS 2017a) evaluating the Council's 2015 proposal includes additional background information on the management of the DGN fishery. Information from that EA is incorporated by reference and summarized in this EA, as noted (40 CFR 1501.12). (Hereafter, this document will be referred to as the "2017 EA.")

As described in Section 2.2, subsequent to the Council's 2015 action, California established a transition program to phase out state limited access permits for the fishery by January 31, 2024. Through Amendment 5 to the HMS FMP a Federal limited entry permit was also implemented for the fishery. A requirement of the California state transition program is that participants may not "not fish under, transfer, or renew a federal drift gill net permit" (14 CCR 106.5(c)(4)). In settling with complainants[2] on July 1, 2022, the State of California stated "it is the interpretation of the California Department of Fish and Wildlife (CDFW) and the California Attorney General that California's Fish & Game Code does not require a state drift gill net shark and swordfish permit for the take of swordfish caught by drift gill net for commercial purposes in federal waters with a valid federal drift gill net permit, or the landing of such swordfish in California for commercial purposes."

1.5 Alternatives Proposed for the Drift Gillnet Fishery

The range of alternatives described here was adopted by the Council in November 2021.

1.5.1 Alternative 1 – The No Action Alternative

Under this alternative hard cap management is not implemented; the fishery continues operation under current regulations.

1.5.2 Alternative 2 – Rolling Two-Year Fishery Closure

Under this alternative, hard caps are implemented as in the Council's original 2015 action, with rolling two-year caps based on observed mortality/injury for five marine mammal and four sea turtle species. Although NMFS found this proposal was inconsistent with MSA National Standard 7, implementation of other proposed actions by the Council could change circumstances such that this alternative now may be consistent with National Standards under the MSA. Further in-depth analysis would be necessary to make that determination.

A description of how hard caps under this alternative would have functioned may be found in the Final Rule Notice (85 FR 7246) published February 20, 2020; subsequent litigation rescinded these regulations. The hard caps for this alternative are shown in Table 1.

[2] Abad, et al. v. Bonham, et al. (Case 2:20-cv-00447-TLN-AC) and Burke, et al. v. Bonham, et al. (Case 2:21-cv-00003-TLN-AC).

Table 1-1. Rolling 2-year hard cap levels for HPPS.

Species	Rolling 2-year hard cap
Fin Whale	2
Humpback Whale	2
Sperm Whale	2
Leatherback Sea Turtle	2
Loggerhead Sea Turtle	2
Olive Ridley Sea Turtle	2
Green Sea Turtle	2
Short-fin Pilot Whale (CA/OR/WA stock)	4
Bottlenose Dolphin (CA/OR/WA stock)	4

Under this alternative, if a cap is reached, the DGN fishery will close until the two-year (i.e., two fishing seasons) mortality and injury for all species falls below their hard cap values. The DGN fishery then reopens on May 1 of the next fishing season. NMFS reports observed protected species mortalities and injuries on an ongoing basis to help participants in the DGN fishery plan for the possibility of a hard cap being reached.

The length of the closure period depends on when a hard cap is reached. The rolling window considers observed mortality/injury during the previous fishing season along with the current fishing season to determine whether a two-year hard cap has been reached or exceeded. Taking a hard cap of two as an example, if one observed mortality/injury occurs in season 1 and a second observed mortality/injury occurs in season 2, the rolling two-year hard cap has been reached and the fishery closes. The fishery would then reopen in season 3 once the level of observed mortality/injury is estimated at one animal during the rolling window for seasons 2-3, which is below the hard cap value of two. However, if two observed mortalities/injuries occurred in season 1, the fishery would close for the remainder of season 1, remain closed for the entirety of season 2 (since the season 1-2 rolling window value is still 2), and reopen in season 3. Under this alternative, the length of closure period can vary considerably under these scenarios, potentially extending up to nearly two entire seasons.

1.5.3 Alternative 3 – In-Season Individual Vessel and Fleetwide Closures

Under this alternative, a combination of individual and fleetwide annual hard caps are implemented based on the values shown in Table 1. “Annual” refers to the fishing year designated in the HMS FMP and regulations, which is the year beginning at 0801 GMT (0001 local time) on April 1 and ending at 0800 GMT on March 31 (2400 local time) of the following year (50 CFR 660.702), except for the alternative time period specified in Option C.2.[3] Caps apply to observed interactions, regardless of the level of observer coverage. In all cases, when a hard cap is met fishing shall cease both inside and outside the U.S. EEZ. Any hard cap closure is continuous for the applicable period, even if it overlaps with any of the existing DGN fishery closure, listed at 50 CFR 660.713(c-e).

Hard caps apply separately to individual vessels and the fleet as a whole. Hard cap levels are further defined in terms of a cap being reached or exceeded. Given the values of the individual and fleetwide caps, the levels for exceeding an individual vessel cap and reaching a fleetwide cap are the same. This is reflected in Table 1-2.

[3] Although the fishing year is from April 1 to March 31, the DGN fishery is closed from February 1 to April 30. Thus a “fishing season” is from May 1 to the following January 31.

When any individual vessel cap is triggered the vessel subject to the cap, and all unobservable vessels, must cease fishing for the specified time period. The NMFS observer program determines which vessels are unobservable. Generally, vessels are unobservable because they are unable to accommodate an observer due vessel condition, inadequate crew space, or other factors. For a given vessel the designation can switch back and forth between observable and unobservable over time, depending on changes in the characteristics of the vessel.

Table 1-2. Hard cap levels under Alternative 3.

Species	Individual Cap Reached	Individual Cap Exceeded and Fleetwide Cap Reached	Fleetwide Cap Exceeded
Fin whale	1	2	3
Humpback whale	1	2	3
Sperm whale	1	2	3
Leatherback sea turtle	1	2	3
Loggerhead sea turtle	1	2	3
Olive-Ridley sea turtle	1	2	3
Green sea turtle	1	2	3
Short-fin pilot whale C/O/W	3	4	5
Common bottlenose dolphin C/O/W Offshore stock	3	4	5

Alternative 3 has three different options (A, B, C) with some sub-options describing various closure periods triggered at the different hard cap thresholds. Table 1-3 provides a summary of these options and sub-options.

Option A:

1. If a vessel **reaches** an individual cap, that vessel and all unobservable vessels cease fishing for:
   - **Sub-option I**: 30 days if the cap is reached before November 1, or 14 days if the cap is reached between November 1 and January 31.
   - **Sub-option II**: For the remainder of the fishing year.
2. If a fleetwide cap is **reached**, the entire fleet ceases fishing for the remainder of the fishing year.

Option B:

1. If a vessel **reaches** an individual cap, that vessel and all unobservable vessels cease fishing for 30 days if the cap is reached before November 1, or 14 days if the cap is reached between November 1 and January 31.
2. If a vessel **exceeds** an individual cap, that vessel and all unobservable vessels cease fishing for the remainder of the fishing year.
3. If a fleetwide cap is **exceeded**, the entire fleet ceases fishing for the remainder of the fishing year.

Option C:

1. If a vessel **reaches** an individual hard cap, that vessel and all unobservable vessels cease fishing for 30 days if the cap is reached before November 1, or 14 days if the cap is reached between November 1 and January 31.

2. If a vessel **exceeds** an individual cap, that vessel and all unobservable vessels cease fishing for the remainder of the fishing year, **AND** the remainder of the fleet ceases fishing for 30 days if the cap is exceeded before November 1, or 14 days if the cap is exceeded between November 1 and January 31.
3. If a fleetwide cap is **reached**, the entire fleet ceases fishing for 30 days if the cap is reached before November 1, or 14 days if the cap is reached between November 1 and January 31. (Note that since the exceedance values for vessel caps and the cap reached values for the fleet are the same, this provision duplicates the fleet provision described above.)
4. If a fleetwide cap is **exceeded**, the entire fleet ceases fishing until:
   Sub-option I: The beginning of the following fishing year.
   Sub-option II: The following November 1, with cap counts beginning November 1 each year.

Table 1-3. Summary of Alternative 3 options and sub-options. (Note that for individual vessel caps both the observed vessel subject to the cap and all unobservable vessels cease fishing for the specified time period.)

	Alternative 3 Options				
Cap level	**A.1**	**A.2**	**B**	**C.1**	**C.2**
Vessel cap reached	Vessel closed 30 days if 5/1-10/31, 14 days if 11/1-1/31	Vessel closed for remainder of fishing year	Vessel closed 30 days if 5/1-10/31, 14 days if 11/1-1/31	Vessel closed 30 days if 5/1-10/31, 14 days if 11/1-1/31	
Vessel cap exceeded			Vessel closed for remainder of fishing year	Vessel closed for remainder of fishing year Fleet closed for 30 days if 5/1-10/31, 14 days if 11/1-1/31	
Fleetwide cap reached	Fleet closed for remainder of fishing year			*Fleet closed for 30 days if 5/1-10/31, 14 days if 11/1-1/31**	
Fleetwide cap exceeded			Fleet closed for remainder of fishing year	Fleet closed until beginning of following fishing year	Fleet closed to following 10/31, with cap counts beginning 11/1 each year

* Note that since the exceedance values for vessel caps and the cap reached values for the fleet are the same, this provision duplicates the fleet provision described above.

1.5.4 Alternatives Considered, but not Further Analyzed

2 Environmental Assessment

2.1 Methods

2.1.1 Environmental Components Addressed in the Analysis

Internal scoping by Council and NMFS staffs identified the range of environmental components likely to be affected by the proposed action. Since this proposed action is very similar to the action proposed by the Council in 2015 (see Section 1.4), a review of the Final Environmental Assessment (EA) prepared by NMFS in 2017 (NMFS 2017b) evaluating the Council's 2015 proposal,[4] contributed to deciding what environmental components to evaluate for effects of the proposed action. The following environmental components are evaluated, presented relative to the likely magnitude of the effect of the proposed action:

1. The socioeconomic environment
   a. Participation in the DGN fishery and in other fisheries by DGN fishery participants, resulting changes in economic benefits
   b. Changes in benefits to fishing communities engaged in the DGN fishery
2. Protected species taken in the DGN fishery including sea turtles and marine mammals and focusing on the HPPS subject to the proposed action

3. Finfish caught in the DGN fishery and either retained or discarded as bycatch

The 2017 EA considered whether essential fish habitat (EFH) designated under the HMS FMP or critical habitat designated for ESA-listed species in the action area would be affected by the proposed action. Critical habitat has been designated in the action area for two species: the eastern distinct population segment (DPS) of Steller sea lion, and Pacific leatherback sea turtle. (Note that the eastern DPS of Steller sea lion was de-listed in 2013.)

HMS EFH is described in Appendix F of the HMS FMP. HMS EFH consists of the epi- and mesopelagic zones of neritic and oceanic waters (PFMC 2003). The 2017 EA concluded that the 2015 proposed action was not likely to affect EFH, and its impact was not further evaluated. Likewise, it is reasonable to conclude that the current proposed action would not have a discernable impact on HMS EFH, and therefore will not be evaluated further.

The eastern (DPS) of stellar sea lion critical habitat designation includes waters within 3,000 feet of the shoreline of rookery areas. Since the DGN fishery does not operate within 3,000 ft of any shoreline, it is unlikely to affect this critical habitat.

Critical habitat was designated off the U.S. West Coast for leatherback sea turtles in 2012 (77 FR 4169). As discussed in the 2017 EA, much of the area so designated in waters off California falls within the PLCA, which is seasonally closed to the DGN fishery.[5] Furthermore, the critical habitat designation focuses on prey species as the primary constituent element essential for the conservation of leatherbacks in marine waters off the U.S. West Coast. The 2017 EA notes that the DGN fishery has a negligible impact on leatherback prey species.

For the reasons outlined above, the 2017 EA concluded that the 2015 proposed action would not

[4] Hereafter, referred to as the "2017 EA."

[5] Additional critical habitat was designated in waters off Oregon and Washington outside of area where the fishery currently operates.

materially affect critical habitat in the action area. Based on that conclusion, and the similarity of the current proposed action to that action, impacts to critical habitat are not evaluated further in this EA.

Three species of shark, as well as Pacific halibut *(Hippoglossus stenolepis)* and Pacific salmon *(Onchorhynchus spp.)* are designated as prohibited species under the HMS FMP. The sharks are the great white *(Carcharodon carcharias)*, megamouth *(Megachasma pelagios)*, and basking shark *(Cetorhinus maximus)*. In general, prohibited species must be released immediately if caught in fisheries permitted under the HMS FMP, unless other provisions for their disposition are established, including for scientific study.

Of these species, only megamouth shark is recorded in DGN fishery observer data summaries for the 2012-13 to 2020-21 fishing seasons, with six caught overall. (Because of the nature of the gear and the area where the fishery occurs, it is very unlikely that Pacific halibut or any Pacific salmon species are caught in the DGN fishery.) All six megamouth sharks were recorded as being released alive, although there is no information on post-release survival. As discussed above, the Council established a process for annual reporting of bycatch performance in the DGN fishery against thresholds, or performance metrics, reflecting historic bycatch rates in the fishery. The prohibited shark species are reported as a group under this process. Estimated bycatch of this group has never exceeded the performance metric established by the Council (see Figure 2-1).

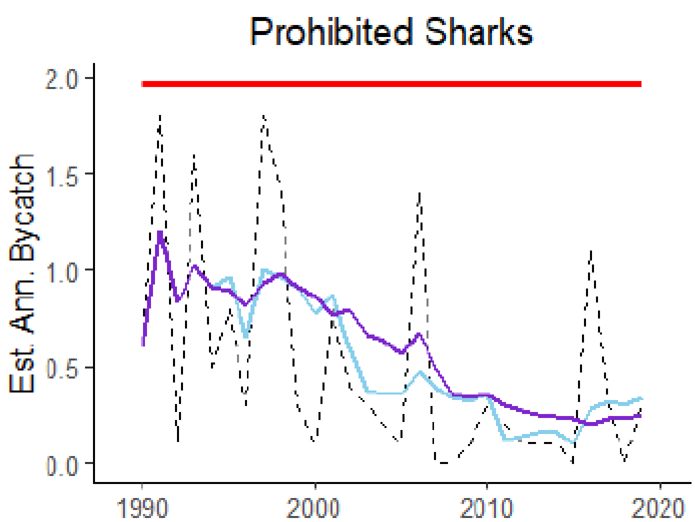

Figure 2-1. DGN annual bycatch trends for prohibited shark species. (Source: Agenda Item F.4.a, Supplemental HMSMT Report 2, June 2021).

Given these low levels of bycatch and the nature of this proposed action, impacts to prohibited species are not further evaluated in this EA. In general, any change in the magnitude of prohibited species bycatch is likely to correlate with changes in bycatch generally and may be considered in that context.

2.1.2 The DGN Observer Program and Catch and Bycatch in the Fishery

Onboard fishery observers are the principal source of data used to estimate total fishing mortality and protected species take in the DGN fishery. It is also the main data source used in the bootstrap model discussed below (Section 2.1.3). The history and characteristics of the NMFS observer program are described below.

NMFS deploys on board observers in the DGN fishery. In this EA, DGN observer data are used to model the effects of hard caps in order to evaluate the impacts of the alternatives (see Chapter 4). NMFS has operated an at-sea observer program in the DGN fishery since July 1990 to the present, while CDFW had operated a DGN observer program from 1980 to 1990. The objectives of the NMFS Observer Program are to record, among other things, information on non-target fish species and protected species interactions that may not be typically or accurately reported in the fishing logbooks due to focus on target species by fishermen or incentives not to report certain species to avoid the potential for increased regulation. These observer data are relied upon to produce estimates of protected species interactions and bycatch of other species and to forecast potential impacts of future fishing effort on these species.

NMFS has sought to obtain 20 percent observer coverage of the DGN fishery each year, per recommendations from the Southwest Fisheries Science Center (NMFS 1989). Coverage rates are determined based on fishing effort, or the number of observed sets as a fraction of all logbook reported sets. NMFS' fleet-wide observer coverage target has been 30 percent since 2013. Since some DGN vessels are unobservable due to safety or accommodations requirements, the observable vessels are observed at a rate higher than 30 percent to attain the fleet-wide 30 percent coverage. Historically, four to six DGN vessels were unobservable during each fishing season.

Table 2-1 provides the recent history of observer coverage based on fishing effort (measured in sets) for fishing seasons 2012-2013 through 2020-21. (This information is reported in data summaries available on the NMFS website. These reports are being transitioned to PacFIN's Apex reporting system.) The coverage rate has varied between 11 and 34 percent. The second lowest rate, recorded for the 2020-21 season, may be an effect of the Covid-19 pandemic. Overall, the annual average of observer coverage during this period was 23 percent.

Table 2-1. Observed and estimated total sets by DGN fishing season and resulting coverage rate, 2012-13 through 2020-21.

Season	Observed sets	Total sets (estimated)	Percent observed
2012-13	84	408	21%
2013-14	191	559	34%
2014-15	113	379	30%
2015-16	41	378	11%
2016-17	160	714	22%
2017-18	114	618	18%
2018-19	124	473	26%
2019-20	86	321	27%
2020-21	22	147	15%

As an outcome of the Council's 2015 action on hard caps the Council's HMSMT has been annually reporting estimated bycatch rates against performance metrics (thresholds) for finfish and HPPS established by the Council. These metrics are computed on a calendar year basis, because the underlying estimates are derived from estimates made by the Southwest Fisheries Science Centers Marine Mammal and Turtle division, which have been reported annually beginning in 2020 (Carretta 2021). The statistical method employed by Carretta uses a two-step modeling approach in which random forest classification trees are used for variable selection and then selected variables are included in regression tree random forest to estimate bycatch in unobserved fishing sets. At the Council's direction, in 2021 the HMSMT computed performance metrics (thresholds) for finfish species/species groups (non-swordfish billfish, prohibited sharks, scalloped hammerhead shark, manta ray) and HPPS based on this methodology and reported annual estimates and five- and 10-year moving average trends (Agenda Item F.4.a, HMSMT Report 1 and Supplemental HMSMT Report 2, June 2021). Because of data processing and review requirements, the years for which estimates are reported are lagged by two years; in 2021 years 2018 and 2019 were reported along with trends over the observer data time series dating back to 1990. In 2018 and 2019 estimated bycatch for these species/species groups were below Council established thresholds. In its report the HMSMT noted that the thresholds "… are not population-based standards, such as Potential Biological Removal for marine mammals, but are rather based on the highest observed bycatch for the period from 2004-2013. This period occurred after the Marine Mammal Protection Act (MMPA) and ESA management measures became effective for the fishery (in the late 1990s and in 2001, respectively). Therefore, the HMSMT regards these metrics as highly conservative, as they reflect a period after DGN bycatch was already substantially reduced" (Supplemental HMSMT Report 2). In addition, the trend analysis showed that the 5- and 10-year moving averages were below the thresholds since at least 2010.

2.1.3 Bootstrap Methodology to Estimate Changes in Fishing Effort, Gross Profits, and Bycatch of High Priority Protected Species

An extension of the bootstrap methodology used to evaluate the impacts of the Council's 2015 action (documented in Agenda Item G.2.a, Supplemental NMFS Report 5, September 2015) is used here. The No Action alternative (Alternative 1) and two-year rolling hard caps (Alternative 2) were among the range of alternatives evaluated with this method for the 2015 action. The model had to be extended to cover Alternative 3, in-season and individual vessel closures, which was not previously evaluated. In addition, input data was updated and model assumptions (e.g., the number of vessels participating in the fishery) were respecified. The HMSMT reported to the Council on the development of the model extension in June 2022 (Agenda Item G.4.a, HMSMT Report 1 and Agenda Item G.4.a, Supplemental HMSMT Report 2).

This bootstrap simulation uses the long time series of observer, logbook, landings, and cost data available for the DGN fishery operation to construct the empirical distribution of observed DGN fishing experience at the set level. Results of bootstrap simulation may be harnessed to obtain reliable standard errors, confidence intervals, and other measures of uncertainty (Davison and Hinkley 1997). To best represent current and future fishery performance data from the 2001-2002 through the 2020-2021 season were used. Documentation for the current version of this bootstrap simulation method may be found in Appendix A. [Model documentation will be presented to and reviewed by the Scientific and Statistical Committee at the November 2022 meeting and subsequently incorporated into the appendix.]

As discussed in Agenda Item G.4.a, HMSMT Report 1, June 2022, several key assumptions were necessary for the modeling process. First, the observer coverage level was assumed to be 25 percent, based on discussions with the NMFS West Coast Observer Program. The observer coverage level is an important variable, because the closures under Alternatives 2 and 3 are triggered by observed HPPS bycatch (mortality/injury), not total (including unobserved) HPPS bycatch. Second, the level of fishery participation must be specified because this dictates the total amount of fishing effort that will occur. The California transition program for the DGN fishery (see Sections 1.4 and 2.2.1.1) has resulted in the retirement of both state and Federal DGN permits along with surrender of nets for destruction. That sets an upper limit on the number of extant Federal permits when the proposed action would be implemented. However, recent fishery participation trends suggest that many of these permits are latent: the permit holders have not fished and may no longer have the vessel and fishing gear necessary to participate in the fishery. The number of vessels designated as unobservable is a related factor that must be accounted for, because under Alternative 3 closures are triggered for both the observed vessel and all unobservable vessels. Based on discussion with the Observer Program about recent numbers of unobservable vessels, a number related to total participation was identified. To account for these factors, the HMSMT identified three fishery participation scenarios representing a reasonable range.

- **Scenario 1**: 2 active vessels / 1 observable / 1 unobservable: Any permit holder eligible to participate in California's buyback program does so.
- **Scenario 2**: 11 active vessels / 7 observable / 4 unobservable: Any permit holder active in the fishery in recent years that has yet to complete California's transition program does not do so.
- **Scenario 3**: 30 active vessels / 24 observable / 6 unobservable: Any permit holder that has yet to complete California's transition program does not do so and that all remaining permit holders have vessels that will become active.

The HMSMT also noted that while a purpose of the proposed action is to incentivize fishers to avoid HPPS bycatch, there is not enough information to parameterize the bootstrap model so as to capture such behavioral changes. They note that the incentive structure could play out in different ways (with different incentives for observable versus unobservable vessels), some of which may be perverse (i.e., resulting in increased bycatch).

The bootstrap model produces distributions of modeled variables based on the replication of simulated seasons (in this case 10,000). These distributions are presented by summary statistics of quantiles (5, 25, 50, 75, 95), mean, and standard deviation in model output tables. These outputs are fishing effort in number of sets, total ex-vessel revenue, total and average per-vessel profits, and the total number of mortalities/injuries for the 10 HPPS. This allows an assessment of both the economic and conservation performance of the alternatives. All these summary results are reproduced in Appendix B.

2.1.4 Methods for Evaluating Impacts to Other Environmental Components

Impacts to fishing communities, finfish, and non-HPPS protected species are not modeled. Impacts to these environmental components are evaluated qualitatively based on the premise that impacts correlate with modeled changes in fishing effort, revenue, and/or HPPS M/I.

2.1.5 Cumulative Impacts

CEQ regulations require consideration of the cumulative impacts of the proposed action. Cumulative impacts are the effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions (RFFAs) regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR 1508.1(g)(3). As practical matter, past and present actions may be characterized as ongoing actions whose effects overlap with those of the proposed action. The affected environment sections in this EA inventory the effects of ongoing actions on the environmental components evaluated in this EA. Ongoing actions materially affecting the environment components evaluated in this EA are:

- The California large mesh driftnet transition program. As described in Sections 1.4 and 2.2.1.1, under this program limited entry permit holders may surrender their state DGN permit and their fishing gear for compensation. They are also prohibited from fishing under, transferring, or renewing their Federal DGN permit. The deadline for permit holders to meet the requirements of the program is October 28, 2022. This has reduced the number of extant permit holders to less than 30 [final number to be inserted when available].

- Issuance of EFPs to test DSBG and development of Amendment 6 to the HMS FMP. As described in Section 2.2.1.2, NMFS has issued more than 50 permits to test this gear, which is intended as a lower bycatch alternative for targeting swordfish. Some EFP holders also possess state and Federal limited entry permits for the DGN fishery. EFPs allow them to test DSBG and evaluate whether it offers an economically viable supplement or alternative to DGN. This could result in their reducing use of DGN gear. Council action under Amendment 6 would establish a tiered limited entry qualification system that encourages DGN permit holders to participate in a state or federal transition program. While pursuant regulations for DSBG and the limited entry program will not be implemented until 2023 (see RFFAs below), knowledge about the proposed tiered qualification system may have encouraged some DGN fishery participants to participate in the California transition program.

- Management actions taken in other fisheries that catch finfish species and take protected species caught or taken in the DGN fishery, which may mitigate stock wide fishing mortality.

The geographic scope of the proposed action is described in Section 1.2. The temporal scope for past and present actions, which contribute to baseline conditions, is 2012 through 2021.

Reasonably Foreseeable Future Actions

The Companion Manual to NOAA Administrative Order 216-6A provides the following additional guidance for considering what constitutes reasonably foreseeable future actions: "Reasonably foreseeable future actions cannot be limited only to those that have been approved or funded, but decision makers need not speculate about future actions that are not likely" (NOAA 2017). The following reasonably foreseeable future actions are identified:

- Revocation of all extant California DGN limited entry permits on January 31, 2024, as part of the California transition program described above. Absent any unforeseen action, Federal DGN permit holders may continue to fish in Federal waters after all state permits have been revoked.
- Implementation of HMS FMP Amendment 6. Once implemented, holders of a state/Federal DGN limited entry permit are given preference in the tiered system for issuing limited entry permits to fish with DSBG in the Southern California Bight. DGN permit holders who surrender their permit under a transition program, and those who have actively participated in the fishery in recent years are prioritized in the tier system. The deadline for participating the California transition program will have passed by the time regulations for Amendment 6 are implemented. However, the availability of DSBG and the establishment of the limited entry program may provide some incentive for DGN fishery participants to redirect some or all fishing effort from DGN to DSBG.

2.2 Socioeconomic Impacts

As noted above, socioeconomic impacts are evaluated in the context of the DGN fishery itself and fishing communities engaged in the DGN fishery.

2.2.1 Status/Affected Environment

2.2.1.1 The DGN Fishery

The characteristics of the DGN fishery including its evolution since its emergence in the late 1970s, are detailed in the 2017 EA and more recent information is available in the HMS SAFE available on the Council website. That information is incorporated by reference and briefly summarized here (50 CFR 1501.12).

DGN gear consists of floating gillnet panels suspended vertically in the water column to catch pelagic species. It has a minimum stretched mesh size of 17 inches and a single set of the gear may not exceed 6,000 feet in length. The gear is set at night targeting thresher shark and swordfish. In recent decades swordfish has emerged as the dominant target species, likely due to its higher value compared to thresher shark and possibly shark conservation measures implemented in the 1990s. Although historically operating as far north as Oregon, today fishing occurs almost entirely south of Monterey, mainly in the Southern California Bight in the fall and winter. Seasonal temperature fronts that concentrate feed for swordfish are a major influence on fishing activity, but regulatory time-area closures also have a big influence on seasonal patterns.

The fishery is managed through both Federal and state regulations to conserve target and non-target stocks including federally protected species that are incidentally captured. Measures in Federal regulations to mitigate impacts to marine mammals include requirement to attach acoustic pingers on the net as deterrence and require setting the net at least 6 fathoms (10.9 m) below the surface.

The fishery is subject to time and area closures to mitigate takes of sea turtles. These are the Pacific Leatherback Conservation Area (50 CFR 660.713(c)(1)) and the Pacific Loggerhead Conservation Area (50 CFR 660.713(c)(2)).

The state of California established a limited entry permit program for the fishery, gear specifications and restrictions, and various time and area closures. (These gear specifications and time/area closures are also described in Federal regulations at 50 CFR 660.713(b) and (d).) Principal among these time and area closures, the fishery is closed in the EEZ from February 1 to April 30. As a result, the DGN fishing season begins on May 1 and ends on January 31, although little fishing effort occurs before August 15 because waters within the 75 nautical miles of the mainland shore are closed May 1 to August 14 (50 CFR 660.713(d)(2)). Pursuant to the HMS FMP, Federal regulations establish a fishing year beginning at 0801 GMT (0001 local time) on April 1 and ending at 0800 GMT on March 31 (2400 local time) of the following year.

A Federal limited entry permit was implemented in 2018 through Amendment 5 to the HMS FMP. It is intended mirror many of the features of the state limited entry permit and is required to fish in Federal waters. In addition to these limited entry permits, the HMS FMP requires a general HMS permit with a drift gillnet gear endorsement for all U.S. vessels that fish for HMS within the West Coast EEZ.

In September 2018 California enacted Senate Bill 1017, which directed the California Department of Fish and Wildlife to develop a program by March 31, 2020, to allow payment to permit holders for the voluntary surrender of drift gillnet permits. After March 31, 2019, California state drift gillnet permits cannot be transferred, and all permits must be surrendered or revoked by January 31 of the fourth year after $2 million in funding for the program is received by the state. The California Department of Fish and Wildlife established the transition program and funding was secured to buy out all fishery participants who wish to voluntarily surrender their permits. Transition program participants must surrender their state DGN permit; affirm their net has been destroyed at an accredited facility; and affirm they will not fish under, transfer, or renew their Federal DGN permit. Any remaining state permits will be revoked on January 31, 2024. As of October 28, 2022, deadline there were 27 state permit holders who did not participate in the transition program and 33 Federal DGN limited entry permit holders. It is expected that the six transition program participants with extant Federal permits could not renew those permits for the period after April 30, 2023. Of those who did not participate in the transition program and could renew their Federal permit, two had DGN landings during the 2020-2021 and 2021-2022 seasons.

Participation and landings in the DGN fishery have been in decline for a long time as indicated by HMS SAFE Table 12 and displayed in Figure 2-2. In the 10 years prior to the Council's previous action on hard caps (2005-2014), an average of 29 vessels landed 333 mt annually while in the more recent 10-year period up through 2021 an average of 16 vessels landed 156 mt annually. During this recent period there was a distinct change in landings in 2019 as shown in Figure 2-3. In addition to a steep drop in landings, species composition shifted away from swordfish, with Pacific bluefin tuna dominating catch in 2021-2022 season. However, for the entire 2012-2021 time period swordfish has been the predominant constituent of landings and revenue, as shown in Table 2-3.

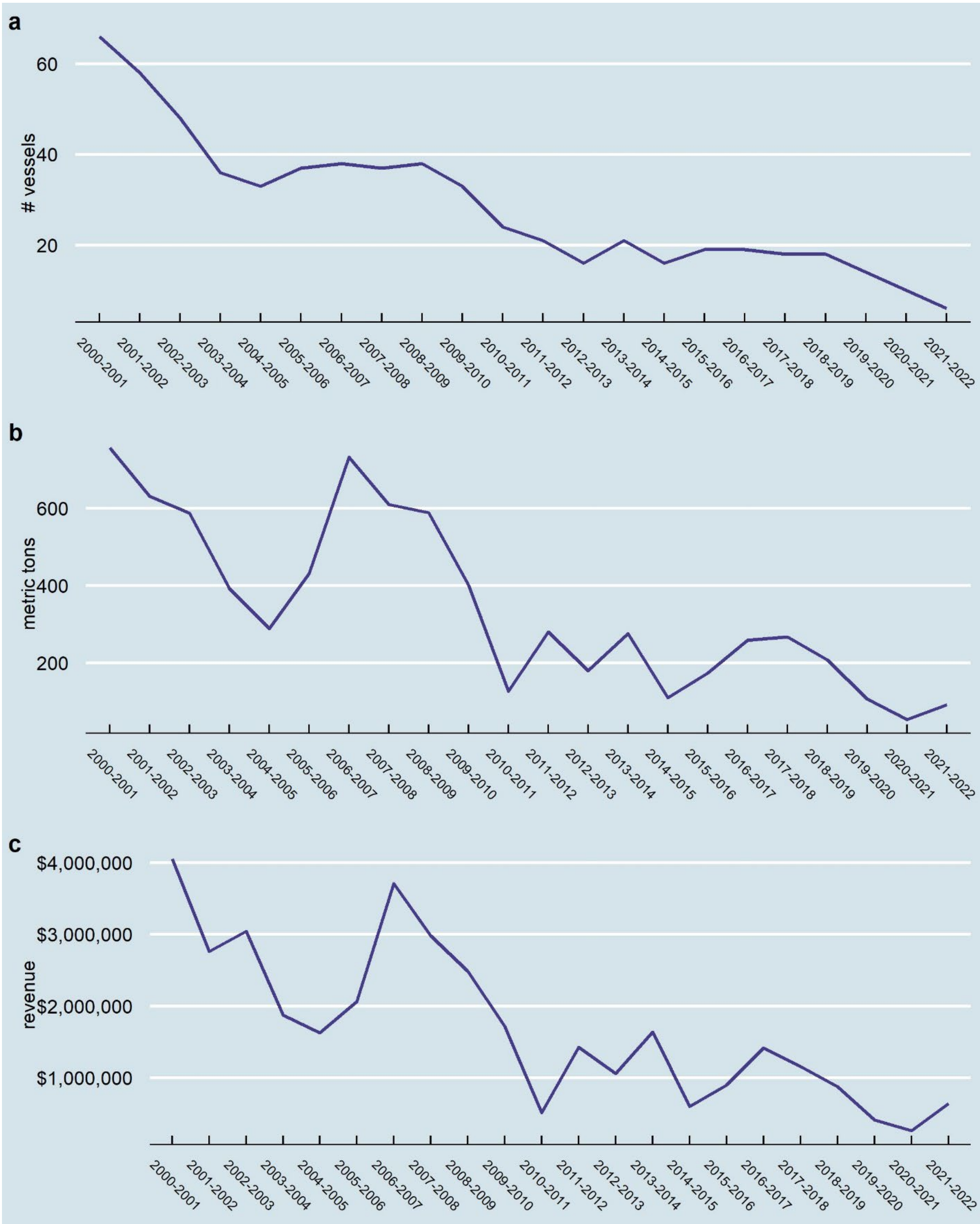

Figure 2-2. DGN fishery trends: a) number of vessels, b) landings (mt), and c) inflation-adjusted ex-vessel revenue (dollars) by fishing season, 2000-01 through 2020-22.

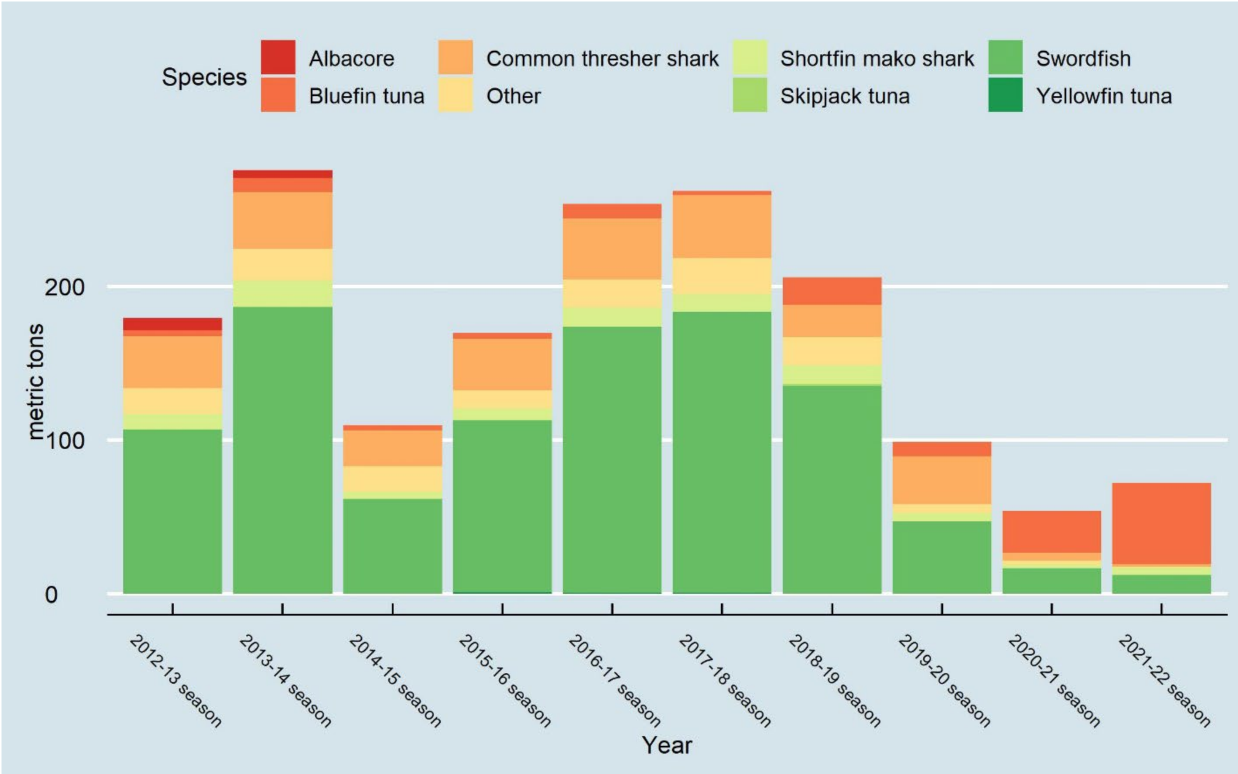

Figure 2-3. Landings composition(mt) in the DGN fishery by season, 2012-13 to 2021-22. "Other" means non-HMS.

Table 2-2. Landings composition by species, percent, 2012-13 through -2021-22 seasons, descending order by revenue percent.

Species	Landings (percent)	Ex-vessel revenue (percent)
Swordfish	61.5%	77.9%
Bluefin tuna	8.3%	10.1%
Common thresher shark	15.9%	5.1%
Non HMS	8.0%	4.2%
Shortfin mako shark	5.2%	2.0%
Albacore	0.8%	0.5%
Yellowfin tuna	0.1%	0.1%
Skipjack tuna	0.1%	0.0%

Participation in the DGN fishery, measured by the number of vessels making landings, remained fairly stable from the 2012-13 fishing season through the 2018-19 season, ranging from 16 to 21 vessels. In the last three fishing seasons, participation has successively declined from 14, to 10, to 6 vessels. This is likely due to the vessels exiting the fishery through the California transition program, but the effects of the Covid-19 pandemic on operations and markets likely have been a confounding factor.

2.2.1.2 Participation in Other Fisheries in the Proposed Action Area by DGN Fishery Participants

In addition to the DGN fishery, there are a variety of other fisheries targeting HMS that occur in the action area. These include the surface hook-and-line (troll and bait boat) fishery targeting albacore tuna, the harpoon fishery targeting swordfish, and the coastal purse seine fishery that intermittently targets yellowfin, skipjack, and bluefin tunas. Table 2-3 shows landings and ex-vessel revenue from authorized HMS fisheries occurring in the action area for the 10 years, 2012 to 2021. In addition to these fisheries, since the Council's 2015 action, it has been recommending issuance of exempted fishing permits (EFPs) to test deep-set buoy gear (DSBG) to target swordfish. In 2019 the Council took final action on a package of management measures, including a limited access permit program, to authorize a fishery for this gear pursuant to the HMS FMP including amending the HMS FMP (Amendment 6). Implementation, including rulemaking, is currently in progress. Landings with DSBG were first recorded in the PacFIN database in 2014. The number of vessels making landings ranged from two to six between 2014 and 2017 and then increased with the issuance of more EFPs to between 20 and 26 in the four years through 2021. Landings peaked in 2020 at 126 mt. Pelagic longline has been the second largest source of landings and revenue among HMS fisheries after the albacore fishery, but this fishery is prohibited in the West Coast EEZ and therefore does not occur in the action area. The characteristics of these fisheries are described in the 2017 EA and in the HMS SAFE, which may be found on the Council's website.

Table 2-3. Average annual landings and ex-vessel revenue from authorized HMS fisheries occurring in the action area, 2012-2021. (Pelagic longline and deep-set buoy gear excluded.)

Fishery	Average annual landings (mt)	Average annual ex-vessel revenue	Average annual no. vessels
Albacore hook-and-line*	9,154	$34,171,768	147
Coastal purse seine	1,014	$1,173,718	2
DGN	125	$904,013	4
HMS hook and line fishery	41	$413,771	53
Harpoon	8	$146,250	5
Other HMS landings	34	$135,511	22

*Not including Canadian vessels landing in U.S. ports.

Participants in the DGN fishery also participate in a range of other non-HMS fisheries, and these can be important sources of alternative revenue. Table 2-4 shows annual average landings and revenue of the 35 vessels that made landings in the DGN fishery, 2014-2021, by fishery. [6] As shown in the table, DGN vessels derived a larger proportion of revenue from the albacore fishery than it did from DGN, while a range of other HMS and non-HMS fisheries contributed to landings and revenue.

[6] Since DSBG landings only began in 2014, to accurately represent its contribution, data from 2014 to 2021 is averaged.

Table 2-4. Average annual landings and inflation-adjusted ex-vessel revenue by fishery for vessels making landings in the DGN fishery, 2014-2021. Percent is of total landings and revenue. HMS fishery landings grouped using the D'Angelo fishery code, other landings grouped by management group code.

Fishery	Landings		Ex-vessel revenue	
	metric tons	percent	dollars	percent
Albacore hook-and-line	509	57.4%	$1,690,820	41.0%
DGN	169	19.1%	$853,797	21.0%
Other non-HMS	60	6.8%	$506,390	12.0%
Dungeness crab	64	7.2%	$424,509	10.0%
DSBG*	24	2.7%	$232,019	6.0%
Salmon	9	1.0%	$131,657	3.0%
Small mesh DGN	14	1.6%	$101,593	2.0%
Shrimp	11	1.2%	$72,311	2.0%
Harpoon swordfish	4	0.4%	$44,912	1.0%
Groundfish	6	0.7%	$26,331	1.0%
Other HMS	7	0.7%	$19,153	<0.1%
Linked DSBG*	2	0.3%	$18,992	<0.1%
Coastal pelagic species	1	0.2%	$8,503	<0.1%
HMS hook-and line	7	0.8%	$2,605	<0.1%

*Conducted under exempted fishing permits.

Table 2-5 presents another perspective on cross-fishery participation. It shows, for the 35 vessels that participated in the DGN fishery between 2012 and 2021, the number of vessels according to the fraction of ex-vessel revenue derived from the DGN fishery and the average annual per-vessel ex-vessel revenue derived from DGN landings for vessels in that category. Notably, those vessels most dependent on the fishery (deriving ≥ 75 percent of ex-vessel revenue from the fishery) had lower per-vessel average revenue from DGN compared to those vessels that derive 25-49.9 percent of ex-vessel revenue from the DGN fishery. In terms of numbers of vessels, 69 percent (24 out of 35 vessels) derived 50 percent or more of their revenue from the DGN fishery during this period.

Table 2-5. Proportion of inflation-adjusted ex-vessel revenue from DGN for DGN vessels, 2012-2021.

Percent of vessel's total revenue from DGN	Number of vessels	Average annual per vessel revenue from DGN
<25%	6	$25,200
25-49.9%	5	$258,304
50-74.9%	10	$227,677
≥75%	14	$250,020

The seasonal pattern of landings in different fisheries is another consideration relevant to the proposed action because it has implications for the availability of alternative sources of revenue should a hard cap closure occur. Figure 2-4 shows the seasonal pattern in ex-vessel revenue for DGN fishery participants by fishery category. (As above, the time period used for the figure is 2014-2021 so that DSBG revenue is comparably accounted for.) As might be expected, little or no revenue is derived from the DGN fishery between February and August when the fishery is effectively closed.[7] As evidenced in Table 2-4, the albacore fishery is the main contributor to ex-vessel revenue for DGN fishery participants, but that fishery occurs almost entirely from July to October (see HMS SAFE Table 7) while most DGN landings occur from October to January. The Dungeness crab fishery, the most important single non-HMS fishery for DGN participants, occurs primarily between December and April. Based on data for the 2012-2021 period, the proportion of ex-vessel revenue derived from the crab fishery by DGN fishery participants is 19.2 percent in December and 23.4 percent in January, accounting for most of the alternative revenue during the DGN fishing season. It then becomes a much larger proportion of DGN fishery participant's total ex-vessel revenue once the DGN fishery closes, peaking at 44 percent of total revenue in April.

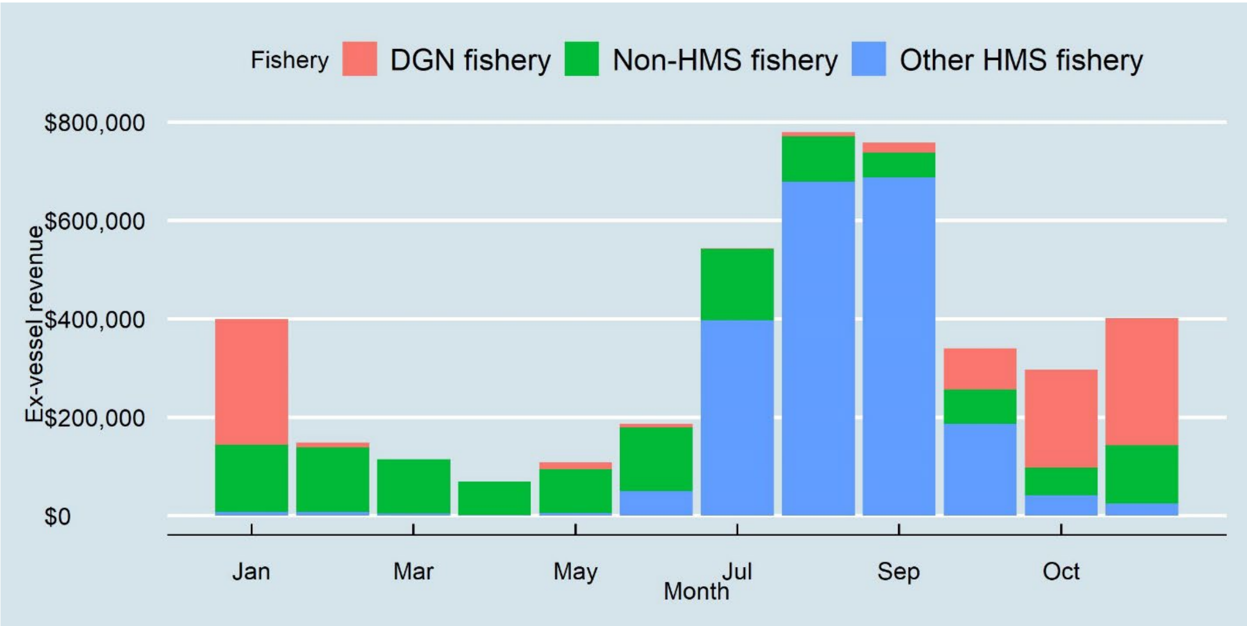

Figure 2-4. Average monthly inflation-adjusted ex-vessel revenue by fishery for DGN vessels making landings in the DGN fishery, 2014-2021.

2.2.1.3 Fishing Communities

MSA National Standard 8 requires conservation and management measures to take into account the importance of fishery resources to fishing communities in order to provide for sustained participation by and minimize adverse economic impacts on fishing communities. National standard guidelines define a fishing community as

> a community that is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew, and fish processors that are based in such communities. A fishing community is a social or economic group whose members reside in a specific location and share a common dependency on commercial, recreational, or subsistence fishing or on directly related fisheries-dependent services and industries (for example, boatyards, ice suppliers, tackle shops). (50 CFR 600.345(a)(3))

Table 2-6 presents information to characterize fishing communities affected by the proposed action. It

[7] Although the fishery is closed throughout the EEZ from February through April, some landings occur in early February from fishing that occurred in January.

shows annual average landings and ex-vessel revenue by PacFIN port group, 2012-2021. No landings have occurred in the other California ports, which are north of San Francisco, since 2017 and only Morro Bay, Santa Barbara, and San Diego saw landings in 2021. Given the PLCA closure period and bad weather after November 15 (when the PLCA opens) combined with reduction in the fleet size due to the California Transition Program, vessels may not fish in more northern areas off California in future years. San Diego accounted for 52 percent of landings and revenue during this period, indicating it is the main port for the DGN fishery.

Table 2-6. Average annual DGN landings (mt) and inflation-adjusted ex-vessel revenue by port group, 2012-2021.

Port group	Average metric tons	Average ex-vessel revenue	Total no. vessels
San Francisco	4.4	$23,352	5
Monterey	0.9	$5,289	5
Morro Bay	25	$122,884	11
Santa Barbara	22.8	$131,996	12
Los Angeles	19.6	$96,053	13
San Diego	91.2	$472,317	24
Other CA ports	11.1	$52,497	3

Another way to evaluate the importance of a fishery to a port is in terms of dependence and engagement. Dependence is measured as the DGN fishery inflation-adjusted ex-vessel revenue as a percentage of all fishery revenue in that port. Engagement is measured as DGN fishery revenue in a port as a percentage of coastwide DGN fishery revenue. These percentages are presented in Table 2-7 by PacFIN port group, with ports listed in descending order according to engagement. Morro Bay and San Diego are relatively more dependent on and engaged in the DGN fishery compared to other port groups. Santa Barbara and Los Angeles are significantly engaged in the fishery but not very dependent on it.

Table 2-7. DGN fishery dependence on and engagement in the DGN fishery by port group, 2012-2021.

Port Group	Dependence	Engagement
San Diego	8.1%	51.5%
Santa Barbara	2.6%	14.4%
Morro Bay	15.4%	13.4%
Los Angeles	1.0%	10.5%
Other CA ports	<0.1%	5.7%
San Francisco	0.4%	2.5%
Monterey	0.3%	0.6%

Figure 2-5 shows the trend on fishery dependence for the four port groups most engaged in the DGN fishery. The most engaged port, San Diego, saw a substantial drop in DGN fishery dependence in 2015. Trends in dependence on the DGN fishery is less obvious for the other three ports.

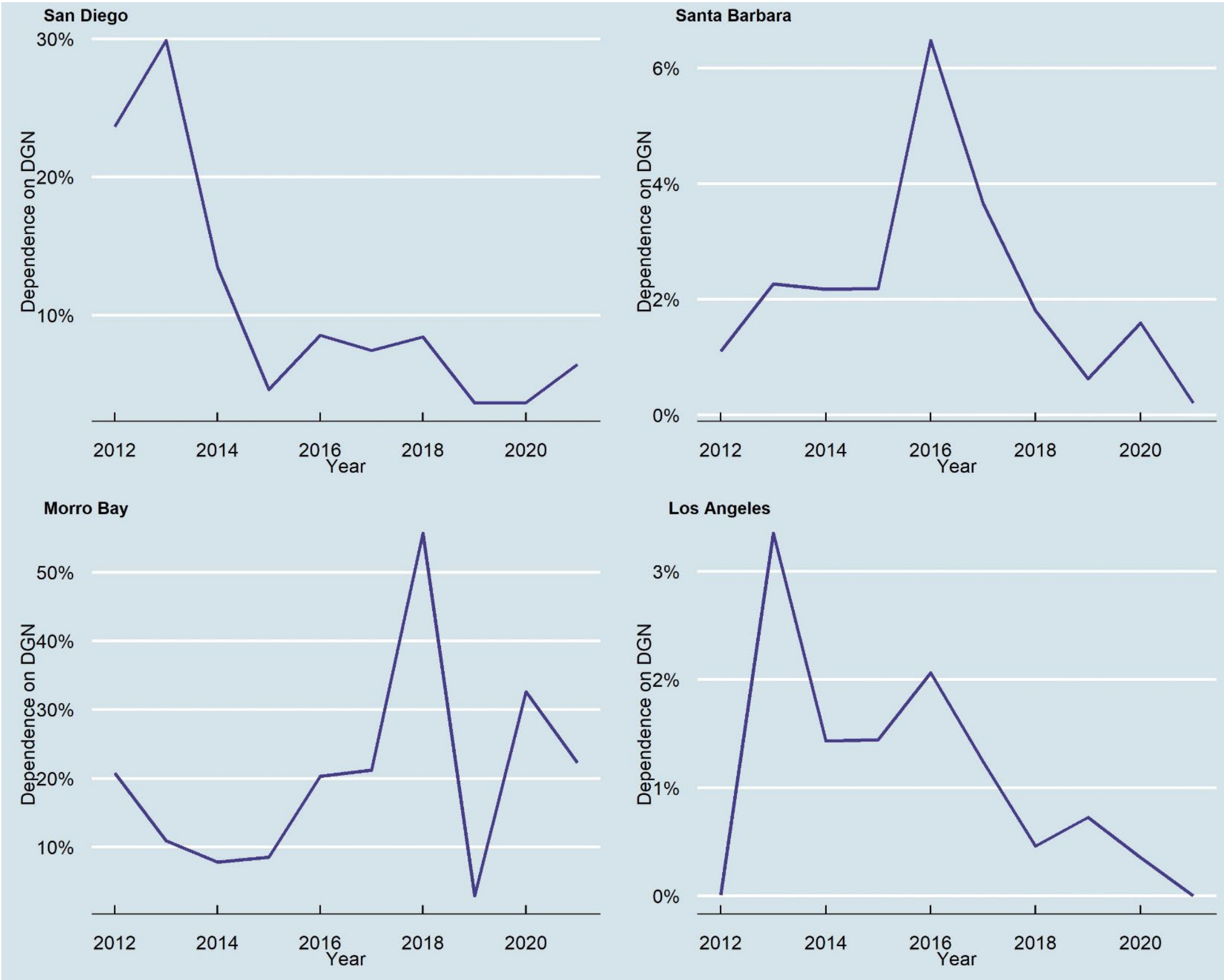

Figure 2-5. Annual values for dependence on the DGN fishery for San Diego, Santa Barbara, Morro Bay, and Los Angeles, 2012-2021.

Figure 2-6 shows the average inflation-adjusted price-per-pound for swordfish by month and selected HMS fisheries, using data from 2017 to 2021. During the fishing season, DGN landed swordfish fetches prices ranging from $3.32 to $4.69 per pound,[8] which are intermediate between pelagic longline and smaller volume, more niche market landings from DSBG and harpoon fisheries. Given high ex-vessel prices, these latter two fisheries are more likely to sell into a premium market, such as the restaurant trade. The slight price premium DGN product commands over pelagic longline landings may reflect relative product quality, given that pelagic longline fishing occurs outside the EEZ so that the fish have already been on ice for some time before reaching markets. Across all fisheries, swordfish prices decline in fall and winter, likely driven by increased supply.

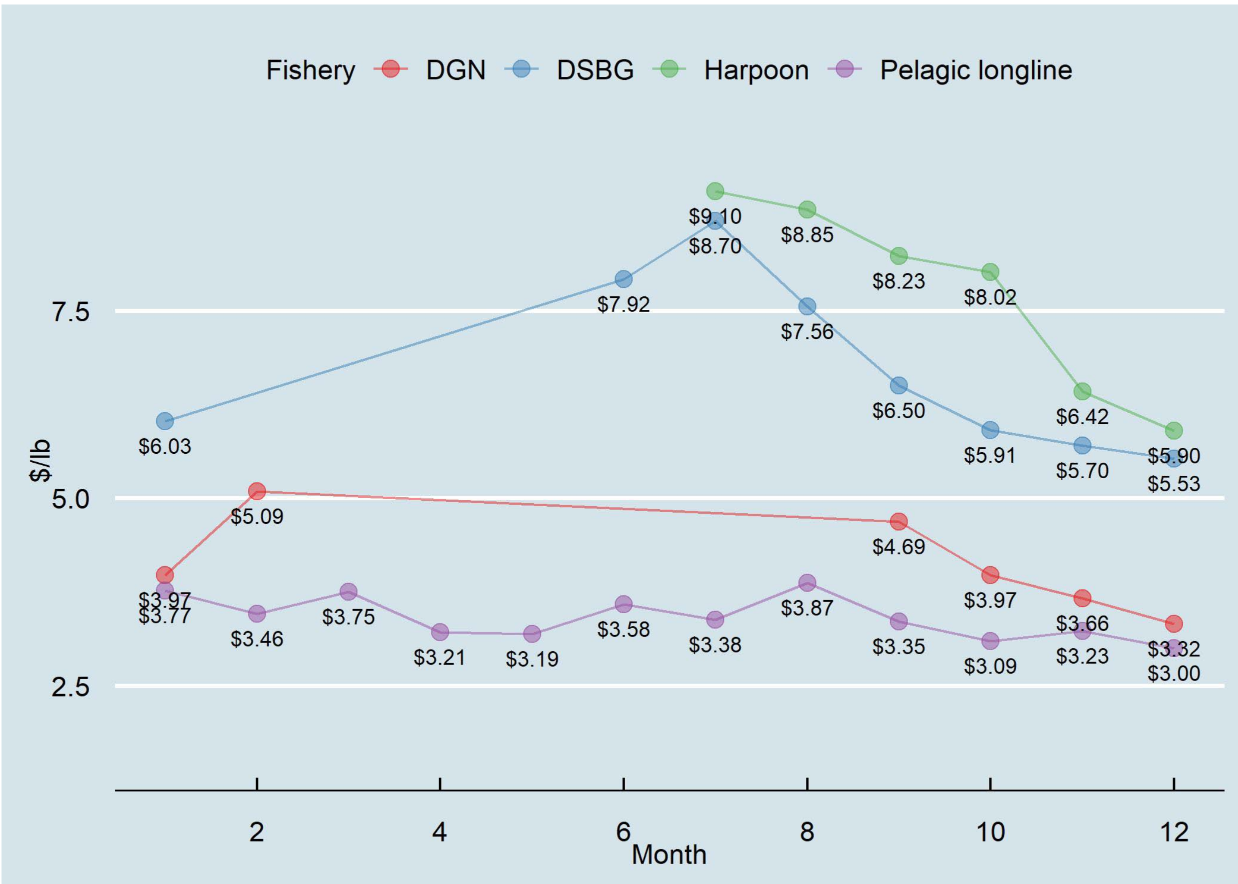

Figure 2-6. Average inflation-adjusted price per pound for swordfish, by fishery and month, 2017-2021. (Confidential data excluded.)

Domestic landings represent only a fraction of local market supply; imports represent a larger source. Table 2-8 shows the average price and volume of swordfish imports into California customs districts by product form in 2021. Imports from Mexico are shown separately; it is an important source of supply to the San Diego customs district. Fresh swordfish is the most common product form and considering all sources sells at an average price comparable to DGN-landed swordfish at $3.55/lb.[9] However, imports

[8] The highest average price of $5.09 per pound in February, representing the relatively small amount of landings that occur at the beginning of that month after the fishing season has ended. It is probably not very representative of prices that DGN-landed swordfish typically fetch.
[9] The "Swordfish Meat Fresh" product category appears anomalous. This category represents a small amount imported from Mexico.

from Mexico, which may compete more directly with DGN landings, sell at a lower average price of $2.52/lb. These imports may periodically exert downward price pressure on DGN-landed swordfish prices.

Table 2-8. Imports of swordfish in 2021 to California customs districts by product form, all sources and Mexico alone, price-per-pound and metric tons. (Source: NOAA Office of Science & Technology online database.)

Product Form	Average price per pound	Quantity (mt)
Swordfish Fillet Fresh	$2.72	2.2
Swordfish Fillet Frozen	$4.28	658.8
Swordfish Fresh	$3.55	1,021.5
Swordfish Meat Fresh	$9.92	0.1
Swordfish Steaks Frozen	$4.74	25.7
All Product Forms	$3.85	1,708.3
Imports from Mexico		
Swordfish Fresh	$2.52	412.4
Swordfish Meat Fresh	$9.92	0.1
Swordfish Fillet Fresh	$2.72	2.2
All Product Forms	$2.52	414.8

2.2.2 Environmental Consequences

2.2.2.1 DGN Fishery

The following criteria are used to evaluate the impact of the alternatives on the DGN fishery:

- Change in DGN fishery participation as measured by the modeled average number of sets made in a fishing season compared to the baseline
- Change in DGN fishery modeled average revenue and profit compared to the baseline
- The timing and duration of hard caps triggered closures in relation to DGN fishery participants' fishing opportunities in other fisheries
- Change in benefits to fishing communities inferred from the modeled change in total ex-vessel revenue

Alternative 1 – The No Action Alternative

Under the No Action Alternative baseline conditions would continue into the future, because the fishery would be unaffected by hard cap triggered closures. As discussed above in Section 2.2.1.1, participation and related ex-vessel revenue in the DGN fishery has been declining over the long term. Given these baseline trends, fishery effort between Scenario 1 (2 vessels) Scenario 2 (11 vessels) best represents future participation (see Table 2-9 for the mean estimates of sets, revenue, profit, and landings for the three effort scenarios).

Table 2-9 shows the mean values for economic metrics produced by the bootstrap model across the three effort scenarios. In the 2021-2022 season six vessels landed 92.3 mt generating $644.9 thousand in ex-vessel revenue (represented in Figure 2-2), which is intermediate between Scenarios 1 and 2. A recent change in landings composition (principally an increase in Pacific bluefin tuna) during recent fishing seasons was noted in Section 2.2.1.1. It is not possible to predict whether this change in landing composition is a permanent fixture of the fishery, and how it would affect revenue derived from the fishery, because it depends on availability of different species to the gear and the difference in price received for each species.

Table 2-9. Bootstrap model mean values for sets, total ex-vessel revenue and profits, average per-vessel profit, and landings across three effort scenarios under Alternative 1, no action.

	Scenario 1 (2 vessels)	Scenario 2 (11 vessels)	Scenario 3 (30 vessels)
Sets	107	586	1,601
Total Revenue	$166,113	$910,216	$2,486,293
Total Profits	$42,144	$230,671	$628,441
Avg. Profits	$21,072	$20,970	$20,948
Landings (mt)	24	130	356

Since no closures due to observed HPPS mortalities/injuries would occur under the No Action alternative, there would not be any revenue loss during the time of the year when DGN fishery participants have few opportunities to participate in other fisheries to offset lost DGN revenues. Section 2.2.1.2 describes DGN fishery participants' involvement in other fisheries and their seasonal patterns. Historically, the albacore hook-and-line fishery has been the largest source of revenue for DGN participants. That fishery occurs from June to October when fishing effort in the DGN fishery is low. On a month-to-month basis, fishery participants derive a majority of ex-vessel revenue from the DGN fishery from November to January (see Figure 2-4; the percentage of total revenue derived from the DGN fishery in these months is 70 percent in November and 66 percent in December and January).

Figure 2-7 shows the distribution of the 10,000 bootstrap model replicates in terms of number of sets, ex-vessel revenue, and profit.

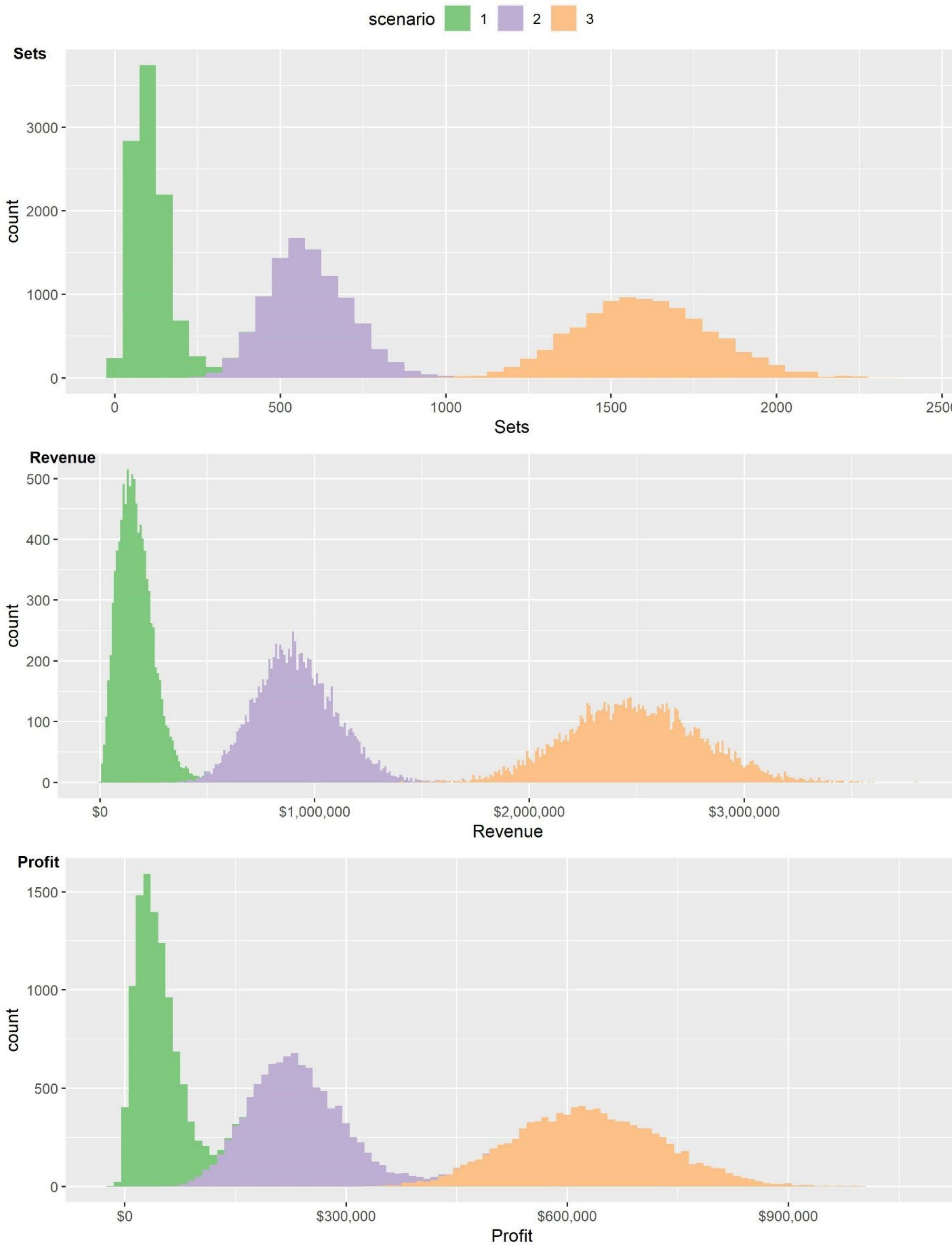

Figure 2-7. Histograms showing distribution of bootstrap outputs of number of sets, ex-vessel revenue, and profits for Alternative 1 under the three effort scenarios.

Alternative 2 – Rolling Two-Year Fishery Closure

The bootstrap model results indicate that fishing effort, landings, revenue, and profits would on average decline under Alternative 2 compared to No Action, which is expected, because on those occasions when observed HPPS mortalities/injuries meet the hard cap the fishery closes for up to two fishing seasons. Mean estimates from the bootstrap simulation under the three effort scenarios are presented in Table 2-10.

Table 2-10. Bootstrap model mean values for sets, total ex-vessel revenue and profits, average per-vessel profit, and landings across three participation scenarios under Alternative 2, rolling two-year fishery closure. The absolute and percent change in mean values are also shown in the second and third panels.

	Scenario 1	Scenario 2	Scenario 3
Sets	106	558	1,400
Total Revenue	164,644	$866,517	$2,167,834
Total Profits	41,736	$218,797	$543,389
Avg. Profits	20,868	$19,891	$18,113
Landings (mt)	24	124	311
Net change (absolute)			
Sets	-1	-27	-201
Total Revenue	-$1,469	-$43,699	-$318,459
Total Profits	-$408	-$11,874	-$85,052
Avg. Profits	-$204	-$1,079	-$2,835
Landings (mt)	0	-6	-45
Net change (percent)			
Sets	-0.86%	-4.68%	-12.56%
Total Revenue	-0.88%	-4.80%	-12.81%
Total Profits	-0.97%	-5.15%	-13.53%
Avg. Profits	-0.97%	-5.15%	-13.53%
Landings (mt)	-0.87%	-4.76%	-12.70%

Table 2-10 also shows the change from No Action in the mean estimates of bootstrap model metrics. Baseline participation trends are most likely to fall between Scenarios 1 and 2, suggesting a decline in ex-vessel revenue between $1,469 (-0.86 percent) and $43,699 (-4.7 percent). The bootstrap model outputs are more comparable to a long-term trend since the model simulates 10,000 fishing seasons. However, fishing firms may not be able to sustain the short-term loss of revenue resulting from a closure of up to two fishing seasons, depending on their financial reserves and alternative sources of revenue during the closure period, as described in Section 2.2.1.2, In this regard Figure 2-8, showing the distribution of the results of the 10,000 bootstrap replicates in terms of effort (number of sets), ex-vessel revenue, and profit for the three participation scenarios, is instructive. Of note are the relatively large number of replicates that produced zero values, reflecting full season closures where no fishing occurred. (Under participation Scenario 2, for example, 14 percent of the total replicates produce zero effort.)

Overall DGN fishery participants derive more revenue from the albacore hook-and-line fishery but the dependence of individual participants varies. As shown in Table 2-5, more than two-thirds of DGN fishery participants derived more than 50 percent of their revenue from the DGN fishery. Vessels/firms with higher fishery dependence are less likely to be able to withstand short-term loss of revenue due to fishery closures. Fishery participants could exit fishing entirely or redeploy capital to focus on other fisheries (e.g., reconfigure vessels to participate in another fishery more effectively).

Alternative 2 is the same as the Council's 2015 proposal, which NMFS analyzed and concluded in its Final Regulatory Impact Review/Regulatory Flexibility Analysis would result in significant adverse economic impacts (NMFS 2017b). That finding stemmed from an analysis of participants' dependence on DGN revenue, which would be impacted in the short-term by closures, and a discussion of various factors inhibiting participants from easily shifting to other fisheries during closure periods. Those findings were also based on the results of an earlier version of the bootstrap simulation methodology to produce estimates in the change in economic and conservation benefits. For that exercise it was assumed that 20 vessels would participate in the fishery.

At issue for the current proposed action is whether the baseline conditions have changed in some way such that the significant adverse economic impacts described for the Council's 2015 proposal would be ameliorated. An important factor is Council action to authorize DSBG gear, which could serve as an alternative to source of revenue for DGN fishery participants. Under this proposal a limited entry program would be established for fishing in the Southern California Bight, where almost all DSBG EFP fishing has occurred, and where a substantial portion of DGN fishing effort has been expended (see Figure 1-1); limited entry permit qualification criteria favor active DGN fishery participants, especially those that surrender their Federal DGN permit and exit the fishery. To date DSBG EFP fishing has accounted for 6 percent of DGN participants total ex-vessel revenue (Table 2-4). This suggests that participation in that fishery would not fully offset loss of revenue from the DGN fishery during closure periods. However, whether increased participation in a future DSBG fishery by DGN fishery participants would offset revenue losses due fishery closures under this proposed action cannot be predicted. According to PacFIN data, average annual per vessel inflation-adjusted ex-vessel revenue during the five years 2017-2021 was $27,855 in the DGN fishery while in the DSBG EFP fishery it was $22,702. The difference in net revenue may be greater if unit costs are greater with DSBG (which is a lower volume fishery on a per vessel basis). This suggests that DSBG would not fully substitute for DGN net revenue during closure periods.

The number of vessels continuing to participate in the DGN fishery is a second change in baseline conditions that would affect the overall adverse economic impact to DGN fishery participants stemming from fishery closures. Results from the bootstrap simulation under the three fishery participation scenarios show that relative impacts (in terms of decline in effort, landings, and revenue) are less with fewer participants (Table 2-10). This stands to reason, because with lower levels of participation and fishing effort the likelihood that observed HPPS mortalities/injuries rise to a level triggering a closure is less. Although not an output of the bootstrap simulation, the frequency of closures is likely correlated with the change in the average number of sets. As noted above, the bootstrap analysis of the Council's 2015 proposed action assumed 20 vessels. For the current proposed action the three participation scenarios encompass that level although, as stated elsewhere, the participation is most likely to fall between 2 and 11 vessels (Scenarios 1 and 2) given baseline conditions.

The adverse economic impacts of Alternative 2 could be mitigated if fishers are able to change fishing behavior in a way that reduces the likelihood of encountering HPPS during observed fishing trips, thus reducing the frequency of closures. There are at least two factors militating against such behavioral change under Alternative 2, however. First, protected species take events are infrequent and fishers may not be able to identify behavioral changes that would reduce take while not substantially reducing catch success. Second, since the penalty (fishery closure) applies to the entire fleet, there is a collective action problem in which the benefit (avoiding a closure) is shared by the whole group while the individual fisher bears any costs associated with bycatch avoidance (akin to the prisoner's dilemma). For this reason, Alternative 2 may not effectively address the purpose of the proposed action, which is to incentivize fishing practices and tools in an effort to minimize bycatch and bycatch mortality.

Figure 2-8. Histograms showing distribution of bootstrap outputs of number of sets, ex-vessel revenue, and profits for Alternative 2 under the three participation scenarios.

Alternative 3 – Inseason Individual Vessel and Fleetwide Closures

Alternative 3 has five options/sub options as described in section 1.5.3. Results of the bootstrap simulation for each of these options/sub options are presented in Table 2-11 in a same format as for Alternative 1 and 2. Figure 2-9 shows the distribution of sets in bootstrap replicates for the Alternative 3 sub options. Since the distributions for ex-vessel revenue and profit are similar, they are not included across the options here.

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Table 2-11. Bootstrap model mean values for sets, total ex-vessel revenue and profits, average per-vessel profit, and landings across three participation scenarios under Alternative 3 options and sub options, inseason fishery closure. The absolute and percent change in mean values are also shown in the second and third panels. Note that results for Option A, Sub Options I and II are identical and therefore shown in a single panel.

Option A, Sub Options I and II			
	Scenario 1	**Scenario 2**	**Scenario 3**
Sets	107	578	1,550
Total Revenue	$165,648	$898,298	$2,400,238
Total Profits	$41,993	$227,000	$601,803
Avg. Profits	$20,996	$20,636	$20,060
Landings (mt)	24	129	344
Net change (absolute)			
Sets	-0.3	-7	-51
Total Revenue	-$465	-$11,917	-$86,056
Total Profits	-$151	-$3,671	-$26,638
Avg. Profits	-$76	-$334	-$888
Landings (mt)	0	-2	-12
Net change (percent)			
Sets	-0.25%	-1.21%	-3.20%
Total Revenue	-0.28%	-1.31%	-3.46%
Total Profits	-0.36%	-1.59%	-4.24%
Avg. Profits	-0.36%	-1.59%	-4.24%
Landings (mt)	-0.27%	-1.27%	-3.35%

Option B			
	Scenario 1	**Scenario 2**	**Scenario 3**
Sets	107	582	1,586
Total Revenue	165,648	904,318	2,460,659
Total Profits	41,993	228,883	620,588
Avg. Profits	20,996	20,808	20,686
Landings (mt)	24	130	352
Net change (absolute)			
Sets	-0.3	-4	-15
Total Revenue	-$465	-$5,898	-$25,635
Total Profits	-$151	-$1,788	-$7,853
Avg. Profits	-$76	-$163	-$262
Landings (mt)	0	-1	-4
Net change (percent)			
Sets	-0.25%	-0.60%	-0.96%
Total Revenue	-0.28%	-0.65%	-1.03%
Total Profits	-0.36%	-0.78%	-1.25%
Avg. Profits	-0.36%	-0.78%	-1.25%
Landings (mt)	-0.27%	-0.63%	-1.00%

Option C, Sub Option I			
	Scenario 1	Scenario 2	Scenario 3
Sets	107	580	1,573
Total Revenue	165,648	901,565	2,440,217
Total Profits	41,993	228,052	614,601
Avg. Profits	20,996	20,732	20,487
Landings (mt)	24	129	349
Net change (absolute)			
Sets	-0.3	-5	-28
Total Revenue	-$465	-$8,651	-$46,076
Total Profits	-$151	-$2,618	-$13,840
Avg. Profits	-$76	-$238	-$461
Landings (mt)	0	-1	-7
Net change (percent)			
Sets	-0.25%	-0.89%	-1.74%
Total Revenue	-0.28%	-0.95%	-1.85%
Total Profits	-0.36%	-1.14%	-2.20%
Avg. Profits	-0.36%	-1.14%	-2.20%
Landings (mt)	-0.27%	-0.93%	-1.83%

Option C, Sub Option II			
	Scenario 1	Scenario 2	Scenario 3
Sets	106	576	1,557
Total Revenue	165,294	896,097	2,422,135
Total Profits	41,989	228,119	615,164
Avg. Profits	20,994	20,738	20,505
Landings (mt)	24	128	347
Net change (absolute)			
Sets	-0.6	-10	-44
Total Revenue	-$820	-$14,119	-$64,159
Total Profits	-$155	-$2,552	-$13,277
Avg. Profits	-$78	-$232	-$443
Landings (mt)	0	-2	-9
Net change (percent)			
Sets	-0.54%	-1.70%	-2.74%
Total Revenue	-0.49%	-1.55%	-2.58%
Total Profits	-0.37%	-1.11%	-2.11%
Avg. Profits	-0.37%	-1.11%	-2.11%
Landings (mt)	-0.50%	-1.58%	-2.62%

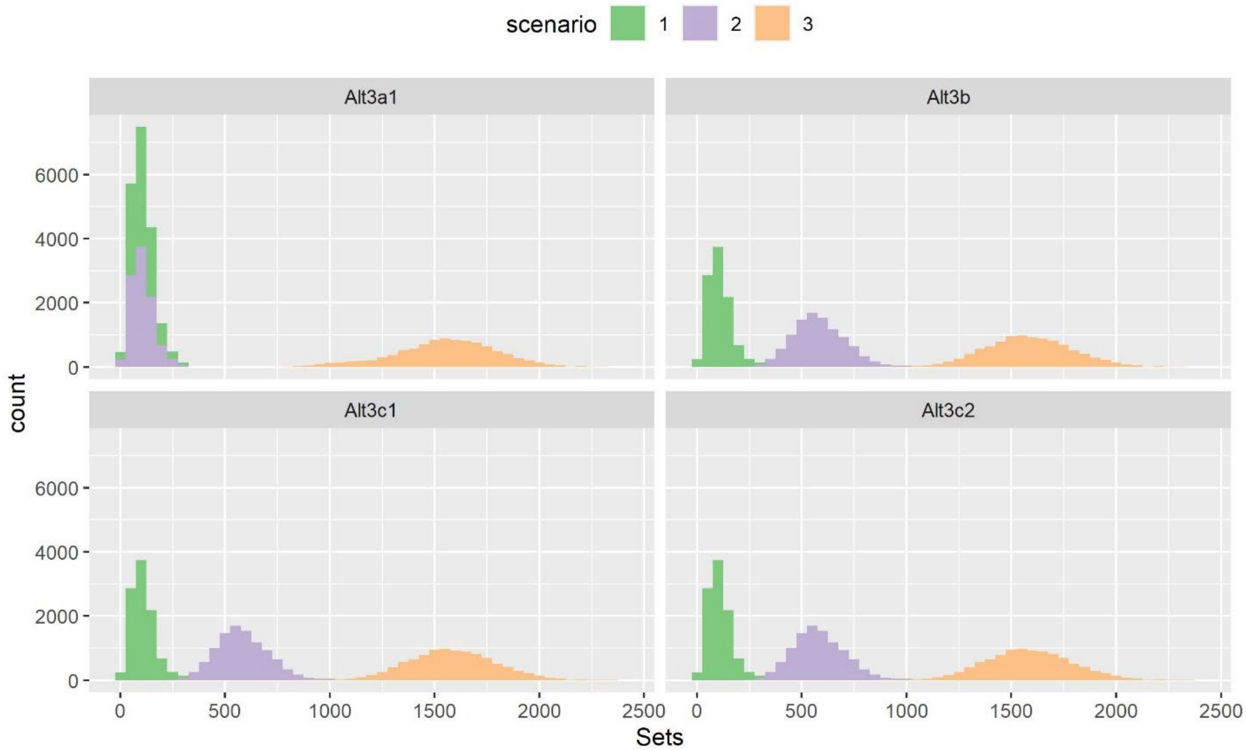

Figure 2-9. Histograms showing distribution of bootstrap outputs of number of sets for Alternative 3 options under the three participation scenarios. Option A Sub Option II is excluded because the results are identical to Sub Option I.

Option A

This option has two sub options. Under Sub Option I an observed vessel and all unobservable vessels would stop fishing for 14 or 30 days when a vessel cap is reached and under option II option an observed vessel and all unobservable vessels would stop fishing for the remainder of the season when a vessel cap is reached. Under both sub options all vessels would stop fishing for the remainder of the season when a fleetwide cap is reached.

As reflected in Table 2-11, the bootstrap model simulation could not detect any differences in the economic metrics between these two sub options. The likely explanation for this result is that in the simulation vessel caps are reached late in the season such that there is no difference between the short-term closures and a remainder of the season closure. (This is a function of the input observer data and the fact that the resampling procedure incorporates the source data day-in-year to construct a simulated season.) Furthermore, sample data for the bootstrap simulation is drawn from the 2001-2002 through 2020-2021 fishing seasons; there were few observed HPPS M/I during this period making it less likely for cap closures to be triggered in the simulation (and likely in real life if fishery participation in the future is very low). Under Scenario 1 (two vessels) these sub options show a very small fractional difference in fishing effort (-0.3 sets) compared to No Action indicating with this low level of effort cap closures would almost never be triggered. This results in a very modest decline in the mean value of total revenue of $465 or 0.3 percent. The comparable values for Scenario 2 (11 vessels) are a decline of 7 sets and $11,917, a 1.2 percent decrease from No Action. If the fleet size was 30 vessels (Scenario 3) the modeled decline in effort and revenue is more substantial at $88,056 or 3.2 percent. Compared to the percentage decline in revenue under this option is roughly a quarter of Alternative 2 across the participation scenarios.

Figure 2-9 shows that the distribution of fishing effort (sets) is narrow and at the low end for participation scenarios 1 and 2 (although there are no zero values as under Alternative 2). Under Scenario 2, 37 percent of season replicates result in between 50 and 100 sets, the largest bin in the distribution. This is followed by the 0 to 50 bin with 13 percent of replicates.

Option B

Under this option an observed vessel and all unobservable vessels would stop fishing for 14 or 30 days when a vessel cap is reached, an observed vessel and all unobservable vessels would stop fishing for the remainder of the fishing year when a vessel cap is exceeded, and all vessels would stop fishing for the remainder of the fishing year when a fleetwide cap is exceeded.

Under Scenario 1 (2 vessels) the model results for this option are identical to Option A; the decline in effort is a fractional value of 0.3 sets resulting in the same revenue decline of $465. More contrast with Option A is observed under Scenarios 2 (11 vessels) and 3 (30 vessels). Under those scenarios this option results in the smallest decline in effort and revenues from No Action of the Alternative 3 options/sub options evaluated.

It can be seen in Figure 2-9 the distribution of sets in the bootstrap output for Scenario 2 (11 vessels) generally falls between Scenario 1 (2 vessels) and scenario 3 (30 vessels). The distributions for Option B and Option C are very similar.

Option C

There are two sub options. Under Sub Option I an observed vessel and all unobservable vessels would stop fishing for 14 or 30 days when a vessel cap is reached, an observed vessel and all unobservable vessels would stop fishing for the remainder of the fishing year when a vessel cap is exceeded, all vessels stop fishing for 14 or 30 days when a vessel cap is reached, and all vessels would stop fishing for the remainder of the fishing year. Sub Option II is the same as Option I except for treatment of the fleetwide cap exceedance level. In that case, HPPS M/I is counted beginning on November 1 (instead of the beginning of the fishing season) and if the cap is exceeded all vessels would stop fishing until October 31 in the following year. *Note, however, that to simplify modeling, this method of counting towards caps was applied to all of the cap levels in Sub Option II.*

As with the other options, the decline in effort and related revenue is negligible under Scenario 1 (2 vessels); effort declines by a mean value of 0.3 sets under Sub Option I (the same mean value under the other options) and 0.6 sets under Sub Option II. Looking at Scenarios 2 (11 vessels) and 3 (30 vessels), Sub Option I is intermediate between Options A and B in terms of the socioeconomic metrics while Sub Option II results in in the largest decline in these metrics across the Alternative 3 options.

The results for Sub Option II are somewhat counterintuitive, or contradict the intent of setting the start date for counting towards caps at November 1. The rationale for this approach is that the most productive period for the fishery (in terms of catch and revenue) is from November 1 to January 31; starting the count on November 1 would, in theory, make it less likely that a cap is triggered during this period. These results are mostly explained by the characteristics of the input data; as explained above, resampling within the model is tied to day-in-year and some HPPS M/I in the source observer data occurred late in the fishing season, which could trigger closures sooner after November 1. Also, the simplified modeling approach, applying the November 1 start date across all cap levels, may also contribute to this result. If Sub Option II were implemented as described in the range of alternatives, with the November 1 state applied only to the fleetwide cap, reductions in effort and revenue may be more modest.

Summary of the Effects of Alternative 3 Options

Table 2-12 summarizes the effect of Alternative 3 by showing the results for Scenario 2 (11 vessels), which is considered the best estimate of likely future participation in the DGN fishery. Using this comparison, the options may be ranked in terms of decline and revenue from lowest to highest: Option B, Option A, Option C Sub Option I, and Option C Sub Option II. However, as noted above, the results for Option C Sub Option II may be an artifact of the modeling procedure. Declines under that sub option may be less if the November 1 start date were only implemented for the fleetwide cap.

Table 2-12. Summary comparison of Alternative 3 options showing results for Scenario 2 (11 vessels).

	Option A (both sub options)	Option B	Option C Sub Option I	Option C Sub Option II
Sets	578	582	580	576
Total Revenue	898,298	904,318	901,565	896,097
Total Profits	227,000	228,883	228,052	228,119
Avg. Profits	20,636	20,808	20,732	20,738
Landings (mt)	129	130	129	128
Net change (absolute)				
Sets	-7	-4	-5	-10
Total Revenue	-11,917	-5,898	-8,651	-14,119
Total Profits	-3,671	-1,788	-2,618	-2,552
Avg. Profits	-334	-163	-238	-232
Landings (mt)	-2	-1	-1	-2
Net change (percent)				
Sets	-1.31%	-0.65%	-0.95%	-1.55%
Total Revenue	-1.59%	-0.78%	-1.14%	-1.11%
Total Profits	-1.59%	-0.78%	-1.14%	-1.11%
Avg. Profits	-1.27%	-0.63%	-0.93%	-1.58%
Landings (mt)	0.00%	0.00%	0.00%	0.00%

All of the Alternative 3 options result in a substantially smaller decline in effort and revenue compared to Alternative 2, ranging from slightly more than a tenth of the Alternative 2 decline (Option B) to slightly less than four-fifths of the decline (Option C Sub Option II).

Although not discernable in these model outputs, features of the Alternative 3 options are likely to address some of the broader adverse impacts identified for Alternative 2. First, and most obviously, the closures are of shorter duration, and likely to only stop fishing for part of the season. And in cases where an individual vessel cap is triggered (without a fleetwide cap triggered simultaneously or subsequently within a season) fewer vessels would be affected. However, because of the infrequency of HPPS M/I in the 2000-2021 observer input data set it is difficult to discern potential differences across the options. This is best reflected in the identical results for Option A Sub Option I (short-duration vessel closures) and Option II (remainder of the season vessel closures). Furthermore, there is almost no difference across the options in socioeconomic impact at low levels of participation, because in the first instance caps would be triggered rarely.

As discussed in the evaluation of Alternative 2, it is unclear whether the potential for DGN vessels to participate in the DSBG fishery would adequately offset revenue loss during DGN fishery closures. In general, short-term closures would be easier to weather in this regard. Whether it would make financial sense to gear switch to DSBG during these shorter closure periods is unknown.

Vessel caps are intended to address the collective action problem identified for Alternative 2. In principal vessel operators would have more incentive to avoid HPPS bycatch if there is individual accountability for fishing behavior. The ability to avoid HPPS bycatch would reduce the adverse financial effects of an individual fisher having to stop fishing. However, it is still an open question as to whether fishers can identify effective behavioral changes when the likelihood of encountering HPPS is very low. However, conceptually, if individual incentives were perfectly effective, we could expect no HPPS M/I to occur without any adverse socioeconomic impacts to hard cap closures being triggered (i.e., revenue and profit at baseline levels as described for Alternative 1, No Action). The fact that vessel closures apply to both the observed vessel and all unobservable vessels means that unobservable vessel operators would not benefit from any behavioral changes to mitigate HPPS bycatch, effectively making the individual vessel closures comparable to a fleetwide closure for them in terms of the incentive structure.

Cumulative Impacts on the DGN Fishery

The RFFAs identified in Section 2.1.5 could modestly mitigate the adverse effects to the DGN fishery. State permit holders willingly participated in the transition program, presumably weighing the compensation thus received against likely future revenue, if any, derived from the fishery. Those who did not participate in the state program and possess a Federal permit would be able to continue fishing after state permits are revoked. This suggests that this transition program would neither add to nor subtract from any adverse economic effects of hard cap closures under the proposed action.

Implementation of HMS FMP Amendment 6 authorizing DSBG could to some degree offset the adverse effects of hard cap closures by offering an alternative gear that DGN fishery participants could use during closure periods to catch swordfish. However, data from fishing with DSBG under EFPs suggest that using DSBG may not fully compensate for the inability to fish with DGN during closure periods. The effects of the availability of DSBG as an alternative gear is further complicated by the characteristics of those vessels subject to closures. It is likely that only a subset of DGN fishery participants could or would participate in an authorized DSBG fishery. First, in the short term not all remaining participants are likely to qualify for limited entry permits to fish in the Southern California Bight. Second, depending on the size and configuration of their vessels it may not be profitable to switch to DSBG gear. For these reasons when closures occur, not all fishers subject to the closure are likely to be able to take advantage of DSBG to offset lost revenue. Nonetheless, this action could reduce the adverse impacts of the proposed action on DGN fishery participants to some degree.

2.2.2.2 Fishing Communities

The impact of the alternatives on fishing communities is evaluated qualitatively since model outputs do not measure it directly. Ex-vessel revenue induces the generation of personal income through expenditures DGN fishing firms make in the community. Thus, ex-vessel revenue may be used as a proxy for an evaluation. The evaluation is made in the context of the historical level of dependence on and engagement in the DGN fishery in affected fishing communities.

Alternative 1 – The No Action Alternative

Under No Action landings to ports would be expected to continue at levels similar to the recent past. As described in Section 2.2.1.3, San Diego, Los Angeles, and Santa Barbara have been the most engaged port groups in the recent past, while Morro Bay has been the most dependent on the DGN fishery. It is likely that these patterns would continue under the No Action alternative, although if fishery participation continues its recent declining trend landings may contract to a fewer number of the historically most important ports. Based on engagement, contraction would tend toward San Diego, which has the largest share of ex-vessel revenue from the fishery.

Section 2.2.1.3 also presents information on swordfish imports and swordfish prices in West Coast HMS fisheries. These patterns are likely to persist under No Action although exogenous factors could lead to increasing demand for other sources of swordfish including imports and other domestic fisheries (pelagic longline, harpoon, DSBG), which is driven both by price and the characteristics of particular market niches. In terms of price, DGN landed swordfish competes most directly with pelagic longline landings by Hawaii permitted vessels. Swordfish landings from that fishery have generally declined. Imported fresh swordfish fillets from Mexico are the most comparable imported product form and generally sell at a lower price than DGN-caught swordfish. However, the DGN fishery lands a variety of other species (Figure 2-3), which may mitigate price competition with other sources of swordfish supply. As previously noted, Pacific bluefin tuna was the largest component of DGN landings during the 2020-2021 and 2021-2022 fishing seasons, possibly due to the relative availability to the fishery of the two species. This suggests some operational flexibility that could also come into play in response to market conditions.

Alternative 2 – Rolling Two-Year Fishery Closure

The impact of Alternative 2 on fishing communities may be indirectly inferred by the change in fishing effort and revenue produced by the bootstrap simulation model. Under participation Scenarios 1 and 2, which bracket the most plausible level of fishery participation, revenue would decline on average by between 0.8 and 4.7.8 percent. If the participation level is higher, as represented by Scenario 3 (30 vessels) revenue decline would be substantially greater, as high as 12.8 percent. As discussed above, the lengthy fishery closures under this alternative would likely have a more substantial impact on fishing communities in the short term, when the closures occur, because of revenue loss for up to two years.

The San Diego port group is most engaged in the DGN fishery accounting for 52 percent of total DGN fishery inflation-adjusted ex-vessel revenue coming from that fishery in the 10 years 2012-2021 (Table 2-7). However, it is not heavily dependent on the fishery (DGN has accounted for 8 percent of all fishery revenue) and its dependence on the fishery has been declining (Figure 2-5). Morro Bay has historically been the most dependent on the DGN fishery (15 percent of all fishery revenue) and ranks third among port groups in terms of average ex-vessel revenue derived from the DGN fishery, 2012-2021. It would likely be the most affected port group by fishery closures.

Alternative 3 – Inseason Individual Vessel and Fleetwide Closures

The impact of Alternative 3 on fishing communities may be indirectly inferred by the change in revenue produced by the bootstrap simulation model. Under participation Scenarios 1 and 2, which bracket the most plausible level of fishery participation, fishing effort would decline on average by between 0.3 and 1.6 percent across the various options. This is a smaller decline compared to Alternative 2 and, as discussed above, fishery closures would in the first instance (individual vessel closures) affect only a portion of the fleet and would be generally shorter in duration compared to Alternative 2. Given that dependance on the DGN fishery among the ports engaged in this fishery is modest (with the possible exception of Morro Bay), the adverse impact of closures under Alternative 3 on these fishing communities is likely to be very modest to negligible.

Cumulative Impacts on Fishing Communities

The RFFAs identified in Section 2.1.5 could reduce the adverse effects to fishing communities to the degree they mitigate adverse impacts to the DGN fishery. If remaining DGN vessels continue to fish under Federal limited entry permits after state permits are revoked participation in the fishery may be comparable to current levels and would be neutral with regard to the effects of the action alternatives. Once DSBG is authorized under HMS FMP Amendment 6, this may provide an alternative source of swordfish landings (although not other marketable species landed by the DGN fishery). As noted above, landings data from DSBG fishing under EFPs suggest that using DSBG may not fully offset for foregone DGN ex-vessel revenue during closure periods.

2.3 Protected Species

2.3.1 Status/Affected Environment

2.3.1.1 Incidental Take in the DGN Fishery

Protected species refer to those species for which any form of exploitation is generally prohibited pursuant to applicable law, principally the ESA and the MMPA. Some level of "incidental take" may be authorized under these statutes, with "take" defined broadly to cover a wide range of interactions resulting from a particular activity.

Pursuant to the ESA, NMFS undertakes a consultation process (generally, for marine species, with the U.S. Fish and Wildlife having authority over all other species) under which a biological opinion (BO) is drafted and a determination is made in an accompanying incidental take statement (ITS), which may impose mitigation measures on an activity such that it is not likely to "jeopardize the continued existence of" a subject species. This process obviates the need to issue an incidental take permit pursuant to section 10(a)(1)(b) of the Act; instead, section 7 applies. The most recent BO and ITS for the DGN fishery was completed in 2013 (NMFS 2013).

The MMPA establishes a general prohibition on the take of any marine mammal (note that the MMPA take definition is somewhat different from the ESA definition). An exemption may be granted if the activity meets certain standards pursuant to MMPA Section 101. To do so, NMFS must reach a negligible impact determination by evaluating various factors. Most recently, NMFS announced a negligible impact determination for the DGN fishery on May 10, 2022, and issuance of a permit to authorize the incidental, but not intentional, take of specific ESA-listed marine mammal species or stocks under the MMPA.

The MMPA mandates that each commercial fishery be classified by the level of mortality and serious injury of marine mammals occurring incidental to each fishery. The List of Fisheries classifies U.S. commercial fisheries into one of three categories according to the level of incidental mortality or serious injury of marine mammals. Commercial fishing vessels that operate in a Category I or II fishery must obtain a marine mammal authorization certificate. This certificate legally authorizes incidental take of marine mammals in a commercial fishery. The DGN fishery is currently a Category II fishery, meaning that the fishery results in the occasional incidental death or serious injury of marine mammals.

NMFS annually publishes marine mammal stock assessment reports by region. The latest, report for the Pacific region was published in 2022 (Carretta*, et al.* 2022). The report describes the biology, distribution, and status for each evaluated stock. The report may be consulted for details on the stocks relevant to the proposed action.

A take reduction plan must be prepared for Category I and II fisheries to help recover and prevent the depletion of strategic marine mammal stocks. Strategic stocks are those: 1) listed under the ESA, 2) declining and likely to be ESA listed, 3) listed as depleted under the MMPA, or 4) experiencing direct human-caused mortality that exceeds the stock's Potential Biological Removal (PBR) level. PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. The Pacific Offshore Take Reduction Team was established in 1996 to draft a plan to address incidental serious injury and mortality of Baird's beaked whales, Cuvier's beaked whales, Mesoplodont species of beaked whales, short-finned pilot whales, pygmy sperm whales, sperm whales, and humpback whales in the DGN fishery. The plan was published in the Federal Register in 1997 (62 FR 51805). The Take Reduction Team has met periodically, most recently in 2015, to develop recommendations about mitigating impacts to marine mammals from the DGN fishery.

As noted above, since 2017 NMFS has been annually publishing model-based estimates of annual bycatch of protected species in the DGN fishery (Carretta 2021) based on observed takes. The report presents estimates for the 31 protected species or species groups taken in the fishery since 1990.

Table 2-13 combines information from Carretta (2021) and the estimated population parameters from the 2021 Pacific Marine Mammal Stock Assessment Report. As noted above, Carretta reports bycatch estimates for all observed takes since 1990. The table extracts summary totals for the recent years, 2015-2019. The HPPS are highlighted in the table and those species/stocks that are ESA listed or designated as strategic under the MMPA are shown in italic. Since the proposed action would potentially affect the take of HPPS, this EA focuses on those species/stocks.

The MMPA, as amended, includes a requirement that the level of incidental mortality and serious injury of marine mammals be reduced to insignificant levels approaching a zero rate, which is the basis for defining the Zero Mortality Rate Goal (ZMRG) (69 FR 23477). The ZMRG threshold is defined as 10 percent of PBR. For its 2015 final action, the Council used marine mammal stocks exceeding ZMRG as one criterion for designating HPPS. At that time, estimated total human-caused mortality / serious injury (M&SI) of common bottlenose dolphin exceeded the threshold and was included in the list of HPPS subject to hard caps. However, according to bycatch estimates and the 2021 draft Pacific Marine Mammal Stock Assessments, ZMRG is not currently exceeded for this stock. Of those marine mammal stocks observed taken in the DGN fishery, the only one for which ZMRG is currently exceeded is the California/Oregon/Washington sperm whale stock, which is a HPPS.

When interpreting the values in Table 2-13 it is important to note that Carretta's bycatch estimates represent 5-year totals while total fishery injury estimates from the SARs are annual values.

Table 2-13. Protected species 2015-2019 total estimated bycatch and M/SI (Carretta 2021) and population parameters (SARs).

Species	Estimated Bycatch	CV of Estimated Bycatch	MSI	CV of MSI	N est	CV N est	PBR	Total Injury	Fishery Injury	Population Estimates Last Revised
Baird's beaked whale	0	–	0	–	1,363	0.53	8.9	≥0.2	0	2021
Common bottlenose dolphin	0	–	0	–	3,477	0.696	20.0	≥0.8	≥0.8	2021
California Sea Lion	58.7	0.69	57.7	0.35	257,606	n/a	14,011.0	≥321	≥197	2018
Cuvier’s beaked whale	0.5	1.5	0.5	1.5	3,274	0.67	21.0	<0.1	<0.1	2017
Dall’s porpoise	3.7	1.3	3.7	1.3	16,498	0.61	99.0	≥0.66	≥0.66	2021
Fin whale	0	–	0	–	11,065	0.405	80.0		≥ 2.2	2021
Gray whale	1.9	1.4	1.9	1.4	26,960	0.05	801.0	131	9.3	2020
Hubb's beaked whale	0.1	2.4	0.1	2.4						
Humpback whale	0.3	3.3	0.1	4.2	4,973	0.05	28.7	≥ 48.6	≥ 25.2	2021
Killer whale	0	–	0	–	300	0.1	2.8	0	0	2018
Long-beaked common dolphin	9	0.76	9	0.76	83,379	0.216	668.0	≥29.7	≥26.5	2021
Minke whale	0.9	1.5	0.4	1.7	915	0.792	4.1	≥ 0.59	≥ 0.59	2021
Northern elephant seal	16.8	0.62	16.8	0.62	187,386	n/a	5,122.0	5.3	5.3	2021
Pacific white sided dolphin	3	2	3	2	34,999	0.222	279.0	7	4	2021
Pygmy sperm whale	0	–	0	–	4,111	1.12	19.2	0	0	2016
Northern right whale dolphin	35.6	0.7	35.6	0.7	29,285	0.72	163.0	≥6.6	≥6.6	2021
Risso’s dolphin	7.4	1.6	7.4	1.6	6,336	0.32	46.0	≥3.7	≥3.7	2016
Short-beaked common dolphin	136.2	0.43	136.2	0	1,056,308	0.21	8,889.0	≥30.5	≥30.5	2021
Short-finned pilot whale	1.2	0.68	1.2	0.68	836	0.79	4.5	1.2	1.2	2016
Sperm whale	2.7	2.4	1.9	1.7	1,997	0.57	2.5	0.6	0.64	2019
Stejneger’s beaked whale	0	–	0	–						
Steller sea lion*	0.2	3.8	0.2	3.8	54,267		326	247	35†	2018
Striped dolphin	0	–	0	–	29,988	0.3	225.0	≥4.0	≥4.0	2021
Green turtle	0.1	4.9	0.1	4.9						
Leatherback sea turtle	2	1	1.3	0.93						
Loggerhead sea turtle	2.4	1.9	0.6	1.5						
Olive ridley sea turtle	0.8	1.6	0	–						

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Species	Estimated Bycatch	CV of Estimated Bycatch	MSI	CV of MSI	N est	CV N est	PBR	Total Injury	Fishery Injury	Population Estimates Last Revised
All beaked whales	0.7	1.5	0.6	1.4						
Mesoplodon	0.1	1.9	0.1	1.9						
Unidentified Ziphid	0.1	8	0.1	8						
Unidentified cormorant	0.1	6	0.1	6						
Northern fulmar	8.7	0.88	1.2	0.64						

*From 2019 Alaska Marine Mammal Stock Assessment Report
†Native subsistence mortality reported separately at 204 animals
Highlight: HPPS subject to caps under the proposed action
Italic: ESA-listed and/or MMPA strategic stock

Table 2-14 excerpts the expected level of take for subject ESA-listed species from the ITS for the 2013 biological opinion. The biological opinion concluded that this level of anticipated take is not likely to jeopardize the continued existence of the subject species. ("Jeopardy" is the standard derived from the ESA when determining whether take that is incidental to the proposed action should be considered a prohibited taking.) In support of the no jeopardy finding the ITS describes non-discretionary terms and conditions implementing specified reasonable and prudent measures. It also describes discretionary conservation recommendations to further the purposes of the ESA. Generally, re-initiation of an ESA consultation for the subject activities is premised on four criteria, the first of which is that the amount and extent of incidental take described in the ITS has been exceeded. To date, the criteria for re-imitation have not been met for the DGN fishery.

Estimated annual average bycatch or M&SI, 2015-2019, summarized in Table 2-13, can be compared to PBR and/or estimate annual take from the ITS (Table 2-14) for an assessment of current baseline effects of the DGN fishery on protected species. (Since the bycatch values in Table 2-13 are five-year totals, they should be divided by five to produce an annual estimate for comparison to PBR.) For marine mammals the ratio of M&SI to PBR exceeds 1 percent for five stocks: minke whale (2 percent), northern right whale dolphin (4.4 percent), Risso's dolphin (3.2 percent), short-finned pilot whale (5.3 percent), and sperm whale (15.2 percent). The last two stocks are HPPS and the MS&I estimate exceeds the ZMRG threshold for sperm whale. Note that the 1 percent threshold used here is not derived from statute but is simply a way to flag those stocks where MS&I has had the most impact.

None of the 2015-2019 MS&I estimates exceed the level of expected mortalities during a 5-year period identified in the ITS (see Table 2-14).

Table 2-14. Amount and extent of take expected in the DGN fishery as presented in the 2013 biological opinion ITS. (Table 12 and 13 in NMFS 2013)

Species	Annual take	5-year take total	Expected mortalities* during 5-year period	Observed take during 5-year period
Fin whale	Up to 1	Up to 2	Up to 1	1
Humpback whale	Up to 2	Up to 4	Up to 2	1
Sperm whale	Up to 2	Up to 8	Up to 6	Up to 2
Leatherback sea turtle	Up to 3	Up to 10	Up to 7	Up to 2
Loggerhead sea turtle	Up to 3	Up to 7	Up to 4	Up to 2
Olive ridley sea turtle	Up to 1	Up to 2	Up to 1	1
Green sea turtle	Up to 1	Up to 2	Up to 1	1

*Expected mortalities includes animals that may be determined to have experienced either serious injury or mortality as a result of interaction with the fishing gear.

The 2017 EA exhaustively details information on the biology, distribution, and population status of protected species occurring in the action area including the HPPS subject to the proposed action. More recent information on marine mammals may be found in Pacific marine mammal stock assessment reports. Additional information on ESA-listed stocks affected by the DGN fishery may be found in the 2013 biological opinion. The Draft Environmental Impact Statement for West Coast Highly Migratory Species Fisheries: Authorization of Deep-set Buoy Gear (NMFS 2021) is another more recent source describing some of the protected species affected by this proposed action. Those sources may be consulted for detailed information, which is not repeated here, except for brief summaries of the distribution and status of HPPS. The 2017 EA concluded that the 2015 preferred alternative would have minor beneficial effects to protected species. However, these effects were unquantified for protected species other than the HPPS subject to hard caps. Because of its similarity to the 2015 proposed action, the current proposed action is expected to have similar effects on protected species taken in the DGN fishery.

2.3.1.2 High Priority Protected Species Status

Information on the biology and status of HPPS is incorporated by reference and summarized here from U.S. Pacific marine mammal stock assessment reports (SARs) (most recent: Carretta*, et al.* 2022) and for sea turtles in recovery plans prepared and related reviews conducted by NMFS (available online at https://www.fisheries.noaa.gov/species-directory/threatened-endangered). Relevant population parameters for marine mammal stocks are found in Table 2-13 and not repeated here.

Fin Whale (California/Oregon/Washington stock). This species is listed as endangered under the ESA and depleted under the MMPA. Population structure is uncertain and no DPSs have been defined pursuant to the ESA. The proposed action would affect the California/Oregon/Washington stock, one of three Pacific stocks defined under the MMPA. It is a segment of a larger Eastern North Pacific population. Fin whales occur in the Southern California Bight year-round but may range to Central California and Baja California seasonally. The best-estimate of population abundance is 11,065 animals, yielding a minimum population estimate of 7,970. There is strong evidence that stock abundance is increasing with estimated annual rates of increase averaging 7.5 percent, 1991-2014. One entanglement in the DGN fishery has been observed and Carretta (2021) estimated no entanglements the most recent five-year period (2015-2019). Three serious injuries for this fin whale stock from unidentified fisheries were documented during this period. Vessel strikes are a larger source of human-caused mortality for this stock (seven in the recent in the recent five-year period). (Sources: Carretta*, et al.* 2022, pp. 194-201; NMFS 2010)

Humpback Whale (California/Oregon/Washington stock). Because the Central America DPS is listed as endangered and the Mexico DPS is listed as threatened under the ESA, the stock is classified as strategic and depleted under the MMPA (Carretta*, et al.* 2022).The stock includes two separate feeding groups: a California and Oregon feeding group of whales that belong to the Central America and Mexico DPSs defined under the ESA, and a northern Washington and southern British Columbia feeding group that primarily includes whales from the Mexico DPS but also includes a small number of whales from the Hawaii and Central America DPSs (Barlow*, et al.* 2011; Calambokidis*, et al.* 2008; Wade*, et al.* 2016). The best estimate of current population abundance (2014-2018) is 4,793 animals with a minimum population estimate of 4,776. The population is estimated to have increased 8.2 percent annually since the late 1980s. Fishery M/SI is estimated for a variety of fisheries including the DGN fishery. Various pot fisheries account for the largest share of fishery M/SI although unidentified sources of entanglement account for approximately 15 percent of cases. Vessel strikes are the principal source of non-fishery M/SI with entanglement in various recreational and tribal fisheries and marine debris as other sources. (Source: Carretta*, et al.* 2022, pp. 176-185)

Sperm Whale (California/Oregon/Washington stock). Sperm whales are ESA listed as endangered and depleted under the MMPA throughout its range. The California/Oregon/Washington sperm whale stock is one of three Pacific stocks defined under the MMPA. They are found year-round off California and seasonally spring to fall off Oregon and Washington. The best estimate of sperm whale abundance in the California Current is 1,997 animals resulting in a minimum population estimate of 1,270 animals. Population abundance appears stable although there a high level of uncertainty around population growth trends. The DGN fishery has accounted for most fishery M/SI with a mean annual rate of 0.4 animals, 2013-2017. The other main source of fishery M/SI is the WA/OR/CA groundfish, bottomfish longline/setline fishery (0.24 M/SI per annum). Sperm whales are known to depredate longline sablefish in the Gulf of Alaska, sometimes resulting in entanglement; this may be another source of fishery M/SI for animals from the California/Oregon/Washington that venture into those waters. Ship strikes are likely the main source of non-fishery M/SI but are poorly documented. (Source: Carretta*, et al.* 2022, pp. 151-

157)

Leatherback Sea Turtle. This species is listed as endangered under the ESA throughout its global range (NMFS 2020). Leatherbacks found off the U.S. West Coast are from the Western Pacific nesting populations. Tracking data from leatherbacks nesting on Western Pacific beaches or foraging off California indicate some leatherbacks will move into U.S. coastal waters as early as the spring, often coming directly from foraging areas in the eastern equatorial Pacific (Benson*, et al.* 2011). Three main areas of foraging have been documented on the U.S. West Coast: in California over the coastal shelf in waters of 14 to 16° C, particularly off of central California; along the continental shelf and slope off of Oregon and Washington, particularly off the Columbia River plume; and offshore of central and northern California at sea surface temperature fronts in deep offshore areas, although this area was not regularly used (Benson*, et al.* 2011). Researchers estimated an average of 178 leatherbacks (CV=0.15) were present between the coast and roughly the 50-fathom isobath off California. Abundance over the study period was variable between years, ranging from an estimated 20 to 366 leatherbacks (Benson*, et al.* 2007). A 2020 five-year review found that all leatherback DPSs met the definition of high risk of extinction, per NMFS' Listing Guidance, as a result of reduced nesting female abundance, declining nest trends, and numerous severe threats (NMFS 2020). As discussed elsewhere in this document, the DGN fishery is subject to a large time/area closure (the PLCA) intended to mitigate takes of leatherback sea turtles. No takes have been observed in the fishery since its implementation.

Loggerhead Sea Turtle. Nine loggerhead DPSs are identified pursuant to the ESA (76 FR 58867). Loggerhead sea turtles in the proposed action area are considered part of the North Pacific Ocean DPS, which is listed as endangered. The North Pacific loggerhead DPS nests entirely in Japan (NMFS and USFWS 2020). Kamezaki, et al. (2003) concluded a substantial decline (50 to 90 percent) in the size of the annual loggerhead nesting population in Japan since the 1950s. Since the 1990s annual counts have varied. According to the 2020 five-year review of the recovery plan (NMFS and USFWS 2020) females estimated to nest annually (FENA) for this DPS had increased over the preceding 14 years. But based on estimates from Martin, et al. (2020) the recovery plan criterion of an average six-year FENA of at least 5,000 has not been met. Main threats to the DPS are fishery-related mortality (including entanglement in discarded gear) and ingestion of plastic marine debris. At the same time, foraging populations have shown statistically significant increases in several regions although there is insufficient information to determine whether this recovery plan criterion had been met. Juvenile loggerheads forage along the coast of Southern California during El Niño conditions with occasional high abundance (Eguchi*, et al.* 2018). The DGN fishery is subject to a time/area closure tied to El Niño conditions to mitigate bycatch.

Olive Ridley Sea Turtle. This species has a circumtropical distribution with occasional appearances at more northerly latitudes (NMFS and USFWS 2014). DPSs for this species have not been designated; the breeding populations on the Pacific coast of Mexico are listed as endangered—all other olive ridleys are listed as threatened. This species spends most of its non-breeding life cycle in the oceanic zone; uniquely, members of the Eastern Pacific population are nomadic migrants over vast oceanic areas. The 2014 five-year review (NMFS and USFWS 2014) concluded that FENA is overall stable and at-sea abundance estimates appear to support an overall increase in the breeding colony populations on the Pacific coast of Mexico. Coastal development in Mexico is likely adversely affecting nesting habitat for this population. Egg depredation and hunting have historically affected the population along with incidental capture in a variety of fisheries.

Green Sea Turtle. Green turtles are distributed globally and under the ESA 11 DPSs are identified (81 FR 20057). The East Pacific DPS is most likely to interact with the DGN fishery; its range extends from the California/Oregon border to central Chile and west to a line outside the U.S. West Coast EEZ. This DPS is listed as threatened under the ESA. Nesting is widely dispersed in Mexico and Central and South America with two concentrations in Michoacán, Mexico, and the Galapagos Islands, Ecuador. Of these two sites, sufficient information to estimate nesting trends is only available from the Colola, Michoacán, Mexico, site (Seminoff, *et al.* 2015). The number of nesting females has been increasing and the status review (Seminoff, *et al.* 2015) population viability analysis suggests continued increase in the population with a 4.9 percent probability that this population will fall below the trend reference point (50 percent decline) at the end of 100 years. Threats to the DPS include limited depredation at the primary nesting sites, coastal development at secondary nesting sites, continuing egg harvest at unprotected nesting beaches, illegal hunting in northwest Mexico, and incidental capture in commercial and artisanal fisheries, principally gillnet fisheries in Peru.

Short-finned Pilot Whale (CA/OR/WA stock). Two genetically and morphologically distinct populations are described in the Pacific with the “Shiho-type” found in the California Current. Sightings have been rare in the west coast EEZ since the 1982-83 El Niño event. Abundance in the west coast EEZ is variable, because of movement related to oceanographic conditions. The most recent stock abundance estimate is 836 animals yielding a minimum population estimate of 466. The DGN fishery is the primary source of fishery M/SI although bycatch has been rarely observed. Elevated bycatch is correlated with warm water years associated with El Niño events. Short-finned pilot whale is not listed under the ESA although overall population status is unknown. (Source: Carretta, *et al.* 2022, pp. 125-128)

Common Bottlenose Dolphin (California/Oregon/Washington offshore stock). This species is distributed globally in tropical and warm-temperate waters. As off California, separate coastal and offshore stocks occur in many regions. The California coastal stock is found within 500 m of the shoreline 99 percent of the time, so it is the offshore stock that is most likely to interact with the DGN fishery. The best estimate of abundance is 3,477 animals, yielding a minimum population estimate of 2,048. No apparent trend in abundance based on line-transect surveys has been detected. The limited entry fixed gear fishery is estimated to be the largest contributor to fishery M/SI followed by the DGN fishery. The status of the population as a whole is unknown, but this species is not listed under the ESA. (Source: Carretta, *et al.* 2022, pp. 94-97)

2.3.2 Environmental Consequences

To evaluate impacts to HPPS the mean values of bootstrap simulations are used. These outputs are fractional values, which may not be easy to interpret. These can be converted to ratio values expressing how many fishing seasons it would take for one take (or mortality/injury) to occur. This is comparable to the way in which levels documented in the BO ITS are presented, as shown in Table 2-14. For example, for humpback whale the ITS has a level of up to two takes in a five-year period, which is expressed fractionally as 0.4 while for sperm whale the level is up to six takes in a five-year period, or 1.2. In addition to presenting tables showing mean values across the alternatives and participation scenarios, frequency distributions are presented in tabular format. These tables show the values graphically represented by histograms as in Figure 2-10. The input data for the bootstrap simulation is for the period 2001-2002 to 2020-2021 seasons, when the only HPPS observed taken were bottlenose dolphin, humpback whale, sperm whale, and shortfin pilot whale. This is reflected in the outputs of the bootstrap simulation.

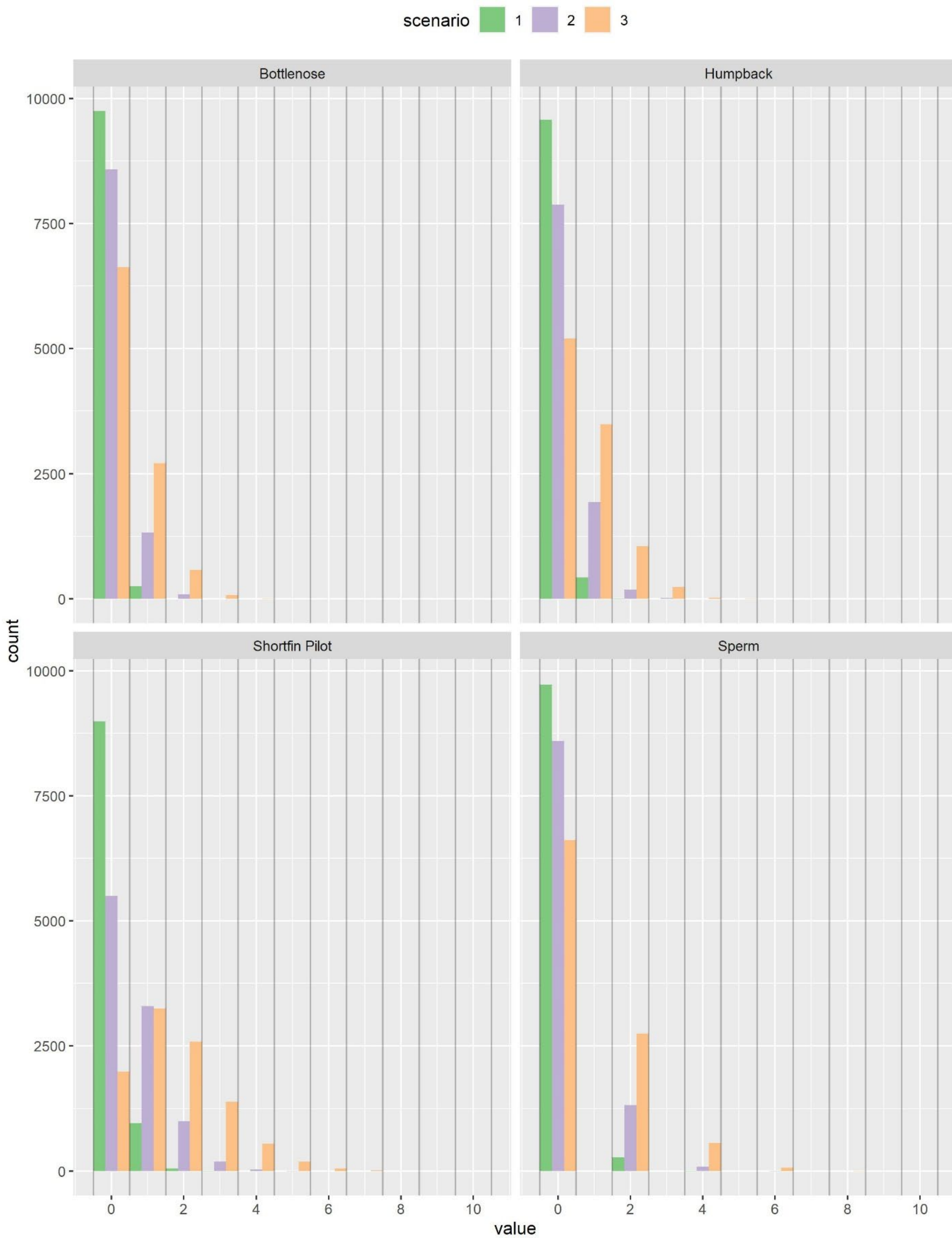

Figure 2-10. Histograms showing the distribution of HPPS M/I under Alternative 1, No Action, for the three participation scenarios.

Alternative 1 – The No Action Alternative

Table 2-15 displays a summary of the bootstrap simulation estimates for the frequency of HPPS mortality/injury in a fishing season. (Note that the bootstrap model simulates all mortality/injury, not just the observed amount.) Note that the bootstrap model relies on observer data; extremely rare take events may never have been observed and thus do not appear in the data from which the bootstrap model samples. For that reason, although mortality/injury is estimated by the model only for humpback whale, sperm whale, shortfin pilot whale, and bottlenose dolphin, take of other HPPS may occur in the future under No Action. As summarized in Section 2.3.1.1, protected species other than the HPPS are also taken in the DGN fishery. Mortality/injury or take levels for HPPS and other protected species under the No Action Alternative would depend on the level of fishing effort, driven mainly by the participation level. Participation within the range of Scenarios 1 and 2 is likely the closest approximation of future baseline conditions.

Table 2-15. Mean values of bootstrap results for HPPS mortality/injury in a fishing season under Alternative 1, No Action for the three fishery participation scenarios.

Mean value of mortality/serious injury expressed fractionally			
	Scenario 1	Scenario 2	Scenario 3
Fin Whale	0.000	0.000	0.000
Humpback	0.043	0.234	0.640
Sperm Whale	0.055	0.299	0.821
Leatherback	0.000	0.000	0.000
Loggerhead	0.000	0.000	0.000
Olive Ridley	0.000	0.000	0.000
Green Turtle	0.000	0.000	0.000
SF Pilot Whale	0.107	0.596	1.609
Bottlenose	0.026	0.151	0.414

Statutory thresholds under the ESA and MMPA are described above. The last BO identified expected levels of take in the DGN fishery; exceeding these levels would trigger re initiation of consultation under ESA section 7 likely resulting in the identification of nondiscretionary actions that would have to be taken to mitigate such take. Those levels are expressed on an annual and fice-year basis.

The model results shown in Table 2-15 indicate that the threshold for humpback whale, two takes in five years, would be exceeded under participation Scenario 3 (30 vessels). For sperm whale, the threshold, six takes in five years, is not exceeded. With respect to thresholds pursuant to the MMPA, as stated in Section 2.3.1.1, of those marine mammal stocks observed taken in the DGN fishery, the only one for which ZMRG is currently exceeded is the California/Oregon/Washington sperm whale stock, which is a HPPS. Take in the DGN fishery contributes to total fishery mortality/serious injury as assessed against the ZMRG threshold. The 2021 SARs (Carretta*, et al.* 2022) summarized in Table 2-13 estimates shortfin pilot whale PBR at 4.5 and total fishery injury at 1.2. These results are consistent with the fishery injury estimate and below PBR, noting that the DGN fishery has not seen participation levels comparable to Scenario 3 (30 vessels) in recent years. Likewise, for common bottlenose dolphin PBR is estimated at 20 and fishery injury at ≥0.8 and the estimates across all scenarios are below those values.

Table 2-16 shows the frequency distribution of M/I for the four species where takes occurred in the source data as a percent of the total number of simulations (10,000). As discussed above, these values can also be converted to the number of fishing seasons in which would take would occur on average by taking the reciprocal of the fractions (expressed as percent). For example, a once in five years event would accord to a value of 20 percent. In those terms under Scenario 2 (11 vessels) one shortfin pilot whale M/I would occur more than once in five years. Under Scenario 3 (30 vessels) one or more M/I events at this frequency would occur for all species.

Table 2-16. Frequency distribution of HPPS M/I from bootstrap simulation replicates as a percentage of total replicates (10,000) for Alternative 1.

	Scenario 1				Scenario 2				Scenario 3			
M/I per season	**Humpback**	**Sperm**	**Bottlenose**	**Shortfin Pilot**	**Humpback**	**Sperm**	**Bottlenose**	**Shortfin Pilot**	**Humpback**	**Sperm**	**Bottlenose**	**Shortfin Pilot**
0	95.71%	97.27%	97.46%	89.88%	78.72%	85.96%	85.83%	54.98%	52.03%	66.15%	66.22%	19.84%
1	4.26%	0.00%	2.53%	9.60%	19.34%	0.00%	13.26%	32.93%	34.89%	0.00%	27.13%	32.47%
2	0.03%	2.71%	0.01%	0.50%	1.81%	13.15%	0.89%	9.92%	10.47%	27.50%	5.80%	25.89%
3	0.00%	0.00%	0.00%	0.02%	0.13%	0.00%	0.02%	1.89%	2.33%	0.00%	0.78%	13.83%
4	0.00%	0.02%	0.00%	0.00%	0.00%	0.86%	0.00%	0.26%	0.23%	5.59%	0.05%	5.45%
5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.05%	0.00%	0.02%	1.89%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%	0.69%	0.00%	0.48%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	0.01%

Alternative 2 – Rolling Two-Year Fishery Closure

Alternative 2 would have a modest beneficial impact on protected species by reducing mortality/injury from estimated baseline levels. Table 2-17 shows mean values for the frequency of HPPS mortality/injury under this alternative estimated by the bootstrap model. The lower panel shows the reduction in these mean values from No Action in percentage terms. Table 2-18 shows the frequency distribution of the number of M/I events across the 10,000 bootstrap simulation replicates for the HPPS in percent terms. The lower panel shows the percent change in the frequency from No Action for each interval.

Considering participation Scenarios 1 (2 vessels) and 2 (11 vessels), the most likely range for future participation in the DGN fishery, the reduction in M/I frequency would be negligible to modest, mainly because at this low level of fishing effort M/I events for these species occur rarely. For example, under these scenarios the percent increase in seasons with no M/I events over 10,000 seasons (bootstrap replicates) ranges from 0.01 percent to 2.5 percent depending on species and scenario. The increase in zero M/I event seasons is greater under Scenario 3 (30 vessels), ranging from 3.1 percent to 10.7 percent.

Table 2-17. Bootstrap simulation mean value of HPPS mortality/injury in a fishing season under Alternative 2. The lower panel shows the percent reduction from No Action for the four species where M/I occurs.

Mean value of mortality/serious injury expressed fractionally			
	Scenario 1	**Scenario 2**	**Scenario 3**
Fin Whale	0.000	0.000	0.000
Humpback	0.043	0.216	0.520
Sperm Whale	0.055	0.288	0.737
Leatherback	0.000	0.000	0.000
Loggerhead	0.000	0.000	0.000
Olive Ridley	0.000	0.000	0.000
Green Turtle	0.000	0.000	0.000
SF Pilot Whale	0.105	0.561	1.362
Bottlenose	0.025	0.146	0.376
Percent reduction from No Action			
Humpback	-1.16%	-7.54%	-18.77%
Sperm Whale	-0.73%	-3.68%	-10.21%
Shortfin Pilot Whale	-1.69%	-5.82%	-15.38%
Bottlenose Dolphin	-0.39%	-3.64%	-9.19%

The beneficial effect of Alternative 2 in terms of reducing HPPS mortality/injury is likely to be evident only at higher levels of fishing effort (reflected in participation Scenario 3). Since DGN fishery participation has been low in recent years and is unlikely to substantially increase, the benefits of Alternative 2 may be difficult to detect.

Although only HPPS would trigger hard cap closures, Alternative 2 is likely to have a modest beneficial impact on other protected species, because of the aggregate reduction in fishing effort over the long term, which would reduce the overall likelihood of takes occurring. Such reductions may be comparable to those estimated for HPPS M/I although differences in the behavior, distribution, and abundance of other protected species suggest that this would be weakly correlated. Many other environmental factors are likely to influence protected species take. Thus, at lower levels of fishing effort any effects of the

Alternative 2 action could be undetectable from these other environmental drivers.

The possibility of fishers changing behavior to mitigate the severe adverse economic impacts of a fishery closure under Alternative 2 is discussed in Section 2.2.2.1. This could have a further beneficial impact by an unquantified incremental reduction in protected species takes. However, as discussed above, information limitations and the incentive structure of fleetwide closures make it unlikely that such behavioral changes would occur under this alternative.

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Table 2-18. Frequency distribution of HPPS M/I from bootstrap simulation replicates for Alternative 2, showing reductions in frequency of M/I by number per season intervals, in percentage terms.

	Scenario 1				Scenario 2				Scenario 3			
M/I per season	Humpback	Sperm	Bottlenose	Shortfin Pilot	Humpback	Sperm	Bottlenose	Shortfin Pilot	Humpback	Sperm	Bottlenose	Shortfin Pilot
0	95.76%	97.29%	97.47%	90.05%	80.34%	86.48%	86.34%	57.41%	61.17%	69.66%	69.35%	30.57%
1	4.21%	0.00%	2.52%	9.44%	17.85%	0.00%	12.79%	31.36%	28.13%	0.00%	24.63%	29.64%
2	0.03%	2.69%	0.01%	0.49%	1.69%	12.66%	0.85%	9.20%	8.53%	24.57%	5.20%	22.05%
3	0.00%	0.00%	0.00%	0.02%	0.12%	0.00%	0.02%	1.78%	1.93%	0.00%	0.76%	11.21%
4	0.00%	0.02%	0.00%	0.00%	0.00%	0.83%	0.00%	0.24%	0.20%	5.10%	0.04%	4.48%
5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.04%	0.00%	0.02%	1.55%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%	0.61%	0.00%	0.37%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.12%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.00%	0.01%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Percent change in the frequency of M/I events by M/I per season interval												
0	0.05%	0.02%	0.01%	0.17%	1.62%	0.52%	0.51%	2.43%	9.14%	3.51%	3.13%	10.73%
1	-0.05%	0.00%	-0.01%	-0.16%	-1.49%	0.00%	-0.47%	-1.57%	-6.76%	0.00%	-2.50%	-2.83%
2	0.00%	-0.02%	0.00%	-0.01%	-0.12%	-0.49%	-0.04%	-0.72%	-1.94%	-2.93%	-0.60%	-3.84%
3	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%	-0.11%	-0.40%	0.00%	-0.02%	-2.62%
4	0.00%	0.00%	0.00%	0.00%	0.00%	-0.03%	0.00%	-0.02%	-0.03%	-0.49%	-0.01%	-0.97%
5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.01%	0.00%	0.00%	-0.34%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.08%	0.00%	-0.11%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.02%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%

Alternative 3 – Inseason Individual Vessel and Fleetwide Closures

Table 2-21 through Table 2-27 shows the bootstrap model outputs for HPPS in a similar format as the tables above (mean values of HPPS M/I and frequency distributions of the simulation replicates in percentage terms) for the Alternative 3 options. Since the bootstrap model did not discern any differences between the two sub options under Option A results are reported in a single table. Table 2-19 below summarizes results across the options by presenting the mean values for participation Scenario 2, which represents the upper bound of the likely level of participation consistent with baseline conditions. Scenario 2 values for Alternative 2 are also shown for comparison. Table 2-20 summarizes the change in the distribution of M/I events by showing the percent increase in the percent of seasons (bootstrap replicates) with zero M/I events. These positive percent values are the inverse of the sum of percent of seasons with one or more M/I event and is another way of representing the beneficial impact of the Alternative 3 options. These percentages are also included in the table for Alternative 2 for comparison.

Table 2-19. Summary comparison of mean values of HPPS M/I for Alternative 3 options under participation scenario 2. Alternative 2 values shown for comparison.

Mean value of mortality/serious injury expressed fractionally					
	Option A	**Option B**	**Option C I**	**Option C II**	**Alternative 2**
Humpback	0.225	0.229	0.228	0.228	0.216
Sperm Whale	0.299	0.299	0.299	0.299	0.288
Shortfin Pilot Whale	0.581	0.590	0.589	0.584	0.561
Bottlenose Dolphin	0.151	0.151	0.151	0.151	0.146
Percent reduction from No Action					
Humpback	-3.77%	-1.93%	-2.48%	-2.40%	-7.54%
Sperm Whale	0.00%	0.00%	0.00%	0.00%	-3.68%
Shortfin Pilot Whale	-2.43%	-1.01%	-1.14%	-1.93%	-5.82%
Bottlenose Dolphin	0.00%	0.00%	0.00%	0.00%	-3.64%

Table 2-20. Percent change in the number of seasons with zero M/I events under participation Scenario 2 for Alternative 3 options.

	Humpback	Sperm	Bottlenose	Shortfin Pilot
Option A	0.78%	0.00%	0.00%	0.86%
Option B	0.38%	0.00%	0.00%	0.30%
Option C I	0.49%	0.00%	0.00%	0.37%
Option C II	0.48%	0.00%	0.00%	0.67%
Alternative 2	1.62%	0.52%	0.51%	2.43%

Because the Alternative 3 options involve inseason closures, they result in smaller reductions in HPPS M/I as estimated by the bootstrap model. The bootstrap model outputs indicate that all of the Alternative 3 options would have no impact on reducing M/I events for sperm whale or bottlenose dolphin. For the other two species, Option A would result in the largest reduction in the mean value of M/I and the largest increase in the percent of seasons with zero M/I events. Following Option A, Option C I shows the largest reduction in humpback whale M/I events while Option C II shows the largest reduction in shortfin pilot whale M/I events. Option B shows the smallest reduction in M/I events for those two species.

Takes of other protected species may be weakly correlated with the reduction in HPPS M/I. At low levels of fishery participation any beneficial impact may be indiscernible. Under participation Scenarios 1 (2 vessels) and 2 (11 vessels) the mean reduction in HPPS M/I ranges from zero (for sperm whale and bottlenose dolphin) to 3.8 percent for humpback whale (Option A) and 2.8 percent for shortfin pilot whale (Option C Sub Option II). As discussed previously, because protected species takes are rare, other environmental drivers may more strongly influence take levels. This could include both the availability and distribution of target species, influencing fishing patterns, and the occurrence of protected species in the area where fishing occurs.

Overall, Alternative 3 would have a modest to negligible beneficial impact in terms in reducing HPPS M/I and other protected species take if future fishery participation is at higher levels. If future participation is comparable to recent baseline levels, Alternative 3 is likely to have a negligible beneficial impact on reducing M/I for HPPS and takes of other protected species.

As noted above, the intent of vessel closures under Alternative 3 is to provide incentives for individual vessel operators to more aggressively engage in bycatch avoidance behavior. Behavioral change is not accounted for in the bootstrap model procedure, because there is not enough information to determine whether any such changes would result in bycatch reduction. If the individual accountability incentive structure implicit in Alternative 3 results in effective bycatch avoidance, the beneficial impacts in terms of bycatch reduction of this alternative would be greater.

The individual vessel closures require both the observed vessel and all unobservable vessels to stop fishing. For unobservable vessels these closures are effectively comparable to a fleetwide closure in that they are not a direct consequence of their behavior. Thus, unobservable vessels would have less incentive to engage in bycatch avoidance behavior.

Table 2-21. Bootstrap simulation mean value of HPPS mortality/injury in a fishing season under Alternative 3 Option A (both sub options). The lower panel shows the percent reduction from No Action for the four species where M/I occurs.

Mean value of mortality/serious injury expressed fractionally			
	Scenario 1	**Scenario 2**	**Scenario 3**
Fin Whale	0.000	0.000	0.000
Humpback	0.043	0.225	**0.577**
Sperm Whale	0.055	0.299	0.821
Leatherback	0.000	0.000	0.000
Loggerhead	0.000	0.000	0.000
Olive Ridley	0.000	0.000	0.000
Green Turtle	0.000	0.000	0.000
SF Pilot Whale	0.106	0.581	1.505
Bottlenose	0.026	0.151	0.414
Percent reduction from No Action			
Humpback	-0.69%	-3.77%	-9.89%
Sperm Whale	0.00%	0.00%	0.00%
Shortfin Pilot Whale	-0.56%	-2.43%	-6.47%
Bottlenose Dolphin	0.00%	0.00%	0.00%

Table 2-22. Bootstrap simulation mean value of HPPS mortality/injury in a fishing season under Alternative 3 Option B. The lower panel shows the percent reduction from No Action for the four species where M/I occurs.

Mean value of mortality/serious injury expressed fractionally			
	Scenario 1	**Scenario 2**	**Scenario 3**
Fin Whale	0.000	0.000	0.000
Humpback	0.043	0.229	0.622
Sperm Whale	0.055	0.299	0.821
Leatherback	0.000	0.000	0.000
Loggerhead	0.000	0.000	0.000
Olive Ridley	0.000	0.000	0.000
Green Turtle	0.000	0.000	0.000
SF Pilot Whale	0.106	0.590	1.579
Bottlenose	0.026	0.151	0.414
Percent reduction from No Action			
Humpback	-0.69%	-1.93%	-2.73%
Sperm Whale	0.00%	0.00%	0.00%
Shortfin Pilot Whale	-0.56%	-1.01%	-1.91%
Bottlenose Dolphin	0.00%	0.00%	0.00%

Table 2-23. Bootstrap simulation mean value of HPPS mortality/injury in a fishing season under Alternative 3 Option C Sub Option I and Sub Option II. The lower panel shows the percent reduction from No Action for the four species where M/I occurs.

	Alternative 3 Option C I			Alternative 3 Option C II		
	Scenario 1	**Scenario 2**	**Scenario 3**	**Scenario 1**	**Scenario 2**	**Scenario 3**
Fin Whale	0.000	0.000	0.000	0.000	0.000	0.000
Humpback	0.043	0.228	0.622	0.043	0.228	0.624
Sperm Whale	0.055	0.299	0.821	0.055	0.299	0.821
Leatherback	0.000	0.000	0.000	0.000	0.000	0.000
Loggerhead	0.000	0.000	0.000	0.000	0.000	0.000
Olive Ridley	0.000	0.000	0.000	0.000	0.000	0.000
Green Turtle	0.000	0.000	0.000	0.000	0.000	0.000
SF Pilot Whale	0.106	0.589	1.578	0.106	0.584	1.565
Bottlenose	0.026	0.151	0.414	0.026	0.151	0.414
Percent reduction from No Action						
Humpback	-0.69%	-2.48%	-2.78%	-0.69%	-2.40%	-2.56%
Sperm Whale	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Shortfin Pilot Whale	-0.56%	-1.14%	-1.93%	-0.75%	-1.93%	-2.76%
Bottlenose Dolphin	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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Table 2-24. Frequency distribution of HPPS M/I from bootstrap simulation replicates for Alternative 3 Option A (both sub options), showing change in frequency of M/I by number per season intervals, in percentage terms.

	Scenario 1				Scenario 2				Scenario 3			
M/I per season	Humpback	Sperm	Bottlenose	Shortfin Pilot	Humpback	Sperm	Bottlenose	Shortfin Pilot	Humpback	Sperm	Bottlenose	Shortfin Pilot
0	95.74%	97.27%	97.46%	89.93%	79.50%	85.96%	85.83%	55.84%	56.83%	66.15%	66.22%	23.33%
1	4.23%	0.00%	2.53%	9.56%	18.65%	0.00%	13.26%	32.55%	31.38%	0.00%	27.13%	32.64%
2	0.03%	2.71%	0.01%	0.49%	1.73%	13.15%	0.89%	9.52%	9.40%	27.50%	5.80%	24.32%
3	0.00%	0.00%	0.00%	0.02%	0.12%	0.00%	0.02%	1.83%	2.13%	0.00%	0.78%	12.56%
4	0.00%	0.02%	0.00%	0.00%	0.00%	0.86%	0.00%	0.25%	0.21%	5.59%	0.05%	4.92%
5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.05%	0.00%	0.02%	1.65%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%	0.69%	0.00%	0.44%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	0.01%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Percent change of frequency of M/I events by M/I per season interval												
0	0.03%	0.00%	0.00%	0.05%	0.78%	0.00%	0.00%	0.86%	4.80%	0.00%	0.00%	3.49%
1	-0.03%	0.00%	0.00%	-0.04%	-0.69%	0.00%	0.00%	-0.38%	-3.51%	0.00%	0.00%	0.17%
2	0.00%	0.00%	0.00%	-0.01%	-0.08%	0.00%	0.00%	-0.40%	-1.07%	0.00%	0.00%	-1.57%
3	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%	-0.06%	-0.20%	0.00%	0.00%	-1.27%
4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.02%	0.00%	0.00%	-0.53%
5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%	0.00%	-0.24%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.04%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 2-25. Frequency distribution of HPPS M/I from bootstrap simulation replicates for Alternative 3 Option B, showing change in frequency of M/I by number per season intervals.

	Scenario 1				Scenario 2				Scenario 3			
M/I per season	Humpback	Sperm	Bottlenose	Shortfin Pilot	Humpback	Sperm	Bottlenose	Shortfin Pilot	Humpback	Sperm	Bottlenose	Shortfin Pilot
0	95.74%	97.27%	97.46%	89.93%	79.10%	85.96%	85.83%	55.28%	53.10%	66.15%	66.22%	20.61%
1	4.23%	0.00%	2.53%	9.56%	19.02%	0.00%	13.26%	32.87%	34.35%	0.00%	27.13%	32.77%
2	0.03%	2.71%	0.01%	0.49%	1.76%	13.15%	0.89%	9.72%	10.07%	27.50%	5.80%	25.54%
3	0.00%	0.00%	0.00%	0.02%	0.12%	0.00%	0.02%	1.86%	2.22%	0.00%	0.78%	13.47%
4	0.00%	0.02%	0.00%	0.00%	0.00%	0.86%	0.00%	0.26%	0.21%	5.59%	0.05%	5.22%
5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.05%	0.00%	0.02%	1.78%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%	0.69%	0.00%	0.46%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	0.01%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Percent change in the frequency of M/I events by M/I per season interval												
0	0.03%	0.00%	0.00%	0.05%	0.38%	0.00%	0.00%	0.30%	1.07%	0.00%	0.00%	0.77%
1	-0.03%	0.00%	0.00%	-0.04%	-0.32%	0.00%	0.00%	-0.06%	-0.54%	0.00%	0.00%	0.30%
2	0.00%	0.00%	0.00%	-0.01%	-0.05%	0.00%	0.00%	-0.20%	-0.40%	0.00%	0.00%	-0.35%
3	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%	-0.03%	-0.11%	0.00%	0.00%	-0.36%
4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.02%	0.00%	0.00%	-0.23%
5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%	0.00%	-0.11%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.02%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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Table 2-26. Frequency distribution of HPPS M/I from bootstrap simulation replicates for Alternative 3 Option C I, showing change in frequency of M/I by number per season intervals, in percentage terms.

	Scenario 1				Scenario 2				Scenario 3			
M/I per season	Humpback	Sperm	Bottlenose	Shortfin Pilot	Humpback	Sperm	Bottlenose	Shortfin Pilot	Humpback	Sperm	Bottlenose	Shortfin Pilot
0	95.74%	97.27%	97.46%	89.93%	79.21%	85.96%	85.83%	55.35%	53.12%	66.15%	66.22%	20.58%
1	4.23%	0.00%	2.53%	9.56%	18.93%	0.00%	13.26%	32.81%	34.37%	0.00%	27.13%	32.73%
2	0.03%	2.71%	0.01%	0.49%	1.74%	13.15%	0.89%	9.71%	10.01%	27.50%	5.80%	25.63%
3	0.00%	0.00%	0.00%	0.02%	0.12%	0.00%	0.02%	1.86%	2.23%	0.00%	0.78%	13.50%
4	0.00%	0.02%	0.00%	0.00%	0.00%	0.86%	0.00%	0.26%	0.22%	5.59%	0.05%	5.21%
5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.05%	0.00%	0.02%	1.75%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%	0.69%	0.00%	0.46%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	0.01%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Percent reduction of frequency of M/I by M/I per season interval												
0	0.03%	0.00%	0.00%	0.05%	0.49%	0.00%	0.00%	0.37%	1.09%	0.00%	0.00%	0.74%
1	-0.03%	0.00%	0.00%	-0.04%	-0.41%	0.00%	0.00%	-0.12%	-0.52%	0.00%	0.00%	0.26%
2	0.00%	0.00%	0.00%	-0.01%	-0.07%	0.00%	0.00%	-0.21%	-0.46%	0.00%	0.00%	-0.26%
3	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%	-0.03%	-0.10%	0.00%	0.00%	-0.33%
4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%	-0.24%
5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%	0.00%	-0.14%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.02%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 2-27. Frequency distribution of HPPS M/I from bootstrap simulation replicates for Alternative 3 Option C II, showing change in frequency of M/I by number per season intervals.

	Scenario 1				Scenario 2				Scenario 3			
M/I per season	Humpback	Sperm	Bottlenose	Shortfin Pilot	Humpback	Sperm	Bottlenose	Shortfin Pilot	Humpback	Sperm	Bottlenose	Shortfin Pilot
0	95.74%	97.27%	97.46%	89.95%	79.20%	85.96%	85.83%	55.65%	53.01%	66.15%	66.22%	21.11%
1	4.23%	0.00%	2.53%	9.54%	18.93%	0.00%	13.26%	32.66%	34.45%	0.00%	27.13%	32.75%
2	0.03%	2.71%	0.01%	0.49%	1.75%	13.15%	0.89%	9.57%	10.04%	27.50%	5.80%	25.34%
3	0.00%	0.00%	0.00%	0.02%	0.12%	0.00%	0.02%	1.86%	2.23%	0.00%	0.78%	13.26%
4	0.00%	0.02%	0.00%	0.00%	0.00%	0.86%	0.00%	0.25%	0.22%	5.59%	0.05%	5.18%
5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.05%	0.00%	0.02%	1.76%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.00%	0.69%	0.00%	0.45%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.07%	0.00%	0.01%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Percent reduction of frequency of M/I by M/I per season interval												
0	0.03%	0.00%	0.00%	0.07%	0.48%	0.00%	0.00%	0.67%	0.98%	0.00%	0.00%	1.27%
1	-0.03%	0.00%	0.00%	-0.06%	-0.41%	0.00%	0.00%	-0.27%	-0.44%	0.00%	0.00%	0.28%
2	0.00%	0.00%	0.00%	-0.01%	-0.06%	0.00%	0.00%	-0.35%	-0.43%	0.00%	0.00%	-0.55%
3	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%	-0.03%	-0.10%	0.00%	0.00%	-0.57%
4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.01%	0.00%	0.00%	-0.27%
5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%	0.00%	0.00%	-0.13%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.03%
7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
8	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Cumulative Impacts on Protected Species

The RFFAs identified in Section 2.1.5 would be beneficial in terms of contributing to the direct and indirect effects of the proposed action on protected species. As discussed in Section 2.2.1, under the California transition program state DGN permits are surrendered along with an obligation that program participants will not renew their Federal DGN permit. Those who did not participate in the state program and possess a Federal permit would be able to continue fishing after state permits are revoked. The participation scenarios modeled in the bootstrap simulation encompass the potential range of Federal permit holders who may participate in the DGN fishery in the future.

Implementation of HMS FMP Amendment 6, authorizing DSBG, could contribute to direct and indirect impacts of the proposed action in modest to negligible positive or adverse ways. If DGN fishery participants switch to DGBG during closure periods this could neglibily contribute to protected species bycatch compared to DGN fishery participants not fishing at all during closure periods, recognizing that DSBG is a very low bycatch gear type. On the other hand, if DGN fishery participants use DSBG in preference to other gear types that have higher intrinsic bycatch rates, the availability of DSBG could have modestly beneficial effects in combination with the direct and indirect effects of the proposed action.

2.4 Finfish

2.4.1 Status/Affected Environment

2.4.1.1 DGN Fishery Catch

The 2017 EA identifies swordfish and common thresher shark as target species and further subdivides non-target into major and minor categories using a catch rate of 10 animals per 100 sets to distinguish these two categories. However, the distinction between these categories in a multi-species fishery in which catch composition has changed over time is somewhat arbitrary. For example, swordfish and common thresher shark have typically been designated as the two target species but, as shown in Table 2-2, in the 10 years through 2021 Pacific bluefin tuna has emerged as the third largest fraction of landed catch by weight and second largest measured by ex-vessel revenue. And, as shown in Figure 2-3, in the 2020-21 and 2021-22 fishing seasons it was the largest component of landings.

Table 2-28 shows data on catch and retention rates reported in observer data summaries for fishing seasons 2012-13 through 2020-21, which can be used to categorize catch in a similar fashion. The table ranks species according to catch rate. Using the 10 animals per set catch rate and a retention rate above 50 percent, aside from swordfish and common thresher shark, there are six species that may be considered major retained species: Pacific bluefin tuna, shortfin mako shark, opah, albacore tuna, skipjack tuna, and Pacific bonito. There are five species that may be considered principally bycatch, with a retention rate of 50 percent or below that have catch rates above 10 animals per 100 sets. These are: common mola, blue shark, bullet mackerel, Pacific mackerel, and slender mola. However, the slender mola catch rate is skewed in that 97 out of total of 103 animals recorded in these observer data summaries were caught during the 2018-19 fishing season.

Information about the status of these species is summarized below. Species with catch rates below the threshold used here are negligibly affected by the DGN fishery, especially given the decline in participation and landings show in Figure 2-2. Therefore, they are not considered further in this EA.

Table 2-28. Observed catch and retention rates based on observer data summaries, 2012-13 through 2020-2021 fishing season.

Species	Catch per 100 Sets	Retention Rate	Species	Catch per 100 Sets	Retention Rate
Common Mola	398.4	0.4%	Striped Marlin	1.6	0.0%
Swordfish	287.3	99.6%	Megamouth Shark	0.9	0.0%
Tuna, Bluefin	139.0	93.6%	Yellowtail	0.9	100.0%
Shark, Shortfin Mako	96.7	94.5%	Jack Mackerel	0.6	83.3%
Shark, Blue	77.0	1.4%	Unidentified Fish	0.6	0.0%
Opah	73.5	99.3%	Mobula	0.4	0.0%
Albacore	67.8	96.2%	Remora	0.3	0.0%
Shark, Common Thresher	62.8	98.8%	Unidentified Ray	0.3	0.0%
Tuna, Skipjack	49.5	73.9%	Unidentified Shark	0.3	0.0%
Bullet Mackerel	23.5	44.5%	Oilfish	0.2	50.0%
Pacific Bonito	22.9	83.6%	Other Identified Fish	0.2	50.0%
Pacific Mackerel	15.3	17.5%	Pacific Electric Ray	0.2	0.0%
Slender Mola	11.0	0.0%	Pacific Hake	0.2	50.0%
Pelagic Stingray	9.8	0.0%	Pelagic Thresher Shark	0.2	50.0%
Louvar	9.0	97.6%	Pelagic Tunicates	0.2	0.0%
Pacific Pomfret	5.8	44.4%	Blue Marlin	0.1	0.0%
Tuna, Yellowfin	4.9	100.0%	Escolar	0.1	100.0%
Shark, Bigeye Thresher	4.3	15.0%	Oarfish	0.1	0.0%
Smooth Hammerhead Shark	3.9	2.8%	Sevengill Shark	0.1	0.0%
Unidentified Tuna	2.8	65.4%	Spiny Dogfish	0.1	100.0%
Bat Ray	2.6	0.0%	Unidentified Crustacean	0.1	0.0%
Shark, Salmon	2.1	5.0%	Unidentified Mackerel	0.1	0.00%

Status of HMS stocks is reported in the HMS SAFE report along with the status determination criteria used by NMFS and the most recent stock assessment upon which stock status is based. That information is discussed in the following summaries where applicable.

2.4.1.2 Stock Status

Swordfish (Xiphias gladius)

In 2014 by the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean (ISC) conducted a stock assessment for North Pacific swordfish (ISC Billfish Working Group 2014), which separately assessed two stocks, one in the Western and Central North Pacific and the other in the Eastern Pacific Ocean. NMFS determined that the WCNPO stock was not subject to overfishing and was not overfished based on stock status determination criteria while the EPO stock was subject to overfishing. The stock boundary chosen for these assessments, based on reported catch patterns, was a generally northeast trending line meeting the North American continent at the Baja California, Mexico peninsula. Given this stock boundary, the DGN fishery is catching fish from the WCNPO stock, although it may be that some stock mixing occurs in the Southern California Bight.

In 2018 the ISC published another benchmark assessment but only for the WCNPO stock (ISC Billfish Working Group 2018), which was found to be healthy. The ISC intends to conduct the next benchmark stock assessment in 2023, with a new stock boundary for a North Pacific stock.

DGN swordfish catch has averaged 106 mt annually, 2012-2021 (HMS SAFE Table 12); according to ISC catch estimates, DGN accounted for 1.5 percent of stock wide catch, 2012-2020. Based on the 2018 ISC assessment NMFS determined at the WCNPO stock is not subject to overfishing or overfished. This is based on the estimate that current F is 47 percent of the overfishing threshold ($F/F_{MSY} = 0.47$) and current biomass is 2.4 times the minimum stock size, or overfished, threshold.

Common thresher shark (*Alopias vulpinus*)

Common thresher shark was last assessed in 2018 (Teo*, et al.* 2018). The stock assessment concludes, based on limited tagging data, a local population limited to the coastal waters of the west coast of North America without substantial interchange with other stocks in the EPO. The main pupping grounds for the stock is in the Southern California Bight. State-imposed time and area restrictions were put in place i 1990 to limit fishery impacts in this spawning area; as a result, the population appears to be recovering from past decline. DGN is the main source of fishing mortality in U.S. waters with drift gillnet, pelagic longline, and artisanal fisheries occurring in Mexican waters. The lack of reporting at the species level in Mexican fisheries until recently has made it difficult to estimate removals for those fisheries.

DGN fishery landings averaged 30 mt, 2012-2021 (HMS SAFE Table 12). Table 2.2 in the 2018 stock assessment present estimated fishery removals by fleet. Over the last 10 years of that data series (2005-2014) the DGN fishery accounted for 28 percent of total U.S. and Mexico estimated catch reported in the stock assessment. However, as discussed above, common thresher shark landings in the DGN fishery subsequently declined from an annual average of 71 mt in the 2005-2014 period to 27 mt in the 2015-2021 period. The HMS FMP established a harvest guideline of 340 mt for common thresher shark for U.S. fisheries, which has never been exceeded.

According to status determinations reported in the HMS SAFE, the stock is not overfished and not subject to overfishing. The reported F/F_{MSY} ratio is 0.21 and the ratio of current biomass to the minimum stock size threshold (overfished threshold) is 1.4.

Pacific bluefin tuna (*Thunnus orientalis*)

Pacific bluefin tuna is a single Pacific-wide stock with trans-Pacific migratory patterns. U.S. West Coast catch is caught opportunistically by commercial purse seiners, hook-and-line gear, and DGN fishing in the SCB. The recreational fishery, mainly prosecuted by commercial passenger fishing vessels (CPFVs), which fish in both U.S. and Mexican territorial waters. In recent years recreational catch has been larger than commercial catch according to ISC catch tables. According to recreational catch data presented in the HMS SAFE, in the three years 2019-2021, CPFVs accounted for 91 percent of catch (in number of fish) and 60 percent of catch (including private recreational vessels) occurred in U.S. waters.

NMFS has determined the stock is overfished. It is managed internationally under a rebuilding plan. In accordance with IATTC Resolutions (currently C-21-05), and in an effort to rebuild the Pacific bluefin tuna stock, NMFS regularly implements commercial catch and trip limits for U.S. commercial catch of Pacific bluefin tuna in the EPO at 50 CFR 300 Subpart C (e.g., 86 FR 16303, March 29, 2021). Once the catch limits are reached, NMFS prohibits U.S. commercial vessels from targeting, retaining onboard, transshipping, or landing Pacific bluefin tuna through the remainder of the calendar year. IATTC Resolution C-21-05 also calls on countries to reduce recreational catch commensurate with commercial catch limits. Pursuant to the HMS FMP in 2015 NMFS issued regulations reducing the daily recreational bag limit for Pacific bluefin tuna to two fish per day with a maximum possession limit of six fish for multi-day trips.

The ISC conducted the most recent stock assessment in 2022 (ISC PBF Working Group 2022). It indicates that spawning stock biomass (SSB) reached its initial rebuilding target ($SSB_{MED} = 6.3\%SSB_{F=0}$) in 2019 and projections indicate that under all examined scenarios the second rebuilding target of $20\%SSB_{F=0}$ is reached by 2029 (10 years after reaching the initial rebuilding target) with at least 60 percent probability. (And under current conservation measures, the second rebuilding target would be reached by 2023 with at least a 60 percent probability.)

DGN catch accounts for a negligible fraction of stock-wide catch at less than 0.01 percent, 2012-20201.

Shortfin mako shark (*Isurus oxyrinchus*)

Shortfin mako constitutes an important incidental catch to the DGN fishery, whose market quality and ex-vessel value are important components of the landed incidental catch (Cailliet*, et al.* 1983; Holts and Sosa-Nishizaki 1998). Shortfin mako is also caught in California's recreational fishery. A majority are caught by anglers fishing with rod-and-reel gear from private vessels in the SCB from June through October, peaking in August. During the early 1980s, they increased in prominence as a popular game fish, and annual catch estimates peaked in 1987 at 22,000 fish. Since 2001, annual catch estimates have ranged from 2,000 to 6,000 fish, with a percentage of sharks successfully released by southern California fishermen favoring catch-and-release versus harvest.

The ISC conducted a benchmark stock assessment for shortfin mako shark in 2018 (ISC Shark Working Group 2018). The assessment assumed a "single stock … in the NPO based on evidence from genetics, tagging studies, and lower catch rates of [shortfin mako shark] near the equator compared to temperate areas. However, within the NPO some regional substructure is apparent as the majority of tagged [shortfin mako sharks] have been recaptured within the same region where they were originally tagged, and examination of catch records by size and sex demonstrates some regional and seasonal segregation across the NPO." (p. 21) The assessment concluded that the stock "is expected to increase gradually if fishing intensity remains constant or is decreased moderately relative to 2013-2015 levels. However, given the uncertainty in fishery data and key biological processes within the model, especially the stock recruitment relationship, the models' ability to project into the future is limited and highly uncertain" (pp 7-8).

Reported DGN landings averaged 9 mt, 2012-2021 (HMS SAFE Table 12) while stock wide catch averaged 1,502 mt, 2012-2020, as reported by the ISC. At less than 0.1 percent of stock wide catch, the impact of DGN fishing mortality is negligible. The HMS SAFE reports the stock is not subject to overfishing or overfished based on these status determination criteria: an F/F_{MSY} ratio of 0.62 (F_{MSY} is the maximum fishing mortality threshold in the HMS FMP) and a biomass to MSST ratio of 1.6.

On January 25, 2021, NMFS received a petition from Defenders of Wildlife to list the shortfin mako shark under the ESA and to designate critical habitat. On April 15, 2021, NMFS announced a 90- day finding on a petition to list the shortfin mako shark, initiation of a status review of the species to determine whether listing under the ESA is warranted, and solicited public input (86 FR 19863, April 15, 2021).

Opah (*Lampris guttatus*)

Opah has not been assessed and its stock structure is uncertain. Although landings to the West Coast have increased in recent years (principally due to landings in the pelagic longline fishery), opah is not an HMS FMP management unit species. Within California, many sport-caught opah are taken from the northern

Channel Islands to the Coronado Islands, just south of the U.S.-Mexico border. NMFS reports that there is no evidence that the stock is in decline or that catch is occurring at unsustainable levels.

Opah landings in the DGN fishery have averaged 11 mt annually, 2021-2021, which is 5 percent of all opah landings to the West Coast during that period. As noted, total opah landings to the West Coast have been increasing, from 50 mt in 2012 to a peak of 429 mt in 2020 but then declining to 153 mt in 2021. In comparison, Hawaii-based fisheries managed under the WPFMC Pelagics FMP landed 740 mt in 2020 (WPRFMC 2021).

North Pacific albacore tuna (*Thunnus alalunga*)

The North Pacific albacore stock occupies waters north of the equator to 55ºN latitude. The ISC conducted the most recent stock assessment in 2020 (ISC Albacore Working Group 2020). The Western and Central Pacific Fisheries Commission's Northern Committee established a biomass-based limit reference point of 20 percent of the current spawning stock biomass (SSB) when F=0 ($20\%_{SSBcurrent,\ F=0}$). The assessment found that SSB had not fallen below this limit reference point at any time since 1994. The assessment reports fishing mortality in terms of fishing intensity (a measure of fishing mortality expressed as the decline in the proportion of the spawning biomass produced by each recruit relative to the unfished state). The assessment found that current fishing intensity, 2015-2017, "was at or lower than all seven potential F-based reference points identified for the north Pacific albacore stock." The HMS SAFE reports the stock is not subject to overfishing or overfished. The reported F/F_{MSY} ratio is 0.6 and the current biomass to MSST ratio is 5.8.

Skipjack tuna (*Katsuwonus pelamis*)

[To be updated with 2022 IATTC stock assessment results]

The IATTC conducts indicatory analyses for the EPO skipjack tuna stock, most recently in 2019 (Maunder 2018); a full age-structured stock assessment is not possible, because of the stock's high and variable productivity, and lack of age composition and tagging data. As a result, status determination based on thresholds in the HMS FMP is not possible. However, as reported in the HMS SAFE, NMFS has determined the stock is not to be subject to overfishing or overfished under the HMS FMP framework, based on available information. DGN skipjack catches are negligible when compared to stock wide catch, which ranges around 300,000 mt annually in the EPO. Almost all of this catch occurs in the tropical purse seine fishery.

Pacific bonito (*Sarda chiliensis*)

A northern subspecies is recognized (*S. chiliensis lineolata*) occurring from Alaska to Baja California, Mexico. The stock status of Pacific bonito has never been assessed. Efforts have been made to obtain indicators of abundance for Pacific bonito; however, the estimates have not been reliable as both their abundance and spatial extent are highly variable from year to year (CDFW 2019). In 2019, the IATTC (Ortega-García and Jakes-Cota 2019) performed an exploratory analysis of available data for Pacific bonito and future directions. The analysis concluded that the focus for future analysis is to determine the main environmental factors that affect its abundance. Presently, there is no evidence that populations are in decline or that fishing rates are too high.

Common mola (*Mola mola*), slender mola (*Ranzania laevis*)

Common mola is the most frequently caught species in the DGN fishery but is not retained. The majority are released alive. [For example, observer records indicate that 100 percent were released alive in the

2019/2020 season, and 91 percent were released alive in the 2020/2021 season.] As noted above, the slender mola catch rate was just above the "major catch" threshold but this was due to what appears to be anomalously high catch in the 2018-19 fishing season. Neither stock has been formally assessed. Common mola is distributed globally in water depths between 30 and 480 m, but is usually between 30 and 70 m (Allen and Erdmann 2012; Powell 2001; Riede 2004). It is listed on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species as Vulnerable because of information showing the population is decreasing globally, although this may not be indicative of the status of the stock found off the West Coast. Like common mola, slender mola globally distributed but unassessed. The IUCN Red List rates it as Least Concern meaning no major conservation threats have been identified.

Blue shark (*Prionace glauca*)

[To be updated with 2022 stock assessment results.]

The ISC conducted a full stock assessment for North Pacific blue shark in 2022 (ISC Shark Working Group 2022). Blue shark is widely distributed in the Pacific Ocean with separate North and South Pacific stocks recognized. Results from the 2017 assessment indicate that the stock fell from a time series high in 1970s to its lowest level between 1990 and 1995 but subsequently increased to reach a time series high in 2005 with modest fluctuations in stock size since then. Future projections indicate the stock will likely remain above B_{MSY} for the foreseeable future.

Blue shark is infrequently landed in U.S. fisheries, because of the difficulty in processing the flesh to make it palatable for human consumption. Estimates of total dead removals presented in Table 1 of the ISC stock assessment show that in the 10 years up to the terminal year of the assessment (2015) the U.S. accounted for 0.5 percent of all removals or 216 mt annually. Considering that most blue shark catch occurs in the pelagic longline fishery, the proportion stock wide catch attributable to the DGN fishery is negligible.

As reported in the HMS SAFE, NMFS has determined that overfishing is not occurring and the stock is not overfished. The ratio of current F to F_{MSY} is 0.37 and current biomass to the MSST is 2.0-2.3.

Pacific mackerel (*Scomber japonicus*), bullet mackerel (*Auxis rochei*)

Pacific mackerel is a management unit species in the Council's Coastal Pelagic Species FMP. The most recent stock assessment was conducted in 2019 (Crone*, et al.* 2019). In the northeastern Pacific, Pacific mackerel is distributed from Southeast Alaska to Banderas Bay, Mexico. Two stocks are hypothesized for this region with the northern stock occurring in waters off California. They are primarily caught in the commercial coastal purse seine fishery; total estimated landings in U.S. and Mexico waters are estimated to average 9,019 mt annually, 2008-2018. Thus, catch in the DGN fishery makes a negligible contribution to overall fishing mortality. Under the CPS FMP the fishery for Pacific mackerel is subject to a harvest guideline. NMFS has determined that the stock is not subject to overfishing or overfished.

An Eastern Pacific subpopulation of bullet mackerel is recognized (*A. rochei eudorax*). It is listed as an HMS under Annex I of the 1982 Law of the Sea Convention but is principally caught in waters around islands. No fishery on the West Coast targets bullet mackerel. It is listed as Least Concern on the IUCN Red List because the species is widespread and abundant. It is considered an important forage species. The stock status of bullet mackerel has never been assessed, but there is no evidence that populations are in decline or that fishing rates are too high.

2.4.2 Environmental Consequences

The proposed action would indirectly affect finfish catch and bycatch in the DGN fishery. The impact of the proposed action is qualitatively evaluated based on the relationship between fishing effort and catch.

Alternative 1 – The No Action Alternative

As discussed in Section 2.4.1.1, six species may be considered a major component of retained catch and five species as major bycatch. Available information indicates that of these only Pacific bluefin tuna is overfished while common mola is listed as Vulnerable on the IUCN Red List. Based on available information, under baseline conditions, fishing mortality in the DGN fishery is a negligible fraction of stock wide fishing mortality. The impact of the DGN fishery on the status of these stocks is likely to remain negligible for the foreseeable future.

Alternative 2 – Rolling Two-Year Fishery Closure

Hard cap closures under this alternative could reduce fishing effort over the long term; to the degree this affects fishing mortality on these stocks it would have a negligible beneficial impact on the status of stocks caught in the DGN fishery.

Alternative 3 – Inseason Individual Vessel and Fleetwide Closures

The five individual and fleetwide closure options under Alternative 3 are likely to reduce fishing effort and any consequent fishing mortality on stocks caught in the DGN fishery less than would be the case under Alternative 2. This is because the closures under Alternative 3 are shorter duration than under Alternative 2 and in many instances only a subset of vessels in the fleet would be subject to closures, because under most of the options individual vessel closures apply before a fleetwide closure is triggered. Alternative 3 may have a negligible beneficial impact on stocks caught in the DGN fishery due to an indirect effect on the level of fishing mortality resulting from the fishery.

Cumulative Impacts on Finfish

The California transition program and the implementation of HMS FMP Amendment 6 are likely to make a modest to indiscernible contribution to the direct and indirect impacts of the alternatives. Reduction in participation in the DGN fishery, due to the California transition program, may result in a modest to indiscernible reduction in finfish catch. The cumulative effect of the use of DSBG on finfish catch and bycatch would depend on whether it is an alternative to not fishing at all or to the use of other, higher bycatch gear types.

2.5 Summary of the Impacts of the Alternatives

The following table summarizes the impacts of the alternatives.

	DGN Fishery	Fishing Communities	Protected Species	Finfish
Alternative 1	Baseline conditions	Baseline conditions	Baseline conditions	Baseline conditions
Alternative 2	Modest to severe adverse impact	Modest adverse impact	Negligible to modest beneficial impact	Negligible beneficial impact
Alternative 3	Modest to severe	Modest adverse	Negligible to	Negligible

	adverse impact	impact	modest beneficial impact	beneficial impact

3 Regulatory Impact Review

Note: This analysis will be completed after Council final action and before the proposed rule is published. Background on requirements pursuant to E.O. 12866 is provided below.

The President of the United States signed E.O. 12866, “Regulatory Planning and Review,” on September 30, 1993. This order established guidelines for promulgating new regulations and reviewing existing regulations. The E.O. covers a variety of regulatory policy considerations and establishes procedural requirements for analysis of the benefits and costs of regulatory actions. The E.O. stresses that in deciding whether and how to regulate, agencies should assess all of the costs and benefits of available regulatory alternatives. Based on this analysis, they should choose those approaches that maximize net benefits to the Nation, unless a statute requires another regulatory approach.

NMFS satisfies the requirements of E.O. 12866 through the preparation of an RIR. The RIR provides a review of the potential economic effects of a proposed regulatory action in order to gauge the net benefits to the Nation associated with the proposed action. The analysis also provides a review of the problem and policy objectives prompting the regulatory proposal and an evaluation of the available alternatives that could be used to solve the problem.

The RIR provides an assessment that can be used by the Office of Management and Budget to determine whether the proposed action could be considered a significant regulatory action under E.O. 12866. E.O. 12866 defines what qualifies as a “significant regulatory action” and requires agencies to provide analyses of the costs and benefits of such action and of potentially effective and reasonably feasible alternatives. An action may be considered significant if it is expected to:

- Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local or tribal governments or communities;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President’s priorities, or the principles set forth in E.O. 12866.

3.1 Statement of the Problem

A statement of the problem is included above in Section 1.3,Purpose and Need.

3.2 Description of the Management Goals and Objectives

Management goals and objectives are included above in Section 1.3,Purpose and Need.

3.3 Description of Fisheries and Other Affected Entities

The fishery and affected entities are described in Section 2.2.1.1; as noted there, the HMS Stock Assessment and Fishery Evaluation document additional information on the management of HMS fisheries, and the economic characteristics of harvesting vessels, processors, and communities.

3.4 Assessment

The Initial Regulatory Impact Review of the Council’s 2015 hard caps proposal (NMFS 2016) concluded:

> [T]he RIR is designed to determine whether the proposed action could be considered a significant regulatory action according to EO 12866. This rule will not trigger any of the EO 12866 test requirements for significant regulatory actions. In other words, it will not have an annual effect on the economy of $100 million or more. Because fishery closures resulting from hard caps on HPPS are not guaranteed, and would be temporary in nature, it is not evident that the proposed action would adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities. Despite the use of other federal authorities to manage populations of marine mammals and endangered or threatened species (e.g., MMPA and ESA), the proposed action does not create a serious inconsistency or otherwise interfere with actions taken or planned by other agencies or under other authorities. Lastly, the proposed action is not expected to materially alter the budgetary impact of entitlement, grants, user fees, or loan programs or the rights and obligations of recipients thereof or raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the EO.

Alternative 2 is substantially comparable to the Council’s 2015 final action while Alternative 3 would impose inseason closures when HPPS caps are met or exceeded and results in smaller adverse socioeconomic impacts compared to Alternative 2. Therefore, the conclusion reproduced above would equally apply to this proposed action.

4 Regulatory Flexibility Analysis

Note: This analysis will be completed after Council final action and before the proposed rule is published. Background on requirements pursuant to the Regulatory Flexibility Act is provided below.

For any rule subject to notice and comment rulemaking, the Regulatory Flexibility Act (RFA) requires Federal agencies to prepare, and make available for public comment, both an initial and final regulatory flexibility analysis, unless the agency can certify that the proposed and/or final rule would not have a "significant economic impact on a substantial number of small entities". These analyses describe the impact on small businesses, non-profit enterprises, local governments, and other small entities as defined by the RFA (5 U.S.C. § 603). This analysis is to inform the agency and the public of the expected economic effects of the alternatives, and aid the agency in considering any significant regulatory alternatives that would accomplish the applicable objectives and minimize the economic impact on affected small entities. The RFA does not require the alternative with the least cost or with the least adverse effect on small entities be chosen as the preferred alternative.

The IRFA must only address the effects of a proposed rule on entities subject to the regulation (i.e., entities to which the rule will directly apply) rather than all entities affected by the regulation, which would include entities to which the rule will indirectly apply.

Part 121 of Title 13, Code of Federal Regulations (CFR), sets forth, by North American Industry Classification System (NAICS) categories, the maximum number of employees or average annual gross receipts a business may have to be considered a small entity for RFAA purposes. See 13 C.F.R. § 121.201. Under this provision, the U.S. Small Business Administration established criteria for businesses in the fishery sector to qualify as small entities. Standards are expressed either in number of employees, or annual receipts in millions of dollars. The number of employees or annual receipts indicates the maximum allowed for a concern and its affiliates to be considered small (13 C.F.R. § 121.201).

- A fish and seafood merchant wholesaler (NAICS 424460) primarily engaged in servicing the fishing industry is a small business if it employs 100 or fewer persons on a full time, part time, temporary, or other basis, at all its affiliated operations worldwide.
- A business primarily engaged in Seafood Product Preparation and Packaging (NAICS 311710) is a small business if it employs 750 or fewer persons on a full time, part time, temporary, or other basis (13 CFR § 121.106), at all its affiliated operations.[10]

In addition to small businesses, the RFA recognizes and defines two other kinds of small entities: small governmental jurisdictions and small organizations. A small governmental jurisdiction is any government or district with a population of less than 50,000 persons. A small organization is any not-for-profit enterprise that is independently owned and operated and not dominant in its field, while. (5 U.S.C. § 601). There is no available guidance beyond this statutory language regarding how to determine if non-profit organizations are "small" for RFA purposes. The Small Business Administration (SBA) does have provisions for determining whether a business is "small" for RFA purposes and whether it is "dominant in its field," and those provisions can inform how NMFS classifies non-profit organizations for the purposes of RFA analyses in rulemaking. After consultation with the SBA, NOAA Fisheries has decided to use SBA's size standards for non-profit organizations to determine whether a non-profit organization is

[10] For purposes of rulemaking, NMFS West Coast Region is applying the seafood processor standard to catcher processors (C/Ps) and mothership processor ships, which earn the majority of their revenue from selling processed Pacific whiting seafood product.

"small" and, in turn, whether it is "dominant in its field," to apply the statutory definition of a "small organization" in practice:

A nonprofit organization is determined to be "not dominant in its field" if it is considered "small" under SBA size standards:

- Environmental, conservation, or professional organizations (NAICS 813312, 813920): Combined annual receipts of $15 million or less.
- Other organizations (NAICS 813319, 813410, 813910, 813930, 813940, 813990): Combined annual receipts of $7.5 million or less.

Provision is made under SBA's regulations for an agency to develop its own industry-specific size standards after consultation with Advocacy and an opportunity for public comment (see 13 CFR 121.903(c)). NMFS has established a small business size standard for businesses, including their affiliates, whose primary industry is commercial fishing (80 FR 81194, December 29, 2015). This standard is only for use by NMFS and only for the purpose of conducting an analysis of economic effects in fulfillment of the agency's obligations under the RFA.

> NMFS' small business size standard for businesses, including their affiliates, whose primary industry is commercial fishing is $11 million in annual gross receipts. This standard applies to all businesses classified under North American Industry Classification System (NAICS) code 11411 for commercial fishing, including all businesses classified as commercial finfish fishing (NAICS 114111), commercial shellfish fishing (NAICS 114112), and other commercial marine fishing (NAICS 114119) businesses. (50 C.F.R. § 200.2; 13 C.F.R. § 121.201).

4.1 Description of why action by the agency is being considered

The reasons why agency action is being considered are explained in the Section 1.3, Purpose and Need, above.

4.2 Statement of the objectives of, and legal basis for, the proposed rule

The statement of the objectives of the proposed rule are explained in Section 1.3, Purpose and Need, above.

Under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1801, *et seq*.), the United States has exclusive fishery management authority over all marine fishery resources found within the exclusive economic zone (EEZ). The management of these marine resources is vested in the Secretary of Commerce (Secretary) and in the regional fishery management councils. In the West Coast Region, the Council has the responsibility for preparing fishery management plans (FMPs) and FMP amendments for the marine fisheries that require conservation and management, and for submitting its recommendations to the Secretary. Upon approval by the Secretary, NMFS is charged with carrying out the Federal mandates of the Department of Commerce with regard to marine and anadromous fish.

The DGN fishery in the EEZ off the West Coast is managed under the Fishery Management Plan for U.S. West Coast fisheries For Highly Migratory Species.

The proposed action under consideration would amend Federal regulations at 50 CFR Part 660 Subpart K. Actions taken to amend FMPs or implement regulations governing these fisheries must meet the requirements of applicable Federal laws, regulations, and Executive Orders.

4.3 Analytical Criteria

Description and estimate of the number of small entities to which the rule applies

The characteristics of the DGN fishery and vessels participating in the fishery are described in Section 2.2.1.1. All fishery participants qualify as small entities.

As discussed in Section 2.1.3, it is expected that there would be no more 30 extant state permit holders once the California transition program is complete. All state permits would be revoked January 31, 2024, but absent further government action individuals possessing a Federal DGN permit holders could continue to participate in the fishery. The number of extant Federal permit holders would be less than 30 and more likely to be in the range of 2 to 11 based on recent participation in the fishery.

Estimate of economic impacts on small entities, by entity size and industry.

All the small entities directly affected by the proposed action are DGN fishery participants. Firms in ports engaged in the DGN fishery could be affected indirectly due to reduced expenditures by DGN fishery participants. The characteristics of these ports are described in Section 2.2.1.3. However, these ports are by and large modestly engaged in the DGN fishery so the impact of lost expenditures is likely to be modest.

The action alternatives would result in a reduction in fishing activity, landings, ex-vessel revenue and profit for all DGN fishery participants. These reductions have been estimated as displayed in Table 2-10, Table 2-11, and Table 2-12. These reductions are higher under Alternative 2 compared to Alternative 3.

At issue in the evaluation of the Council's 2015 proposal, which is equivalent to Alternative 2, was the conclusion that DGN fishery participants would be unable to find other sources of fishery revenue during the time of year when most revenue accrues in the DGN fishery, November to January. Since that time a new gear type, DSBG, for targeting swordfish, historically the principal target species in the DGN fishery has been extensively tested. By the time the proposed action would be implemented DSBG is likely to be an authorized gear type in Federal regulation and could offer an alternative to DGN gear during that period. However, there are several mitigating factors. First, to fish in the Southern California Bight, where almost all DSBG fishing has occurred to date, an individual would have to qualify for a limited entry permit. DGN fishery participants are generally given preference to obtain those permits but not all fishery participants may immediately qualify. Second, revenue gained from the use of DSBG may not fully substitute for revenue that would have been gained from DGN during closure periods.

Reporting and recordkeeping requirements.

This proposed action does not contain new collection-of-information requirements.

Relevant Federal rules that may duplicate, overlap, or conflict with the proposed action.

The DGN fishery currently complies with all applicable laws, including MSA, ESA, and MMPA. All current time and area restrictions will continue to apply under the proposed regulations. The implementation of hard caps is intended to ensure that take and bycatch of unmarketable non-target species, including ESA-listed species and marine mammals, in the DGN fishery is minimized to the extent practicable and that such take and bycatch does not result in limitations on the economic viability of the west coast swordfish fishery. It could result in the reduction of protected species takes below baseline levels, recognizing that the fishery is compliant with thresholds established under the ESA and MMPA. The Council is taking this action consistent with MSA Section 303(b)(12).

A description of any significant alternatives to the proposed rule that accomplish the stated objectives of applicable statutes and that minimize any significant economic impact of the proposed rule on small entities

The Council considered to action alternatives as described in Section 1.5.

Significant Impact Determination Pursuant to the Regulatory Flexibility Act

To be completed during rulemaking.

5 MSA and HMS FMP Considerations

5.1 Magnuson-Stevens Act National Standards

Below are the 10 National Standards as contained in the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), and a brief discussion of how each alternative is consistent with the National Standards, where applicable. In recommending a preferred alternative, the Council must consider how to balance the national standards.

The 2017 EA described how the Council's 2015 proposed action complied with these National Standards. For most of the National Standards the findings in that EA would apply to the current proposed action, because it is very similar to the 2015 action. The exception is National Standard 7, because during rulemaking after publication of the EA NMFS found that the 2015 proposed action was inconsistent with National Standard 7 as explained in a

National Standard 1 — Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

Guidelines at 50 CFR 600.310 describe the framework for setting harvest specifications (overfishing limit, acceptable biological catch, annual catch limits, optimum yield, and other reference points) and related accountability measures. The proposed action does not involve changes to the framework for establishing such specifications and accountability measures described in Chapter 4 of the HMS SMP.

National Standard 2 — Conservation and management measures shall be based upon the best scientific information available.

Guidelines and 50 CFR 600.315 describe criteria for determining what constitutes best scientific information available (BSIA) and, when appropriate peer review processes to verify the quality of information and methods used in analyses. The principal sources of data for the analyses used to evaluate the proposed action are data on fishery landings stored in the PacFIN database (aggregating information from state landings receipts), the NMFS West Coast Region Observer Program, and logbook collated by NMFS. These are the best available data sources to evaluate the proposed action. The principal analytical tool used in the analysis is a bootstrap simulation model (see Section 2.1.3) that provides estimates of fishing effort, revenue and profits, and mortality/injury of HPPS resulting from prosecution of the fishery (Alternative 1, No Action) and the range of potential actions considered by the Council (Alternatives 2 and 3). The Council's Scientific and Statistical Committee has reviewed the bootstrap model and determined it is methodologically sound.

National Standard 3 — To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

This action does not propose to manage any fish stock in only a portion of its range.

National Standard 4 — Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be; (A) fair and equitable to all such fishermen, (B) reasonably calculated to promote conservation, and (C) carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

This action does not allocate or assign fishing privileges among various U.S. fishermen.

National Standard 5 — Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources, except that no such measure shall have economic allocation as its sole purpose.

Guidelines at 50 CFR 600.330 explain that "an FMP should contain management measures that result in as efficient a fishery as is practicable or desirable." Furthermore, "Management regimes that allow a fishery to operate at the lowest possible cost (e.g., fishing effort, administration, and enforcement) for a particular level of catch and initial stock size are considered efficient." The proposed action would adversely affect the efficiency of the DGN fishery. Periodic closures under hard caps management are likely to make the use of inputs (capital and labor) less efficient if they cannot be redeployed to other productive uses during closure periods. There is evidence that this would be the case at certain times of the year when closures could occur. However, the Guidelines also state the use of management measures that "impede the use of cost-effective techniques" may be permissible if it "contributes to the attainment of other social or biological objectives." The purpose and need for the proposed action described in Section 1.3 describes other objectives motivating the Council's proposed action that outweigh maximizing efficient utilization.

National Standard 6 — Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

According to Guidelines at 50 CFR 600.335, variations relate to changing biological, social, and economic conditions while contingencies recognized that a fishery may be subject to unpredictable events. If a hard cap closure regime is established through the proposed action, the Council would be able to address such variations and contingences by modifying such measures in a future rulemaking.

National Standard 7 — Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

National Standard 7 guidelines at 50 CFR 600.340 state that "[m]anagement measures should not impose unnecessary burdens on the economy, on individuals, on private or public organizations, or on Federal, state, or local governments." Supporting analysis should "demonstrate that the benefits of fishery regulation are real and substantial relative to the added research, administrative, and enforcement costs, as well as costs to the industry of compliance." The analysis should weigh the burdens imposed on fishermen by management measures against the benefits to society resulting from such measures. As discussed in Section 1.4, in 2017 NMFS made a "negative determination" on the Council's 2015 proposed hard cap regulations and did not implement the final rule (June 19, 2017, letter to Council Chair Herb Pollard from NMFS Regional Administrator Barry Thom). The 2015 Council proposal is represented by Alternative 2 in the range of alternatives evaluated for the current proposed action. NMFS analyzed landings and permit holdings data for the 20 vessels most likely to be impacted by the proposed action and concluded that significant adverse impacts would occur. Furthermore, NMFS found that implementing hard caps would offer little additional benefit to protected species than what has been achieved through measures pursuant to the MMPA and ESA. NMFS concluded that pursuant to National Standard 7 "implementing protected species hard caps for the DGN fishery under MSA authority is not warranted at this time."

The Council's 2015 proposal was evaluated using a comparable bootstrap modeling methodology based on an assumed 20 vessels participating in the fishery. That analysis used data through the 2014-2015 fishing season. Compared to baseline conditions then used (No Action), it found a reduction of 180 sets and a decline in revenue of $273,239. For Alternative 2 under the current action, which is comparable to the 2015 proposal, those values are intermediate between participation Scenario 2 (11 vessels) and Scenario 3 (30 vessels). This suggests that at higher levels of fishery participation a similar conclusion could be reached for Alternative 2 as was made for the 2015 action. The options under Alternative 3 result in roughly a quarter of the reduction in fishing effort and revenue as Alternative 2 suggesting that Alternative 3 would not result adverse impacts outweighing the additional benefits in terms of bycatch mitigation due to inseason hard cap closures. On the other hand, the reduction in HPPS M/I is comparably more modest at generally less than half what is estimated to occur under Alternative 2 using bootstrap model results.

National Standard 8 — Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities by utilizing economic and social data that meet the requirements of National Standard 2, in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

Guidelines at 50 CFR 600.345 state that while an FMP must take into account the importance of fishery resources to fishing communities, such considerations “must not compromise the achievement of conservation requirements and goals of the FMP.” An evaluation of the impacts of the proposed action and alternatives on fishing communities may be found Section 2.2.2.2. Communities engaged in the DGN fishery are primarily in the Southern California Bight but are only modestly dependent on the fishery (as measured by the proportion of total ex-vessel revenue accounted for by DGN landings). For the most dependent community, Moro Bay (which is north of the Southern California Bight), DGN landings have accounted for 15 percent of total ex-vessel revenue. Closures would periodically reduce DGN landings in affected communities resulting in a modest adverse impact.

National Standard 9 — Conservation 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.

The MSA defines bycatch with respect to “fish,” which is further defined as “finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds.” The list of HPPS that would trigger hard cap closures includes four sea turtle species. As discussed in Sections 2.3 and 2.4, the proposed action would reduce bycatch of finfish and sea turtles as a direct or indirect effect.

National Standard 10 — Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

In limited circumstances hard cap closures could provide incentives to operate unsafely. If a hard cap closure is for an entire fishing season there would be no reason to operate in unsafe weather conditions or otherwise operate a vessel unsafely. Closures under Alternative 3, which could truncate but not entirely close a fishing season, could provide an incentive for operators to fish in unsafe conditions if a closure was deemed imminent or the fishery reopened for a short time period.

5.2 HMS FMP

Section 2.2 in the HMS FMP lists 18 goals and objectives that provide context for management actions taken by the Council. The proposed action is relevant to the following goals and objectives:

9. Minimize bycatch and avoid discard, and implement measures to adequately account for total bycatch and discard mortalities.

11. Acquire biological information and develop a long-term research program.

15. Establish procedures to facilitate rapid implementation of future management actions, as necessary.

16. Promote outreach and education efforts to inform the general public about how U.S. West Coast HMS fisheries are managed and the importance of these fisheries to fishers, local fishing communities, and consumers.

17. Manage the fisheries to prevent adverse effects on any protected species covered by MMPA and MBTA and promote the recovery of any species listed under the ESA to the extent practicable.

6 Other Applicable Law

Executive Order 13175 Consultation and Coordination with Indian Tribal Governments

Executive Order 13175 is intended to ensure regular and meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications, to strengthen the United States government-to-government relationships with Indian tribes, and to reduce the imposition of unfunded mandates upon Indian tribes. The Secretary recognizes the sovereign status and co-manager role of Indian tribes over shared Federal and tribal fishery resources. At Section 302(b)(5), the MSA reserves a seat on the Council for a representative of an Indian tribe with Federally-recognized fishing rights from California, Oregon, Washington, or Idaho.

No Federally-recognized tribes participate in the DGN fishery nor would tribal fishery resources be materially affected by the proposed action.

7 Preparers and Persons Consulted

Preparers

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Contributors

Stephen Stohs, PhD in Environmental and Natural Resource Economics (UC Berkeley), Southwest Fisheries Science Center Fisheries Resources Division, HMSMT Chair: Initial developer of the bootstrap modeling platform to analyze DGN hard caps, plus extension to evaluate the November 2021 Range of Alternatives including input data update, and lead analyst in SSC review of the model; and Karter Harmon, NMFS West Coast Region: Assistance with R coding and producing results from extension of the bootstrap modeling platform to the November 2022 range of alternatives.

Other HMSMT members: Review of modeling approach and identifying bootstrap model input parameters

Persons *(and Agencies)* Consulted

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Appendix B: Bootstrap Model Output Tables

Alternative 1 Scenario 3

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	1275	1461	1595	1737	1944	1600.882	204.1073
TotRevs	1988858	2274232	2478446	2691637	3001490	2486293	308706
TotProfs	466483.9	557942.7	625711.4	696855.5	797241.7	628441.3	100756
AveProfs	15549.46	18598.09	20857.05	23228.52	26574.72	20948.04	3358.533
Lnds	284.4582	325.5339	354.8501	385.6552	430.528	355.9792	44.58653
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	1	2	0.6399	0.785678
Sperm_M	0	0	0	2	4	0.8206	1.270581
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	1	1	2	4	1.6093	1.267917
BotnDlph_I	0	0	0	1	2	0.4137	0.644511

Alternative 2 Scenario 3

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	0	1326	1532	1696	1921	1399.759	512.7186
TotRevs	0	2055433	2382712	2635564	2963946	2167834	797918.8
TotProfs	0	489528.1	596034.4	677935.7	787087.1	543388.8	214389.9
AveProfs	0	16317.6	19867.81	22597.86	26236.24	18112.96	7146.329
Lnds	0	294.4339	340.9966	377.2396	425.277	310.7542	114.0293
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	1	2	0.5198	0.753701
Sperm_M	0	0	0	2	4	0.7368	1.230478
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	0	1	2	4	1.3618	1.278931
BotnDlph_I	0	0	0	1	2	0.3757	0.626888

Alternative 3 AI Scenario 3

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	1089	1403	1564	1716	1933	1549.683	247.1139
TotRevs	1628707	2188782	2432661	2665212	2978835	2400238	390235.3
TotProfs	357954	530828.6	612297.8	687754.7	793916.5	601802.9	126235.5
AveProfs	11931.8	17694.29	20409.93	22925.16	26463.88	20060.1	4207.85
Lnds	237.9275	312.8288	347.8739	381.4851	427.9646	344.0589	55.17972
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	1	2	0.5766	0.771487
Sperm_M	0	0	0	2	4	0.8206	1.270581
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	1	1	2	4	1.5052	1.261876
BotnDlph_I	0	0	0	1	2	0.4137	0.644511

Alternative 3 II Scenario 3

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	1089	1403	1564	1716	1933	1549.683	247.1139
TotRevs	1628707	2188782	2432661	2665212	2978835	2400238	390235.3
TotProfs	357954	530828.6	612297.8	687754.7	793916.5	601802.9	126235.5
AveProfs	11931.8	17694.29	20409.93	22925.16	26463.88	20060.1	4207.85
Lnds	237.9275	312.8288	347.8739	381.4851	427.9646	344.0589	55.17972
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	1	2	0.5766	0.771487
Sperm_M	0	0	0	2	4	0.8206	1.270581
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	1	1	2	4	1.5052	1.261876
BotnDlph_I	0	0	0	1	2	0.4137	0.644511

Alternative 3 B Scenario 3

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	1255	1445	1579	1722	1935	1585.56	207.4466
TotRevs	1951831	2249630	2455195	2673716	2980353	2460659	315987.9
TotProfs	455448	549472.6	618866.5	690229.5	794311.6	620588	103426.9
AveProfs	15181.6	18315.75	20628.88	23007.65	26477.05	20686.27	3447.562
Lnds	279.5822	321.881	351.1771	382.6136	428.5012	352.4064	45.43413
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	1	2	0.6224	0.777739
Sperm_M	0	0	0	2	4	0.8206	1.270581
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh_	0	1	1	2	4	1.5786	1.261182
BotnDlph_I	0	0	0	1	2	0.4137	0.644511

Alternative 3 CI Scenario 3

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	1223	1427	1569	1717	1933	1573.105	215.3705
TotRevs	1896112	2221053	2438702	2665656	2978835	2440217	330654.8
TotProfs	439794.4	542179.5	614454.5	688074.1	794129.1	614601.3	107650.7
AveProfs	14659.81	18072.65	20481.82	22935.8	26470.97	20486.71	3588.358
Lnds	272.3996	317.8769	348.7745	381.6496	427.9646	349.4637	47.43635
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	1	2	0.6221	0.778172
Sperm_M	0	0	0	2	4	0.8206	1.270581
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	1	1	2	4	1.5783	1.258343
BotnDlph_I	0	0	0	1	2	0.4137	0.644511

Alteranative 3 C II Scenario 3

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	1158	1410	1565	1716	1933	1557.038	239.0674
TotRevs	1821110	2199994	2433160	2665212	2978835	2422135	357761.3
TotProfs	442032.6	542557.6	614543.9	688140.3	794129.1	615164.4	106880
AveProfs	14734.42	18085.25	20484.8	22938.01	26470.97	20505.48	3562.667
Lnds	260.9293	314.9437	348.0041	381.4717	427.9646	346.6644	51.55549
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	1	2	0.6235	0.778337
Sperm_M	0	0	0	2	4	0.8206	1.270581
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	1	1	2	4	1.5649	1.261565
BotnDlph_I	0	0	0	1	2	0.4137	0.644511

Alternative 1, Scenario 2

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	396	500	577	666	797	585.5534	122.4541
TotRevs	616959.6	782765.9	901539.2	1030999	1227377	910215.9	185426
TotProfs	136219.5	187800.2	227256.1	270280.7	335003.1	230670.7	60832.83
AveProfs	12383.59	17072.74	20659.65	24570.97	30454.83	20970.06	5530.257
Lnds	88.19648	111.8232	128.9196	147.6894	176.229	130.3312	26.75791
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	0	1	0.2335	0.472229
Sperm_M	0	0	0	0	2	0.2992	0.764812
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	0	0	1	2	0.5958	0.766734
BotnDlph_I	0	0	0	0	1	0.151	0.383684

Alternative 2, Scenario 2

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	330.95	482	565	657	793	558.1297	163.111
TotRevs	508398	750242.2	883117.1	1018476	1220809	866516.7	250728.5
TotProfs	101424.2	178189.6	221007.9	266076.1	331995.6	218797.1	74479.39
AveProfs	9220.378	16199.06	20091.63	24188.73	30181.41	19890.65	6770.853
Lnds	73.33191	107.3765	126.237	145.7354	174.9575	124.1318	35.98096
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	0	1	0.2159	0.458594
Sperm_M	0	0	0	0	2	0.2882	0.752992
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	0	0	1	2	0.5611	0.753607
BotnDlph_	0	0	0	0	1	0.1455	0.37755

Alternative 3 AI Scenario 2

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	384	492	571	661	794	578.4472	125.2364
TotRevs	590444.3	767187.9	891962.7	1023469	1222682	898298.5	191045.4
TotProfs	128141.3	183220.1	224344.6	267954.9	333488.1	227000.1	62596.84
AveProfs	11649.21	16656.37	20394.96	24359.54	30317.1	20636.37	5690.622
Lnds	85.03262	109.8409	127.6157	146.5075	175.2334	128.6774	27.4477
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	0	1	0.2247	0.464792
Sperm_M	0	0	0	0	2	0.2992	0.764812
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	0	0	1	2	0.5813	0.758715
BotnDlph_I	0	0	0	0	1	0.151	0.383684

Alternative 3 All Scenario 2

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	384	492	571	661	794	578.4472	125.2364
TotRevs	590444.3	767187.9	891962.7	1023469	1222682	898298.5	191045.4
TotProfs	128141.3	183220.1	224344.6	267954.9	333488.1	227000.1	62596.84
AveProfs	11649.21	16656.37	20394.96	24359.54	30317.1	20636.37	5690.622
Lnds	85.03262	109.8409	127.6157	146.5075	175.2334	128.6774	27.4477
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	0	1	0.2247	0.464792
Sperm_M	0	0	0	0	2	0.2992	0.764812
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	0	0	1	2	0.5813	0.758715
BotnDlph_I	0	0	0	0	1	0.151	0.383684

Alternative 3 B Scenario 2

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	393	497	573	662	794	582.0116	122.457
TotRevs	611784.6	776299.4	896282.5	1024917	1222682	904317.8	185673.6
TotProfs	134457.2	185799.7	225601.9	268603.5	333604.9	228882.9	60968.37
AveProfs	12223.38	16890.88	20509.26	24418.5	30327.72	20807.54	5542.579
Lnds	87.35133	111.0399	128.1734	146.7386	175.2334	129.5051	26.76222
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	0	1	0.229	0.467954
Sperm_M	0	0	0	0	2	0.2992	0.764812
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	0	0	1	2	0.5898	0.762361
BotnDlph_I	0	0	0	0	1	0.151	0.383684

Alternative 3 CI Scenario 2

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	390	495	572	661	794	580.3554	123.4837
TotRevs	605003.5	772096.5	893388.4	1023868	1222682	901565.2	187594.6
TotProfs	132329.4	184773.2	224829.7	268231.9	333488.1	228052.4	61508.21
AveProfs	12029.95	16797.57	20439.06	24384.72	30317.1	20732.03	5591.656
Lnds	86.60909	110.5794	127.7725	146.5475	175.2334	129.1175	27.01271
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	0	1	0.2277	0.46677
Sperm_M	0	0	0	0	2	0.2992	0.764812
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	0	0	1	2	0.589	0.762323
BotnDlph_I	0	0	0	0	1	0.151	0.383684

Alternative 3 CII Scenario 2

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	370	490	571	661	794	575.5868	130.2005
TotRevs	580571.5	765918.9	891906.8	1023469	1222682	896097.3	195186.5
TotProfs	133072.3	184592.6	224781.8	268231.9	333488.1	228118.5	61336.15
AveProfs	12097.48	16781.14	20434.71	24384.72	30317.1	20738.05	5576.014
Lnds	83.2113	109.6442	127.5394	146.5075	175.2334	128.2772	28.15529
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	0	1	0.2279	0.467101
Sperm_M	0	0	0	0	2	0.2992	0.764812
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh_	0	0	0	1	2	0.5843	0.760231
BotnDlph_I	0	0	0	0	1	0.151	0.383684

Alternative 1, Scenario 1

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	34	68	100	137	205	106.8225	52.77808
TotRevs	51677.99	106362.5	157305.4	215940.7	314265	166113.5	80110.74
TotProfs	5829.094	22205.98	38374.19	58280.53	90966.95	42144.06	26347.85
AveProfs	2914.547	11102.99	19187.09	29140.27	45483.48	21072.03	13173.92
Lnds	7.463628	15.10515	22.46392	30.90756	45.02998	23.77476	11.55854
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	0	0	0.0432	0.204788
Sperm_M	0	0	0	0	0	0.055	0.329524
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh_	0	0	0	0	1	0.1066	0.326262
BotnDlph_I	0	0	0	0	0	0.0255	0.158279

Alternative 2, Scenario 1

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	31	67	100	136	205	105.9079	53.29361
TotRevs	48511.78	105040.4	156292.9	215028.9	312960.6	164644.3	80922.31
TotProfs	5052.052	21818.83	37938.96	57905.96	90718.43	41736.26	26453.79
AveProfs	2526.026	10909.41	18969.48	28952.98	45359.22	20868.13	13226.9
Lnds	7.006128	14.87831	22.32713	30.76014	44.88975	23.56754	11.67304
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	0	0	0.0427	0.203669
Sperm_M	0	0	0	0	0	0.0546	0.328374
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	0	0	0	1	0.1048	0.323771
BotnDlph_I	0	0	0	0	0	0.0254	0.157979

Alternative 3 A I, Scenario 1

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	34	67	100	136	205	106.5517	52.70641
TotRevs	51366.5	106048.9	156866.6	215222.9	313524.5	165648.1	79981.12
TotProfs	5829.094	22115.14	38170.01	58025.02	90732.44	41992.89	26294.27
AveProfs	2914.547	11057.57	19085	29012.51	45366.22	20996.45	13147.14
Lnds	7.443648	15.05427	22.41006	30.78799	44.88975	23.71005	11.53808
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	0	0	0.0429	0.204117
Sperm_M	0	0	0	0	0	0.055	0.329524
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	0	0	0	1	0.106	0.32523
BotnDlph_I	0	0	0	0	0	0.0255	0.158279

Alternative 3 A II, Scenario 1

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	34	67	100	136	205	106.5517	52.70641
TotRevs	51366.5	106048.9	156866.6	215222.9	313524.5	165648.1	79981.12
TotProfs	5829.094	22115.14	38170.01	58025.02	90732.44	41992.89	26294.27
AveProfs	2914.547	11057.57	19085	29012.51	45366.22	20996.45	13147.14
Lnds	7.443648	15.05427	22.41006	30.78799	44.88975	23.71005	11.53808
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	0	0	0.0429	0.204117
Sperm_M	0	0	0	0	0	0.055	0.329524
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh_	0	0	0	0	1	0.106	0.32523
BotnDlph_I	0	0	0	0	0	0.0255	0.158279

Alternative 3 B, Scenario 1

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	34	67	100	136	205	106.5517	52.70641
TotRevs	51366.5	106048.9	156866.6	215222.9	313524.5	165648.1	79981.12
TotProfs	5829.094	22115.14	38170.01	58025.02	90732.44	41992.89	26294.27
AveProfs	2914.547	11057.57	19085	29012.51	45366.22	20996.45	13147.14
Lnds	7.443648	15.05427	22.41006	30.78799	44.88975	23.71005	11.53808
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	0	0	0.0429	0.204117
Sperm_M	0	0	0	0	0	0.055	0.329524
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_N	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	0	0	0	1	0.106	0.32523
BotnDlph_I	0	0	0	0	0	0.0255	0.158279

Alternative 3 C I, Scenario 1

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	34	67	100	136	205	106.5517	52.70641
TotRevs	51366.5	106048.9	156866.6	215222.9	313524.5	165648.1	79981.12
TotProfs	5829.094	22115.14	38170.01	58025.02	90732.44	41992.89	26294.27
AveProfs	2914.547	11057.57	19085	29012.51	45366.22	20996.45	13147.14
Lnds	7.443648	15.05427	22.41006	30.78799	44.88975	23.71005	11.53808
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	0	0	0.0429	0.204117
Sperm_M	0	0	0	0	0	0.055	0.329524
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	0	0	0	1	0.106	0.32523
BotnDlph_I	0	0	0	0	0	0.0255	0.158279

Alternative 3 C II, Scenario 1

	Q5	Q25	Q50	Q75	Q95	Mean	SD
Sets	33	67	100	136	205	106.2498	52.91182
TotRevs	50921.55	105326	156445.4	215187.3	313524.5	165293.6	80208.52
TotProfs	5829.094	22123.92	38144.35	58025.02	90732.44	41988.81	26290.87
AveProfs	2914.547	11061.96	19072.18	29012.51	45366.22	20994.4	13145.44
Lnds	7.381122	14.90951	22.34725	30.78195	44.88975	23.65624	11.57044
Fin_M	0	0	0	0	0	0	0
Hump_M	0	0	0	0	0	0.0429	0.204117
Sperm_M	0	0	0	0	0	0.055	0.329524
Leather_M	0	0	0	0	0	0	0
Logger_M	0	0	0	0	0	0	0
OliveRid_M	0	0	0	0	0	0	0
Green_M	0	0	0	0	0	0	0
ShtFnPiWh	0	0	0	0	1	0.1058	0.324988
BotnDlph_l	0	0	0	0	0	0.0255	0.158279