Overview of National Marine Fisheries Service Documents Submitted for PFMC Agenda Item G.2. Highly Migratory Species Management: Swordfish Management and Monitoring Plan Hard Caps

August 18, 2015
Prepared by NMFS West Coast Region

During Agenda Item G.2., the Council will consider swordfish management and monitoring, and may adopt final preferred alternatives for hard caps in the drift gillnet fishery. Following Council discussion and action at the June 2015 meeting, the National Marine Fisheries Service (NMFS) West Coast Region prepared the following documents for this discussion:

- *Preliminary Draft Environmental Assessment (EA) of Drift Gillnet Hard Caps and Monitoring Alternatives*
- *Preliminary Analysis of Options for Council Bycatch Performance Metrics for the U.S. West Coast Large-Mesh Drift Gillnet Fishery*[1]

This Preliminary Draft EA is a working draft; it is not yet an official draft EA but is intended to inform Council discussion on this agenda item. NMFS expects the official draft EA to be completed and available for public comment in late 2015, subject to Council final action in September. In the coming weeks, NMFS may further consider and enhance the version enclosed and provide an updated document for the Council's Supplemental Briefing Book (and flag any sections that are updated).

In addition to Council selection of final preferred alternatives, Council input is needed on the following sections or issues for further developing a draft EA after final Council action:

- Whether the 5-year hard cap sub-options meet the purpose and need of the action and should remain as part of the range of alternatives. If they remain, then the economic analysis of the hard caps will need to be expanded to include the 5-year sub-options. Otherwise, the 5-year sub-options would be moved to a section describing alternatives that were considered but not further analyzed.
- Alignment with the goals and objectives listed in Section 2.2 of the Highly Migratory Species Fishery Management Plan (HMS FMP). In the Preliminary Draft EA (section 5.1), NMFS suggested 6 of the 18 goals and objectives as relevant to the proposed action. The Council may consider if these are relevant to the proposed action and whether additional HMS FMP goals and objectives should be included.
- Consistency with Magnuson-Stevens Fishery Conservation and Management Act (MSA) National Standards. Fishery management actions prepared pursuant to the MSA must be consistent to the 10 National Standards for fishery conservation and management listed in MSA Section 301. NMFS seeks Council assistance to address the proposed action in relation to National Standards in Section 5.2 of the Preliminary Draft EA.

[1] This was not included in the Preliminary Draft EA because it does not entail a Federal action; the rationale is explained in the analysis.

PRELIMINARY DRAFT ENVIRONMENTAL ASSESSMENT

Drift Gillnet Hard Caps and Monitoring Alternatives

PREPARED BY:

DEPARTMENT OF COMMERCE
NATIONAL MARINE FISHERIES SERVICE
WEST COAST REGION
LONG BEACH, CALIFORNIA

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AUGUST 2015

Cover Sheet
Preliminary Draft Environmental Analysis of Drift Gillnet Hard Caps and Monitoring Alternatives

Proposed Action:	Establish hard caps on specific protected species and enhance monitoring in the drift gillnet fishery.
Type of Statement:	Preliminary Draft Environmental Assessment
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List of Acronyms

BO	Biological Opinion
CDFW	California Department of Fish and Wildlife
CFR	Code of Federal Regulations
CPUE	Catch Per Unit Effort
DGN	Drift Gillnet
DPS	Distinct Population Segment
EEZ	Exclusive Economic Zone
EFP	Exempted Fishing Permit
EM	Electronic Monitoring
EPO	Eastern Pacific Ocean
ESA	Endangered Species Act
FEP	Fishery Ecosystem Plan
FMP	Fishery Management Plan
FR	Federal Register
HMS	Highly Migratory Species
HMS FMP	Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species
HMSMT	Highly Migratory Species Management Team
HPPS	High Priority Protected Species
IATTC	Inter-American Tropical Tuna Commission
ISC	International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean
ITS	Incidental Take Statement
IUCN	International Union for Conservation of Nature
M&SI	Mortality and Serious Injury
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
NMFS	National Marine Fisheries Service
PBR	Potential Biological Removal
PDO	Pacific Decadal Oscillation
PLCA	Pacific Leatherback Conservation Area
PPA	Preliminary Preferred Alternative
SAFE	Stock Assessment and Fisheries Evaluation
SAR	Stock Assessment Report
SCB	Southern California Bight
SSLL	Shallow-Set Longline
TRT	Pacific Offshore Take Reduction Team
WPFMC	Western Pacific Fishery Management Council
ZMRG	Zero Mortality Rate Goal

1 INTRODUCTION

While the California large-mesh drift gillnet (DGN) fishery currently complies with all applicable laws, including the Magnuson-Stevens Fishery Conservation and Management Act (MSA), Endangered Species Act (ESA), and Marine Mammal Protection Act (MMPA), the Pacific Fishery Management Council (Council) seeks to establish additional precautionary measures beyond the standards set forth under the current legal requirements for the fishery. Therefore, the proposed action is to implement management measures for the DGN fishery to further reduce 1) interactions with ESA-listed species and other marine mammals, and 2) bycatch including bycatch mortality. A further component of the proposed action is to enhance monitoring of the DGN fishery, through the use of on-board observers and/or electronic monitoring (EM). Using MSA authority, the action would reduce levels of protected species takes in the fishery below those currently authorized under ESA and MMPA and further reduce bycatch of other species. The proposed action is intended to achieve these reductions while providing an economically viable west coast based swordfish fishery.

1.1 Proposed Action

The proposed action consists of two main components: 1) hard caps/limits on specific protected species and 2) enhanced fishery monitoring.

The first component includes establishing hard caps/limits on the number of high priority protected species (HPPS), including sea turtles, ESA-listed marine mammals, bottlenose dolphin, and short-finned pilot whale caught in the DGN fishery. If a limit is met or exceeded, the DGN fishery would close for the remainder of the fishing season, which is defined as May 1 through January 31.

The second component of the proposed action is to enhance the current DGN monitoring program, which would involve on-board observers and/or EM.

The hard caps and monitoring alternatives are analyzed later in this document. These are the alternatives which would require action by the National Marine Fisheries Service (NMFS) and which have specific effects to be analyzed.

Another set of alternatives considered by the Council would establish performance metrics. Performance metrics are not hard caps. Performance metrics are levels of bycatch of finfish or non-ESA-listed marine mammals encountered in the existing DGN fishery. They serve as a metric that can be used to measure how the DGN fishery performs to minimize bycatch. The alternatives are based on recommendations from the Highly Migratory Species Management Team (HMSMT), public comment, and Council action.

The effects of performance metrics are not analyzed in this document since the Alternatives do not identify specific actions that would be taken if a performance metric is exceeded. The Council would review fishery performance in relation to the performance metrics after the end of each fishing season (May 1 through January 31) and determine if any management measures are needed to further minimize bycatch in the DGN fishery. The effects of any new management measures recommended by the Council would be analyzed at that time.

The Council and its HMSMT would monitor DGN fishery performance relative to performance metrics after each fishing season based on data that are collected by NMFS, including observer data. Monitoring DGN performance relative to performance metrics would require no new collection of information.

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 coast of California, Oregon, and Washington.[1] To a large degree, the action area for 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 from 2001 to 2010 represent the current state and expected extent of the DGN fishery in the foreseeable future (Figure 1). Additional years of data (2011 – 2013) will be added to Figure 1 in future updates to this document, although the range and extent of the DGN fishery is not likely to be different than what is currently shown.

[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 could include a small amount DGN fishing effort occurring in the high seas waters outside the EEZ in relatively close proximity to the EEZ, although fishing effort has not been observed in high seas waters from 2001 to 2010 (Figure 1).

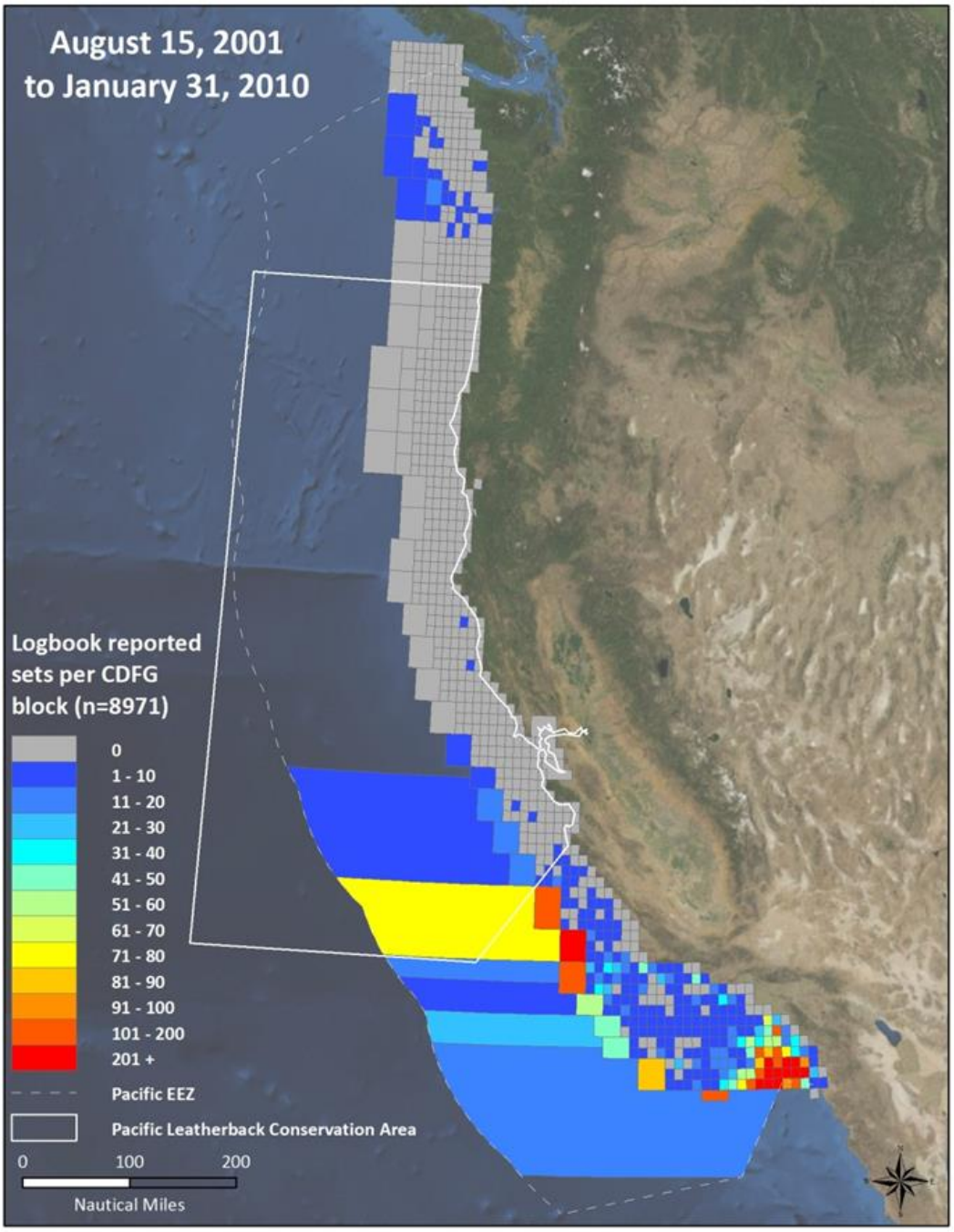

Figure 1. DGN logbook-reported fishing effort from August 15, 2001, to January 31, 2010.

1.3 Purpose and Need

The purpose of the proposed action is to conserve non-target species and further reduce bycatch, including incidental take of ESA-listed species and marine mammals, in the DGN fishery below levels currently permitted by applicable law while maintaining or enhancing an economically viable west-coast-based swordfish fishery.

The proposed action is needed to better integrate fishery management under the Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species (HMS FMP) with enhanced protection of ESA-listed species and other marine mammals, and to address National Standard 9 and Section 303 of the MSA to minimize bycatch and bycatch mortality and conserve non-target species to the extent practicable.

1.4 Background

The DGN fishery for swordfish and thresher shark (14" minimum mesh size) is managed through both federal and state regulations to conserve target and non-target stocks including protected species that are incidentally captured. The regulations for ≥14" stretched mesh drift gillnets are summarized as follows:

Federal Regulations

Pacific Offshore Cetacean Take Reduction Plan measures to protect marine mammals (50 CFR 229.31[2]):

• Acoustic deterrent devices (pingers) are required on drift gillnets to deter entanglement of marine mammals. Pingers, when immersed in water, must broadcast a 10 kHz (± 2kHz) sound at 132 dB (±4 dB) re 1 micropascal at 1 meter lasting 300 milliseconds (± 15 milliseconds) and repeating every 4 seconds (±0.2 seconds). They must also remain operational to a water depth of at least 100 fathoms). Pingers must be attached in a staggered configuration no more than 300 ft (91.44m) apart along the floatline and leadline (Figure 2).

• All drift gillnets must be fished at minimum depth below the surface of 6 fathoms (fm) (10.9 m).

• Attendance at skipper workshops is required after notification from NMFS.

• Vessels must provide accommodations for observers when assigned.[3]

[2] Initially implemented in 1997 (62 FR 51805; October 3, 1997); amended in 1998 (63 FR 27860; May 21, 1998); amended again in 1999 (64 FR 3431; January 22, 1999).

[3] This is a regulatory requirement under 50 CFR 660.719.

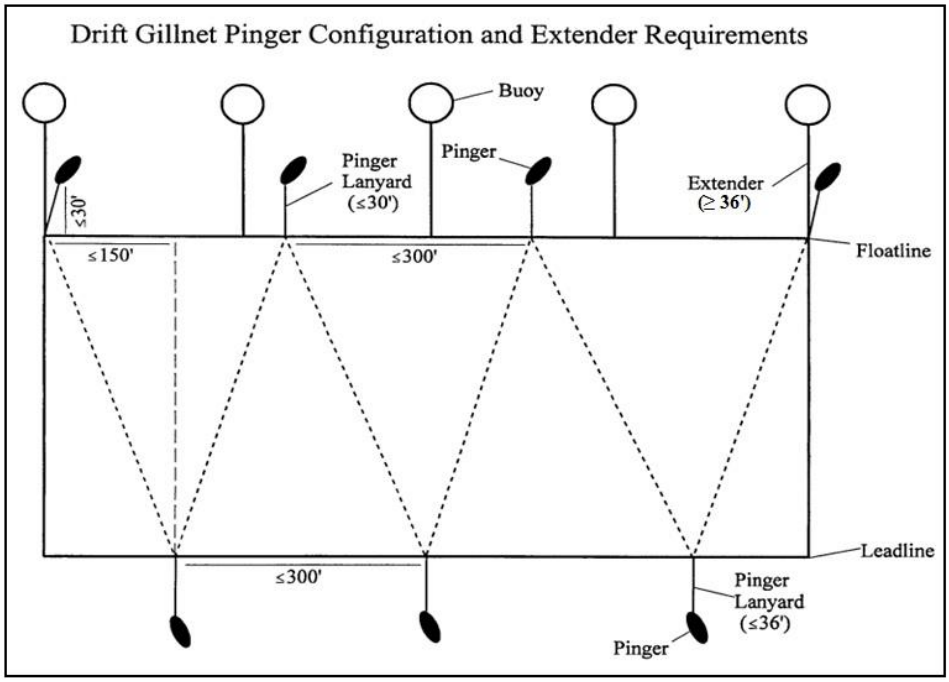

Figure 2. Diagram of required pinger placement on a drift gillnet (50 CFR Sec. 229.31).

Pacific Sea Turtle Conservation Areas (50 CFR 660.713)

• Drift gillnet fishing may not be conducted:

- From August 15 to November 15 in the portion of the EEZ bounded by the coordinates 36° 18.5' N latitude (Point Sur), to 34°27' N latitude, 123° 35' W longitude; then to 129°W longitude; then north to 45° N latitude; then east to the point where 45° N latitude meets land - Pacific Leatherback Conservation Area (PLCA).
- From the months of June, July, and/or August during a forecast or declared El Niño, as announced by NMFS in the Federal Register, in the portion of the EEZ south of Point Conception, California (34°27' N latitude) and west to 120° W longitude - Pacific Loggerhead Conservation Area.

The two Pacific sea turtle conservation areas are based on a NMFS October 23, 2000, biological opinion on the DGN fishery and subsequent recommendations made by the Pacific Offshore Cetacean Take Reduction Team (TRT) in 2001 (TRT 2001). In an effort to minimize the economic impact of the time and area closures, NMFS modified the TRT recommendations in the 2001 final rule creating the PLCA (66 FR 44549; August 24, 2001). The TRT recommended a line heading due west from shore at 36°15' N latitude as the southern boundary of the PLCA. NMFS moved the southern boundary's intersection with shore to Point Sur because it is a more recognizable landmark and only three miles north of 36° 15' N latitude. NMFS also modified the TRT recommendation (a line heading due west) to a diagonal line from Point Sur to 34° 27' N latitude, 123° 35' W longitude based on satellite tracking data of two leatherback turtles tagged in Monterey Bay in September 2000. The reason for this precaution was to protect a potential migratory corridor of leatherbacks departing Monterey Bay for western Pacific nesting beaches. The original trigger language identified by the TRT to extend the area closure in a southerly direction to Point Conception if a leatherback was observed taken was also removed because NMFS did not consider this extra precaution to be necessary based on the distribution of the turtles that had historically been

taken incidentally in the fishery. In addition, the final PLCA did not include lowering the top of drift gillnets to at least 60 feet deep as recommended by the TRT, because observer data (1990-2000) did not suggest that this would result in a definite decrease in leatherback interactions. Modifications provided access to the productive fishing grounds north of Point Conception, which is consistent with the intent of the TRT proposal, while still providing at least an equal, if not greater, level of protection for leatherback and loggerhead sea turtles.

The Pacific sea turtle conservation areas, as well as other seasonal time/area closures for the DGN fishery and designated leatherback critical habitat, are shown below in Figure 3.

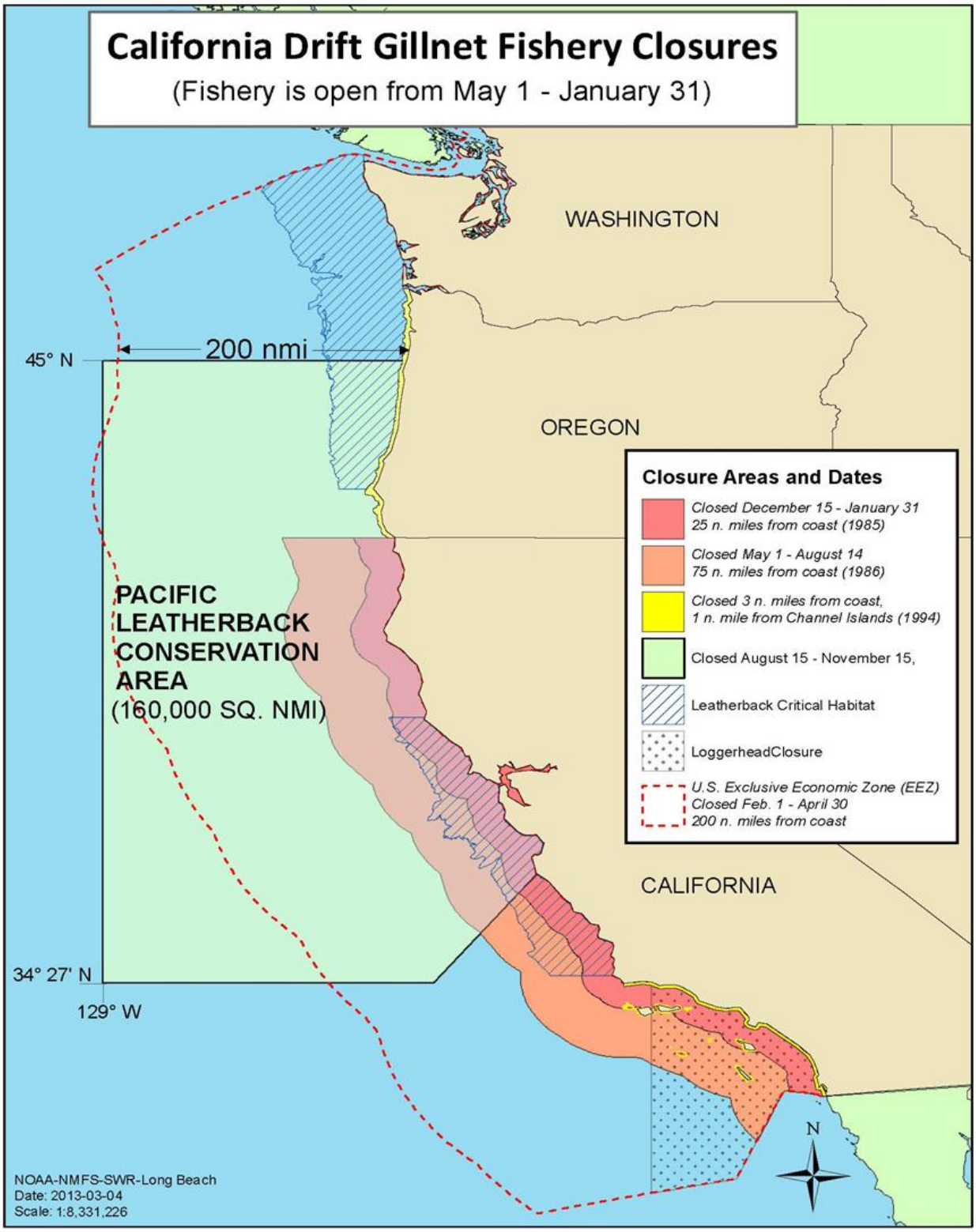

Figure 3. Pacific Sea Turtle Conservation Areas and other time/area closures for the DGN fishery and designated leatherback critical habitat.

State Restrictions (applicable to vessels operating from the state's ports)

Participation restrictions:

• California has a limited entry program, which was adopted into the HMS FMP, for the swordfish/thresher shark DGN fishery. No new permits will be issued and current permits (issued to vessel operator) can only be transferred under certain conditions to another fisherman currently holding or eligible for a general gillnet/trammel net permit by the State of California.

Gear restrictions (California):

• The maximum cumulative length of a shark or swordfish gill net(s) on the net reel of a vessel, on the dock of the vessel, and/or in the water at any time shall not exceed 6,000 ft in float line length, except that up to 250 fm of spare net (in separate panels not to exceed 100 fm) may be on board the vessel stowed in lockers, wells, or other storage.

• The use of quick disconnect devices to attach net panels is prohibited.

• DGN gear must be at least 14 inch stretched mesh.

• The unattached portion of a net must be marked by a pole with a radar reflector.

Mainland area restrictions/closures:

• DGN gear cannot be used:

- In the EEZ off California from February 1 to April 30.
- In the portion of the EEZ off California within 75 nm of the coastline from May 1 to August 14.
- In the portion of the EEZ off California within 25 nm of the coastline from Dec. 15 through Jan. 31.
- In the portion of the EEZ bounded by a direct line connecting Dana Point; Church Rock on Catalina Island; and Point La Jolla, San Diego County; and the inner boundary of the EEZ from August 15 through September 30 each year.
- In the portion of the EEZ within 12 nm from the nearest point on the mainland shore north to the Oregon border from a line extending due west from Point Arguello.
- East of a line running from Point Reyes to Noonday Rock to the westernmost point of southeast Farallon Island to Pillar Point.
- In waters shallower than 1,000 fm off the Oregon coast.
- In State waters off the Washington coast (Washington does not authorize the use of this gear).

Channel Islands (California) closures:

• DGN gear cannot be used:

- In the portion of the EEZ within six nm westerly, northerly, and easterly of the shoreline of San Miguel Island between a line extending six nm west magnetically from Point Bennett and a line extending six nm east magnetically from Cardwell Point and within six nm westerly, northerly, and easterly of the shoreline of Santa Rosa Island between a line extending six nm west magnetically from Sandy Point and a line extending six nm east magnetically from Skunk Point, from May 1 through July 31 each year.
- In the portion of the EEZ within 10 nm westerly, southerly, and easterly of the shoreline of San Miguel Island between a line extending 10 nm west magnetically from Point Bennett and a line extending 10 nm east magnetically from Cardwell Point and within 10 nm westerly, southerly, and easterly of the shoreline of Santa Rosa Island between a line extending 10 nm west magnetically from Sandy Point and a line extending 10 nm east magnetically from Skunk Point from May 1 through July 31 each year.
- In the portion of the EEZ within a radius of 10 nm of the west end of San Nicolas Island from May 1 through July 31 each year.
- In the portion of the EEZ within six nm of the coastline on the northerly and easterly side of San Clemente Island, lying between a line extending six nm west magnetically from the

extreme northerly end of San Clemente Island to a line extending six nm east magnetically from Pyramid Head from August 15 through September 30 each year.

2 ALTERNATIVES PROPOSED FOR THE DRIFT GILLNET FISHERY

At its June 2014 meeting, the Council directed the HMSMT to begin development of a range of alternatives to: 1) establish hard caps on HPPS incidentally caught in the DGN fishery, 2) set performance standards on the amount of bycatch of other species, and 3) enhance monitoring of the fishery.

The Council adopted three sets of alternatives and identified a Preliminary Preferred Alternative (PPA) for each at its September 2014 meeting. The Council refined these alternatives at its November 2014 meeting.

At its March 2015 meeting, the Council adopted a second hard cap PPA identified as the California Department of Fish and Wildlife (CDFW) PPA. This additional hard cap PPA was developed to address implementation issues that NMFS had identified in the Council's PPA from September 2014. The Council also adopted a second performance measure that uses a more recent time frame to calculate performance measures than is used in the Council PPA.

At its June 2015 meeting, the Council added a two-year hard cap sub-option to the Council hard cap PPA and the CDFW hard cap PPA.

2.1 Hard Caps

Hard caps are limits on DGN interactions with HPPS. Hard cap management would be aligned with the fishing season (May 1-January 31)[4] and the fishery would be closed as soon as practicable for the remainder of the fishing season after interactions reach the hard cap value.

There are 6 alternatives, including the no action alternative, considered for establishing hard cap limits.

- Alternatives 1 through 4:
  Mortalities and serious injuries (M&SI) to protected species are counted towards the hard cap. In MMPA regulations, a serious injury to a marine mammal is defined as "any injury that will likely result in mortality" (50 CFR 229.2). NMFS does not have a definition of serious injury for sea turtles. The cap levels are expressed in Table 1 as estimated total M&SI. If fishery monitoring is below 100 percent, then the number of observed M&SI may be expanded based on the level of monitoring to estimate total take to determine whether a cap has been reached or exceeded.

- Alternative 5:
  Cap levels are based on observed entanglement (not M&SI) at an assumed 30 percent observer coverage level. In the future, the cap levels would remain the same, regardless of actual observer

[4] The fishery is closed February 1-April 30 and prohibited from operating within 75 nm of the mainland shore from May 1 to August 14. Between August 15 and January 31 additional closures are in place including the PLCA. Very little fishing activity occurs between May 1 and August 14.

coverage level. Entanglement is defined under this alternative as "an animal captured in any part of the DGN gear, regardless of its condition". Alternative 5 cap levels are derived by applying a ratio of 0.3 to the cap levels under Alternative 4 and rounding up the fractional results.

There are sub-options with various time scales for hard caps.

- Alternatives 1 through 3 contain sub-options, which would establish either a one-year or a five-year hard cap on HPPS.

- Alternatives 4 and 5 contain sub-options which would establish either a one-year or a two-year average hard cap on HPPS.

Table 4. Summary of hard cap levels under the action alternatives. (Blank cells indicate there is no cap for that species proposed under the alternative.)

	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5	
Number of Years	1	5	1	5	1	5	1	2-Year Average	1	2-Year Average
Fin Whale	1	2					2	2	1	1
Humpack Whale	2	4	11	55	5	25	2	2	1	1
Sperm Whale	2	8	2	8	3	15	2	2	1	1
Leatherback Turtle	3	10	3	10	4	13	3	3	1	1
Loggerhead Turtle	3	7	3	7	4	9	3	3	1	1
Olive Ridley Turtle	1	2					2	2	1	1
Green Turtle	1	2					2	2	1	1
Short-fin Pilot Whale CA/OR/WA stock			5	23			5	5	2	2
Bottlenose Dolphin CA/OR/WA stock							6	6	2	2
Pinniped Group			4,316	21,580						
Dolphin Group			13,582	67,910						

2.1.1 No Action Alternative

Hard caps on incidental catch of protected species would not be established for the DGN fishery.

NMFS currently manages DGN incidental catch of ESA-listed marine mammals and sea turtles relative to the Incidental Take Statement (ITS) in the May 2, 2013, Biological Opinion (BO) for the fishery (Table 2). If the DGN fishery exceeds the ITS for any species, NMFS is required by the ITS to re-initiate ESA Section 7 consultation to determine if the amount of take expected in the fishery jeopardizes the continued existence of ESA-listed species.

Table 2. Amount and extent of take in the 2013 DGN BO.

	Annual take	5-year take total	Expected mortalities[5] during 5-year period
Fin whale	up to 1	up to 2	up to 1
Humpback whale	up to 2	up to 4	up to 2
Sperm whale	up to 2	up to 8	up to 6
Leatherback turtle	up to 3	up to 10	up to 7
Loggerhead turtle	up to 3	up to 7	up to 4
Olive ridley turtle	up to 1	up to 2	up to 1
Green turtle	up to 1	up to 2	up to 1

NMFS currently manages incidental catch of marine mammals under the MMPA. The catch of each marine mammal stock is compared to that stock's Potential Biological Removal (PBR). PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, which may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. The TRT established for the DGN fishery evaluates the fishery's performance relative to PBR and recommends measures to keep the catch of each marine mammal stock below PBR. The TRT is also tasked with identifying measures to reduce human-caused M&SI of each stock of marine mammal to below its Zero Mortality Rate Goal (ZMRG). ZMRG is defined as 10 percent of a stock's PBR.

2.1.2 Action Alternative 1 - Species Listed in the ITS

Establish hard caps for HPPS, which are species listed in the ITS in the May 2, 2013, BO for the DGN fishery. The hard cap values are equal to the estimated total amount of expected take listed in Table 12 in the 2013 DGN fishery BO.

M&SI to protected species are counted towards the hard cap. The cap numbers are expressed in Table 3 as estimated total M&SI. If fishery monitoring is below 100 percent then observed M&SI would be expanded based on the level of monitoring to estimate total take to determine whether a cap has been reached or exceeded. If the hard cap on any species is reached or exceeded, the DGN fishery would be closed for the remainder of the fishing season.

There are two sub-options:

> Alt 1 Sub-option 1: annual hard caps based on each fishing season. These would be assessed based on total estimated M&SI beginning on May 1 each year.
>
> Alt 1 Sub-option 2: five-year hard caps. The determination of whether a five-year cap has been reached or exceeded would be based on estimated M&SI during the current fishing season and the previous four fishing seasons.

[5] Includes animals that may be determined to have experienced either serious injury or mortality as a result of interaction with the fishing gear.

Table 3 shows the resulting hard cap values under this alternative.

Table 3. One and five year hard cap values under Alternative 1.

Species	One Year Hard Cap	Five Year Hard Cap	Basis
Fin whale	1	2	ITS
Humpback whale	2	4	ITS
Sperm whale	2	8	ITS
Leatherback sea turtle	3	10	ITS
Loggerhead sea turtle	3	7	ITS
Olive ridley sea turtle	1	2	ITS
Green sea turtle	1	2	ITS

2.1.3 Action Alternative 2 - Recently Caught Marine Mammals and Select Sea Turtles

Establish hard caps for marine mammals based on documented recent (2001-2013) encounters with the DGN fishery and selected ESA-listed sea turtles for which population status is of greatest concern. For non-ESA listed marine mammals, other than short-fin pilot whales, hard caps are established for grouped dolphins and pinnipeds.

Marine mammal hard caps are based on PBR from the 2013 U.S. Pacific Marine Mammal Stock Assessment Report (Carretta, *et al.* 2013). For non-ESA listed marine mammals, hard caps are established for grouped dolphins and pinnipeds. Hard cap values for ESA-listed sea turtles are based on the expected amount of take of individuals shown in Table 12 in the 2013 DGN fishery BO. Hard caps would not be revised as PBR values for species or groups change.

M&SI to protected species are counted towards the hard cap. The cap numbers are expressed in Table 4 as estimated total M&SI. If fishery monitoring is below 100 percent, then the numbers of observed M&SI would be expanded based on the level of monitoring to estimate total take to determine whether a cap has been reached or exceeded. If the hard cap on any species is reached or exceeded, the DGN fishery would be closed for the remainder of the fishing season.

There are two sub-options:

> Alt 2 Sub-option 1: annual hard caps based on each fishing season. These would be assessed based on total estimated M&SI beginning May 1 each year.
>
> Alt 2 Sub-option 2: five-year hard caps. The determination of whether a five-year cap has been reached or exceeded would be based on estimated M&SI during the current fishing season and the previous four fishing seasons. For the five-year PBR-based hard caps annual PBR values are multiplied by five.

Table 4 shows the hard cap values for Alternative 2. Hard cap values for the dolphin group and pinniped group would be based on summing the PBR values for the constituent stocks. Table 5 shows the constituent stocks and their PBR values.

Table 4. One- and five-year hard cap values under Alternative 2.

Species	One-Year Hard Cap	Five-Year Hard Cap	Basis
Humpback whale	11	55	PBR
Sperm whale	2	8	Rounded up PBR*
Short-fin pilot whale	5	23	PBR
Pinniped group	4,316	21,580	PBR
Dolphin group	13,582	67,910	PBR
Leatherback sea turtle	3	10	ITS
Loggerhead sea turtle	3	7	ITS

*For the five-year cap value the fractional one-year value is multiplied by five and then rounded up.

Table 5. PBR values (Carretta*, et al.* 2013) for components of the dolphin and pinniped groups.

Group / Stock	PBR
Dolphin group	**4,316**
Short-beaked common dolphin	3,440
Long-beaked common dolphin	610
Pacific white-sided dolphin	171
Northern right whale dolphin	48
Risso's dolphin	39
Bottlenose dolphin	7.9
Pinniped group	**13,582**
California sea lion	9,200
Northern elephant seal	4,382

2.1.4 Action Alternative 3 - Select ESA-listed Marine Mammals and Sea Turtles

Establish hard caps for ESA-listed marine mammals (sperm and humpback whales) and sea turtles (leatherback and loggerhead turtles) for which population status is of particular concern.

Hard cap values are based on levels for which takes are unlikely to trigger a jeopardy determination under an ESA section 7 consultation. A jeopardy determination is made on a case-by-case basis. If actual estimated takes exceed the expected take levels listed in the ITS, then consultation under section 7 of the ESA is reinitiated. Through that process the jeopardy determination is made. There is no specific guidance in place stating what specific levels of take above the expected take listed in the BO would result in a jeopardy determination. Therefore, the hard cap values under this alternative have been determined based on estimated fishery M&SI for marine mammals and values slightly above the expected take listed in the BO.

M&SI to protected species are counted towards the hard cap. The cap numbers are expressed in Table 6 as estimated total M&SI. If fishery monitoring is below 100 percent then observed M&SI would be expanded based on the level of monitoring to estimate total take to determine whether a cap has been reached or exceeded. If the hard cap on any species is reached or exceeded, the DGN fishery would be closed for the remainder of the fishing season.

There are two sub-options:

Alt 3 Sub-option 1: annual hard caps based on each fishing season. These would be assessed based on total estimated M&SI beginning May 1 each year.

Alt 3 Sub-option 2: five-year hard caps. The determination of whether a five-year cap has been reached or exceeded would be based on estimated M&SI during the current fishing season and the previous four fishing seasons.

Table 6 shows the hard cap values under this alternative.

Table 6. One and five year hard cap values for Alternative 3.

Species:	One-Year Hard Cap	Five-Year Hard Cap	Basis
Humpback whale	5	25	Rounded down fishery M&SI
Sperm whale	3	15	Rounded down fishery M&SI
Leatherback sea turtle	4	13	1.25 X ITS rounded up
Loggerhead sea turtle	4	9	1.25 X ITS rounded up

2.1.5 Action Alternative 4 – HPPS and Marine Mammals over ZMRG (Council PPA)

Establish hard caps for HPPS and marine mammal species with an annual fishery M&SI of greater than or equal to 10 percent of PBR. In addition, a hard cap is set for short-fin pilot whale. This stock is not ESA-listed and the fishery M&SI is below 10 percent of PBR. However, its PBR of 4.6 animals is low. Marine mammals where annual fishery M&SI (from all fisheries) exceeds 10 percent of PBR were identified based on information provided in Appendix 3 to the 2013 Pacific Marine Mammal Stock Assessment Report. Table 7 shows reported PBR and fishery M&SI values for these stocks. Fishery M&SI takes into account the effect of all fisheries, not just the DGN fishery.

Hard cap values for ESA-listed species are based on the expected amount of take of individuals shown in Table 12 in the 2013 DGN fishery BO. However, the hard caps for fin whale, olive ridley sea turtle, and green turtle are set above the estimated one-year take in the ITS, recognizing that these species are infrequently encountered in the DGN fishery so expected take is less likely to trigger a jeopardy determination. For non-ESA listed marine mammals, PBR (Carretta, *et al.* 2013) is used for the hard cap values.

M&SI to protected species are counted towards the hard cap. The cap numbers are expressed in Table 8 as estimated total M&SI. If fishery monitoring is below 100 percent then observed M&SI would be expanded based on the level of monitoring to estimate total take to determine whether a cap has been reached or exceeded. If the hard cap on any species is reached or exceeded, the DGN fishery would be closed for the remainder of the fishing season.

There are two sub-options:

Alt 4 Sub-option 1: annual hard caps based on each fishing season. These would be assessed based on total estimated M&SI beginning May 1 each year.

Alt 4 Sub-option 2: two-year hard caps. The two-year caps are the average of estimated M&SI over the biennial management cycle or two consecutive fishing seasons.

Table 8 shows the hard cap values for this alternative.

Table 7. Information from the 2013 Pacific Stock Assessment Report for stocks where annual fishery M&SI is greater than or equal to 10 percent of PBR.

Species	Stock Area	PBR	Annual Fishery M&SI	10% PBR
Common bottlenose dolphin	C/O/W Offshore	5.5	≥2.0	0.55
Sperm whale*	C/O/W	1.5	3.8	0.15
Humpback whale	C/O/W	11	≥ 4.4	1.1

*In the draft 2014 Pacific Marine Mammal Stock Assessment Report the PBR for sperm whale is revised to 2.7 and annual fishery M&SI is revised to 1.7.

Table 8. Hard cap values for Alternative 4 (Council PPA)

Species	One Year Hard Cap	Two Year Average Hard Cap	Basis
Fin whale	2	2	ITS
Humpback whale	2	2	ITS
Sperm whale*	2	2	ITS
Leatherback sea turtle	3	3	ITS
Loggerhead sea turtle	3	3	ITS
Olive ridley sea turtle	2	2	ITS
Green sea turtle	2	2	ITS
Short-fin pilot whale C/O/W stock	5	5	Rounded up PBR
Common bottlenose dolphin C/O/W Offshore stock	6	6	Rounded up PBR

2.1.6 Action Alternative 5 – Observed Entanglement Caps (CDFW PPA)

This Alternative establishes hard caps for the same HPPS as in Alternative 4. Observed entanglement of a protected species, rather than estimated M&SI, would count towards a hard cap. Entanglement is defined under this alternative as an animal captured in any part of the DGN gear, regardless of its condition.

The hard caps under this Alternative were calculated based on 30 percent observer coverage, which is the NMFS DGN Observer Program target coverage level. The cap numbers are derived by applying a ratio of 0.3 to the cap numbers under Alternative 4 and rounding up the fractional results. These caps would not change if observer coverage levels differed from 30 percent. If the hard cap on any species is reached or exceeded, the DGN fishery would be closed for the remainder of the fishing season.

There are two sub-options:

Alt 5 Sub-option 1: annual hard caps based on each fishing season. These would be assessed based on based on total observed entanglement beginning May 1 each year.

Alt 5 Sub-option 2: two-year hard caps. The two-year caps are the average of observed entanglements over the biennial management cycle or two consecutive fishing seasons. Table 9 shows the hard cap values for this alternative.

Table 9. CDFW Preliminary Preferred Alternative - annual hard caps (Observed Entanglement Caps) for high priority species or species of concern. Values in parentheses reflect fractional numbers derived by multiplying the caps in Alternative 4 by 0.3.

Species	One-Year Observed Entanglement Cap	Two-Year Average Observed Entanglement Cap
Fin whale	1 (0.6)	1
Humpback whale	1 (0.6)	1
Sperm whale	1 (0.6)	1
Leatherback sea turtle	1 (0.9)	1
Loggerhead sea turtle	1 (0.9)	1
Olive ridley sea turtle	1 (0.6)	1
Green sea turtle	1 (0.6)	1
Short-fin pilot whale	2 (1.5)	2
Common bottlenose dolphin C/O/W Offshore stock	2 (1.8)	2

2.2 Monitoring

Under all of the alternatives, prior to each fishing year, NMFS would inform the Council of the level of observer coverage and/or EM that NMFS would be able to fund. The balance of the costs associated with observer coverage/EM requirements would be non-government funded. Individual vessel owners/operators would be allowed to contract with an approved observer or EM provider company to meet any monitoring requirements beyond those paid for by NMFS.

2.2.1 No Action Alternative

NMFS would continue to place observers on board DGN vessels, targeting 30 percent coverage of total fishing effort each fishing season. Vessels that do not meet observer safety and accommodations requirements (50CFR 600.746) are not selected for observer coverage, and are allowed to fish without an observer. The observable portion of the DGN fleet is observed at a rate higher than 30 percent, in order to attain 30 percent coverage fleet-wide.

2.2.2 Action Alternative 1 - Observers for Biological Sampling and 100% EM

Target observer coverage to a level sufficient for biological sampling and require EM on all DGN vessels that fish.

2.2.3 Action Alternative 2 - 50% Observer Coverage

Require a minimum of 50 percent observer coverage level on each vessel in the DGN fishery. Unobservable vessels would be prohibited from fishing in the DGN fishery.

2.2.4 Action Alternative 3 – 100% Monitoring (Council PPA/CDFW PPA)

Require 100 percent monitoring in the DGN fishery, using on-board observers and/or EM, by 2018. Vessels which are unobservable or unable to carry EM would be prohibited from fishing in the DGN fishery when 100 percent monitoring is required. Maintain NMFS current 30 percent target observer coverage level until 100 percent monitoring is required.

3 AFFECTED ENVIRONMENT

This chapter describes the resources that may be affected by the proposed action. These resources include target, non-target, and prohibited species captured in the DGN fishery; protected species; essential fish habitat; critical habitat; and the socioeconomic environment. The HMS FMP provides a detailed description of the baseline environment for all Highly Migratory Species (HMS) fisheries, including the DGN fishery and the reader is referred to that reference for further insight (PFMC 2003, Ch.4 Pg.14).

3.1 Baseline Description of Commercial Fisheries in the Proposed Action Area

3.1.1 DGN Fishery

California's swordfish fishery transformed from primarily a harpoon fishery to a drift gillnet fishery in the early 1980s; landings soared to a historical high of 2,198 mt by 1985. Initial development of the drift gillnet fishery in the late 1970s was founded on catches of common thresher shark. The thresher shark fishery rapidly expanded, with 228 vessels landing more than 1,000 mt of shark in 1985. Following 1985, swordfish replaced thresher shark as the primary target species because there was a greater demand for swordfish which commanded a higher price-per-pound and possibly also due to the 1986 establishment of a state of California shark conservation measure. Annual thresher shark landings declined in subsequent years because of the switch to swordfish to maximize economic returns and the implementation of management measures to protect the thresher shark resource. From 2012 through 2014 thresher shark landings in the DGN fishery ranged from 10 mt to 48 mt (2015 HMS SAFE).

The drift gillnet fishery is managed by a limited entry permit system, with mandatory gear standards and seasonal area closures used to address various conservation concerns. The permit is linked to an individual fisherman, not a vessel, and is only transferable under very restrictive conditions; thus the value of the vessel does not become artificially inflated. To keep a permit active, current permittees are required to purchase a permit from one consecutive year to the next; however, they are not required to make landings using drift gillnet gear. In addition, a general resident or non-resident commercial fishing license, general gillnet permit, and a current vessel registration are required to catch and land fish caught in drift gillnet gear. The DGN permit may only be transferred to an individual who already possesses a general gillnet permit. A logbook is also required. The HMS FMP requires a federal permit with a drift gillnet gear endorsement for all U.S. vessels that fish for HMS within the West Coast EEZ and for U.S. vessels that pursue HMS on the high seas (seaward of the EEZ) and land their catch in California, Oregon, or Washington. About 150 permits were initially issued when the limited entry program was established in 1980 and peaked at 251 permits in 1986. In recent years the number of extant permits has declined below 50.

Historically, the California drift gillnet fleet operated within EEZ waters adjacent to the state and as far north as the Columbia River, Oregon, during El Niño years. In addition some Oregon-based vessels participated in this fishery. In Oregon, the DGN fishery for swordfish had been managed under the Developmental Fisheries Program, which authorized up to ten annual permits to fish for swordfish with DGN gear. The fishery became inactive and no one applied for permits. As part of a substantial reduction in the Developmental Fisheries Program, the Oregon Fish and Wildlife Commission removed swordfish from the program, beginning in 2009. Consequently, state permits to fish with DGN gear off Oregon are no longer allowed.

Fishing activity is highly dependent on seasonal oceanographic conditions that create temperature fronts which concentrate feed for swordfish. Because of the seasonal migratory pattern of swordfish and seasonal fishing restrictions, nearly all of the fishing effort in recent years has occurred from August 15 through January 31 off the California coast.

The drift gillnet fishery has been subject to a number of seasonal closures over the years. Since 1982, the drift gillnet fishery has been closed inside the entire West Coast EEZ from February 1 to April 30. In 1986, a closure was established within 75 miles of California mainland from June 1 through Aug 14 to conserve common thresher sharks; this closure was extended to include May in 1990 and later years. In 2001, NMFS implemented two Pacific sea turtle conservation areas on the West Coast with seasonal drift gillnet restrictions to protect endangered leatherback and loggerhead turtles. The larger of the two closures spans the EEZ north of Point Conception, California (34°27' N. latitude) to mid-Oregon (45° N. latitude) and west to 129° W. longitude. Drift gillnet fishing is prohibited annually within this conservation area from August 15 to November 15 to protect leatherback sea turtles. A smaller closure was implemented to protect Pacific loggerhead turtles from drift gillnet gear during a forecasted or concurrent El Niño event, and is located south of Point Conception, California and west of 120° W. longitude from June 1 – August 31 (72 FR 31756). Since the leatherback closure was enacted the number of active participants in the drift gillnet fishery declined by nearly half, from 78 vessels in 2000 to 40 in 2004, and has remained under 50 vessels since then.

As indicated above, both participation and fishing effort (measured by the number of sets) have declined over the years. Industry representatives attribute the decline in vessel participation and annual effort to regulations implemented to protect marine mammals, endangered sea turtles, and seabirds. In addition, if oceanic or other conditions are unfavorable for swordfish, permittees may concentrate on more favorable fisheries, such as albacore; however, permittees may return to swordfish fishing once conditions improve. DGN fishery revenue and number of participating vessels are shown in Figure 4.

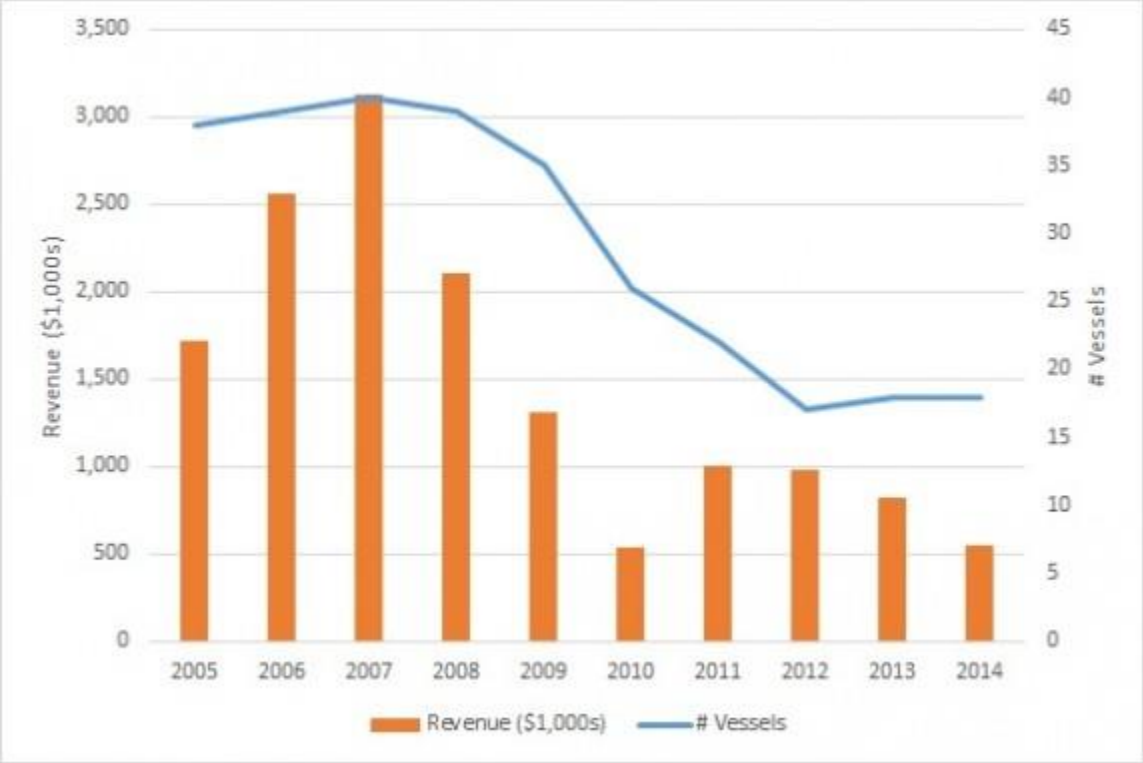

Figure 4. Real (inflation adjusted) ex-vessel revenue ($1,000s) and number of vessels in the West Coast drift gillnet fishery, 2005-2014.

3.1.2 DGN Fishery Observer Program

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 1980–90. The NMFS observer program has been entirely government-funded since 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 nor accurately reported in the fishing logbooks, due to focus on target species by fishermen or incentives not to report certain species to avoid increased regulation. These observer data are relied upon to produce estimates of protected species bycatch and forecast potential impacts of future fishing effort on these species.

Since 1990, 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). 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. Four to six DGN vessels have been unobservable during each fishing season from 2011 to present.

Table 10 provides the recent history of observer coverage based on the calendar year fishing effort (although the fishing season typically runs August - January), which has been less than 20 percent in some years. Overall, the annual average of observer coverage that occurred from 2001-2014 was 19.8 percent and total observer coverage of all effort during this time was 19.4 percent.

Table 10. Summary of CA thresher shark/swordfish DGN Observer Program from 2001-2014 (calendar fishing year January to December).

Calendar Year	Estimated Total Fishing Effort (Sets)	Total Number of Observed Sets	% Observer Coverage
2001	**1665**	**339**	**20.4%**
2002	**1630**	**360**	**22.1%**
2003	**1467**	**298**	**20.3%**
2004	**1084**	**223**	**20.6%**
2005	**1075**	**225**	**20.9%**
2006	**1433**	**266**	**18.6%**
2007	**1241**	**204**	**16.4%**
2008	**1103**	**149**	**13.5%**
2009	**761**	**101**	**13.3%**
2010	**492**	**59**	**12.0%**
2011	**435**	**85**	**19.5%**
2012	**445**	**83**	**18.7%**
2013	**470**	**176**	**37.4%**
2014	**409**	**97**	**23.7%**

3.1.3 Other Commercial Fisheries in the Proposed Action Area

Surface Hook-and-Line Fishery for Albacore

Albacore is an economically valuable fishery in all three West Coast states and has been a target of commercial fishermen for more than 100 years. Troll and bait boat (live bait) are the principal commercial gears, although some albacore is caught using purse seine, longline, and drift gillnet gear as well. The fishing season varies from year to year, depending on oceanographic conditions, which strongly influence the occurrence of fish within range of the West Coast fleet, and economics. A typical season runs July through October, with landings peaking in August-September. The HMS FMP requires a federal permit with a surface hook-and-line gear endorsement for all U.S. commercial and recreational charter fishing vessels that fish for HMS within the West Coast EEZ, and for U.S. vessels that pursue HMS on the high seas (seaward of the EEZ) and land their catch in California, Oregon, or Washington.

In 2001, the last operational cannery in the Port of Los Angeles closed its doors, ending a West Coast tuna-canning dynasty. Changing global market conditions and a dynamic raw material/finished goods supply environment forced the plants to close. Without domestic-based cannery operations, a majority of the albacore are landed fresh or frozen, then exported to overseas markets for processing. Comparing the 1980s to the 2000s, participation in California (measured by the number of surface hook-and-line vessels annually landing albacore) declined by 64 percent while participation in Oregon and Washington increased by 62 percent and 130 percent respectively. Overall, the coastwide decline was 13 percent based on this metric.

These trends likely reflect a shift in fishing effort into waters off Oregon and Washington where albacore have been more available due to favorable oceanographic conditions. In recent years lower operating costs and better landing facilities in Oregon and Washington compared to California may also have contributed to this shift. Albacore surface hook-and-line fishery revenue and number of participating vessels are shown in Figure 5.

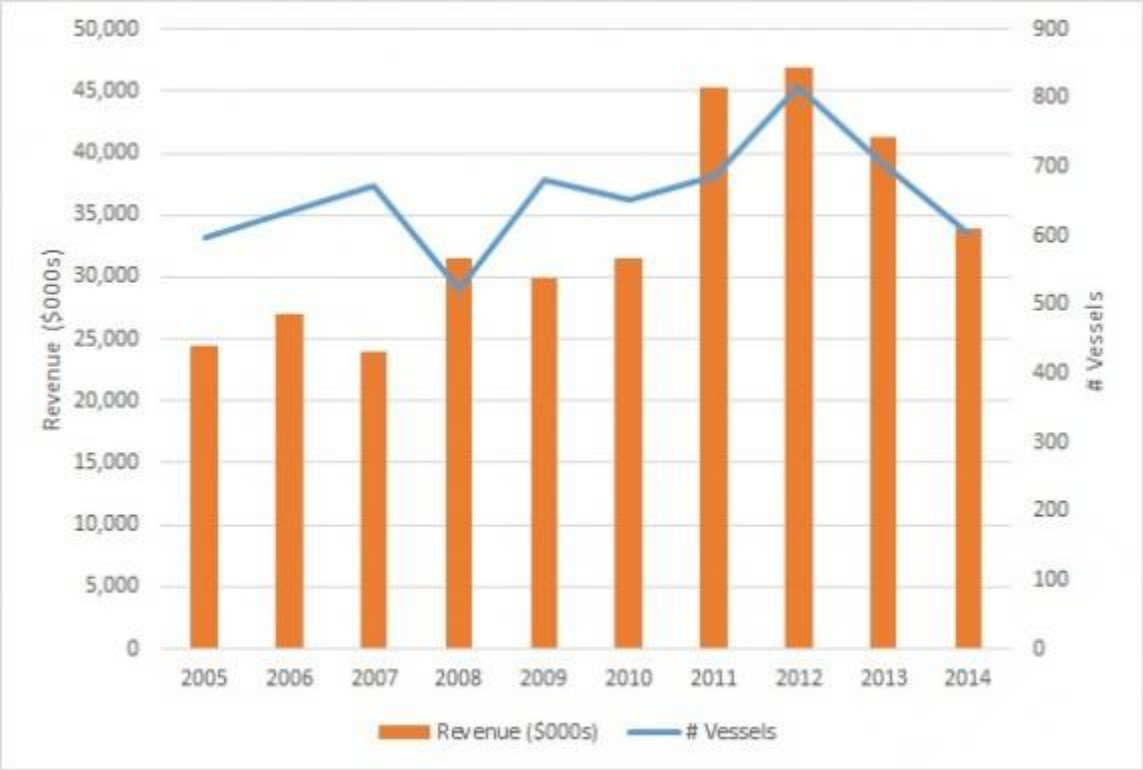

Figure 5. Real (inflation adjusted) ex-vessel revenue from North Pacific albacore ($1,000s) and number of vessels in the West Coast albacore surface hook-and-line (troll and baitboat) fishery, 2005-2014, Canadian vessels included.

Harpoon Fishery for Swordfish

California's modern harpoon fishery for swordfish developed in the early 1900s. Prior to 1980, harpoon and hook-and-line were the only legal gears for commercially harvesting swordfish. At that time, harpoon gear accounted for the majority of swordfish landings in California ports. In the early 1980s, a limited entry drift gillnet fishery was authorized by the State Legislature and soon afterward drift gillnets replaced harpoons as the primary method for catching swordfish. The number of harpoon permits subsequently decreased from a high of 1,223 in 1979 to a low of 25 in 2001. Fishing effort typically occurs in the Southern California Bight (SCB) from May to December, peaking in August, depending on weather conditions and the availability of fish in coastal waters. Some vessel operators work in conjunction with a spotter airplane to increase the search area and to locate swordfish difficult to see from the vessel. This practice tends to increase the catch-per-unit-effort compared to vessels that do not use a spotter plane, but at higher operating cost.

A state permit and logbook are required to participate in the harpoon fishery in addition to a general resident or non-resident commercial fishing license and a current CDFW vessel registration. DGN permit holders are entitled to obtain a harpoon permit free of charge. Additionally, the HMS FMP requires a federal permit with a harpoon gear endorsement for all U.S. vessels that fish for HMS within the West Coast EEZ and for U.S. vessels that pursue HMS on the high seas (seaward of the EEZ) and land their catch in California, Oregon, or Washington.

Harpoon fishery revenue and number of participating vessels are shown in Figure 6.

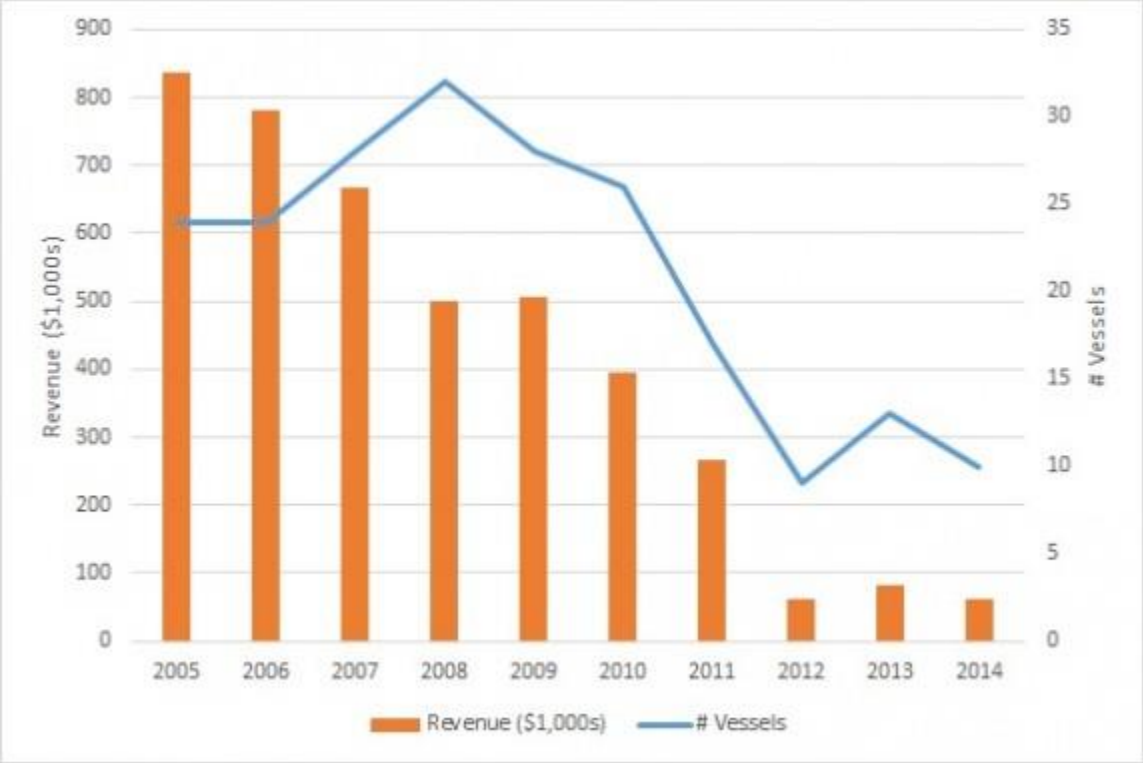

Figure 6. Real (inflation adjusted) ex-vessel revenue ($1,000s) and number of vessels in the West Coast harpoon fishery, 2005-2014.

Coastal Purse Seine Fishery for Yellowfin, Skipjack, and Bluefin Tunas

U.S. West Coast catch of yellowfin, skipjack, and bluefin tuna represents a relatively minor component of overall eastern Pacific Ocean (EPO) tuna catch, on average equaling approximately less than 1 percent of EPO- wide landings. More than 90 percent of the catch for these species in the U.S. west coast EEZ is made by small coastal purse seine vessels operating in the SCB from May to October. These vessels primarily target small pelagic species, especially Pacific mackerel, Pacific sardine, anchovy, and market squid. However, they will target the tropical yellowfin and skipjack tunas when intrusions of warm water from the south, typically during periodic El Niño episodes, bring these species within range of the coastal purse seine fleet. Similarly, purse seine vessel operators will target the higher-valued temperate water bluefin tuna when they enter the coastal waters of the SCB. The number of purse seine vessels that landed tuna in California averaged 197 annually 1981-90 but subsequently declined substantially to an annual average of 4 in the 2003-2012 period.

The decline in the number of domestic vessels is correlated with the relocation of large cannery operations. Increased labor costs for cannery operations contributed to these facilities being moved overseas, where labor costs are less. Currently there are no canneries in California functioning as primary offloaders of tuna.

The HMS FMP requires a logbook and federal permit with a purse seine gear endorsement for all U.S. vessels that use purse seine gear to fish for HMS within the West Coast EEZ and for U.S. purse seine vessels that pursue HMS on the high seas (seaward of the EEZ) and land their catch in California, Oregon, or Washington.

West coast purse seine fishery revenue and number of participating vessels are shown in Figure 7.

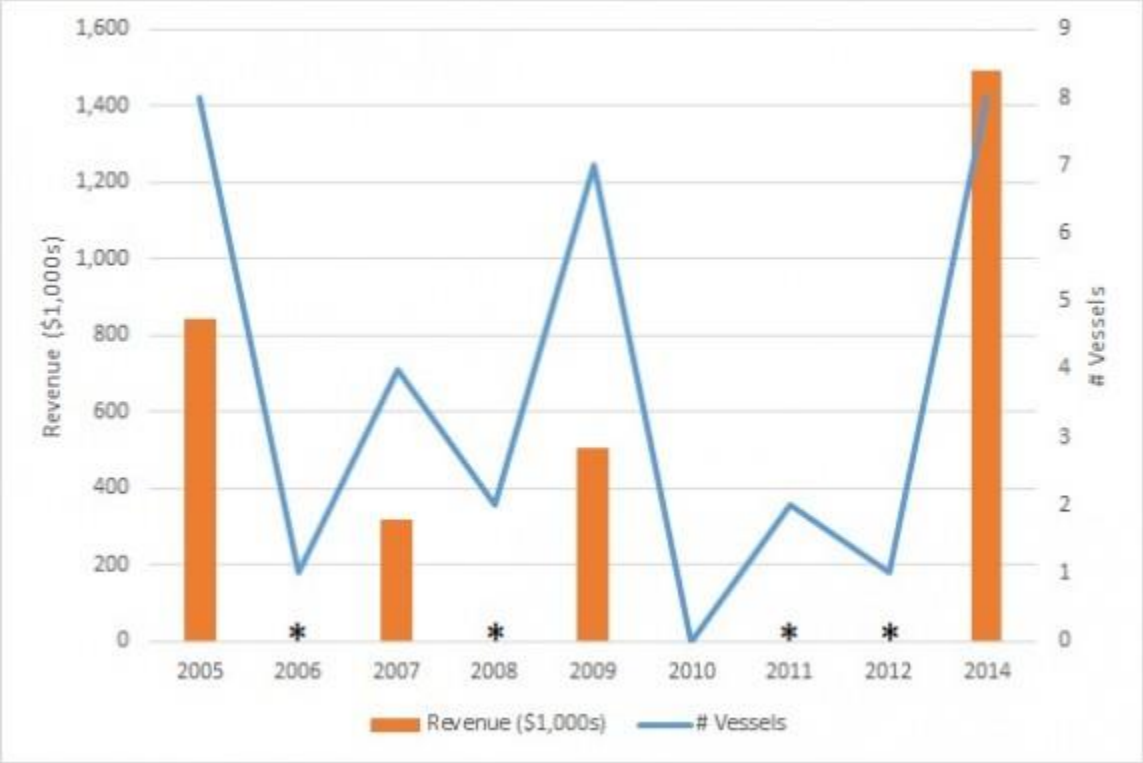

Figure 7. Real (inflation adjusted) ex-vessel revenue ($1,000s) from HMS tunas and number of vessels in the West Coast purse seine fishery, 2005-2014. *In these years revenue data are confidential (less than 3 vessels or dealers) and therefore suppressed.

3.2 Stock Status of Target and Non-Target Species

3.2.1 Target Species

Swordfish (Xiphias gladius) ***(Billfish Working Group 2014)***

The most recent stock assessment for swordfish in the North Pacific identifies two stocks, a Western and Central North Pacific stock and an Eastern Pacific stock. The Western and Central North Pacific stock is healthy while the Eastern Pacific stock is subject to overfishing. For the Western and Central North Pacific in 2012 (the terminal year of the assessment) the stock relative biomass (B/B_{MSY}) was estimated at 1.20 and the relative harvest rate (H/H_{MSY}) was 0.58; the probability of the annual harvest rate exceeding

H_{MSY} was zero. Comparable statistics for the Eastern Pacific stock are 1.87, 1.11, and 0.55. Thus, while stock biomass is well above Maximum Sustainable Yield (MSY), overfishing is occurring with greater than a 50% probability. On June 18, 2015, NMFS notified the Western Pacific Fishery Management Council (WPFMC) that the EPO stock is subject to overfishing, triggering requirements in the MSA. The notification states "Based on federal logbook records, the 2012 catch of EPO swordfish by the U.S. was four (4) mt and caught by Hawaii longline vessels."

From the 2001/2002 through 2013/2014 fishing seasons, swordfish have been caught in the DGN fishery at a rate of 205.5 fish per 100 observed sets. The DGN fishery operates within the boundary of the healthy Western and Central North Pacific stock.

Common Thresher shark (Alopias vulpinus) (Federal Register 2015)

The common thresher shark is currently listed as "Vulnerable" on the International Union for Conservation of Nature's (IUCN) Red List of Threatened Species, reflecting the global population status of thresher sharks. In August 2014, Friends of Animals requested common thresher sharks be listed as endangered or threatened under the Endangered Species Act, or, alternatively, delineated as six distinct population segments (DPS) with each segment being listed as endangered or threatened. Friends of Animals cited fishing pressure, life history characteristics, and the lack of regulatory mechanisms to protect the sharks as the reasons for the listing. In March 2015, NMFS determined the action described in the petition was warranted for the species globally, but not warranted for the DPS because of the failure to support the identification of discrete populations.

Regarding the health of common thresher shark populations, NMFS found populations to be either decreasing globally or stable at a diminished abundance. In the EPO, however, populations have been slowly increasing over the past two decades due to gill net regulations imposed in 1990, which effectively eliminated commercial thresher shark fishing. NMFS has initiated efforts to conduct a full stock assessment.

With state-imposed time and area restrictions in place since 1990 (see timeline, Table 3.12), the population appears to be in recovery; however, because this stock is also harvested by the adjacent Mexican fishery, total annual landings are not well understood for this species. A regional harvest guideline of 340 mt is in place under the HMS FMP. Average annual DGN catch levels for the common thresher shark during the time period 2005–09 averaged 194 mt.

From the 2001/2002 through 2013/2014 fishing seasons, common thresher shark have been caught in the DGN fishery at a rate of 87.0 fish per 100 observed sets.

3.2.2 Non-Target Fish Species

Major vs. Minor Non-Target Catch

For the purposes of this document, the assessment of impacts is analyzed for those species that have been captured in the DGN fishery in quantities greater than 10 animals per 100 observed fishing sets. These are referred to as major non-target species. The species captured in quantities less than 10 animals per 100 observed sets did not, for the most part, involve species for which there are pressing resource conservation concerns, given their infrequent capture in the DGN fishery. These are referred to as minor

non-target species. Table 11 shows the minor non-target species that were excluded from analysis for the purposes of this document. The determination whether a species is a major or minor non-target species is based on observer records from the 2001/2002 fishing season through the 2013/2014 fishing season.

Table 11. Minor non-target species and observed DGN catch rates, 2001/2002 through 2013/2014 fishing seasons.

Species	DGN Catch per 100 observed sets
Bat Ray	0.0043
Bay Pipefish	0.0004
Blue Marlin	0.0051
California Skate	0.0004
Crestfish	0.0004
Escolar	0.0008
Jack Mackerel	0.0121
King of the Salmon	0.0004
Longfin Mako Shark	0.0020
Longnose Lancetfish	0.0004
Manta	0.0004
Mobula	0.0012
Oarfish	0.0004
Oilfish	0.0047
Pacific Electric Ray	0.0043
Pacific Hake	0.0012
Pacific Pomfret	8.3919
Pacific Sardine	0.0047
Pelagic Stingray	0.0433
Pelagic Thresher Shark	0.0004
Prickly Shark	0.0008
Remora	0.0074
Round Stingray	0.0004
Salmon Shark	2.1858
Sevengill Shark	0.0004
Smooth Hammerhead Shark	0.0027
Soupfin Shark	0.0008
Spiny Dogfish	0.0008
Striped Marlin	0.0402
White Seabass	0.0008
Yellowfin Tuna	9.5238
California Yellowtail	0.0121

3.2.2.1 Major Non-Target Tunas

3.2.2.1.1 North Pacific Albacore (Thunnus alalunga) (ISC 2014)

Stock status of North Pacific albacore is reviewed at one- to two-year intervals by the North Pacific Albacore Working Group of the International Scientific Committee for Tuna and Tuna-like Species in the

North Pacific Ocean (ISC) with participating members from U.S., Mexico, Canada, Japan, and Taiwan. The latest assessment was conducted in July 2014.

North Pacific albacore total stock biomass and female spawning biomass experienced a long-term decline from the 1970s to 1990. Albacore stocks recovered through the 1990s, followed by fluctuations without trend in the 2000s. Recruitment has fluctuated around the historical average of 42.8×10^6 recruits annually since the 1990s. Stock status was determined in relation to MSY-based and MSY proxy reference points. When evaluated against various fishing mortality based reference points, current fishing mortality (2010-2012) is below the 2002 to 2004 fishing mortality level and 48 percent below F_{MSY}. The stock assessment concludes that the north Pacific albacore stock is not experiencing overfishing and is most likely not in an overfished condition.

Since the 1950s, surface gears (troll, pole-and-line) have accounted for the majority of albacore catch. From 2003 to 2012, the U.S. component of the overall pan-Pacific Ocean catch is 17.7 percent. Currently there are no quotas or harvest guidelines established for north Pacific albacore catch under the HMS FMP.

From the 2001/2002 through 2013/2014 fishing seasons, North Pacific albacore have been caught in the DGN fishery at a rate of 117.7 fish per 100 observed sets.

3.2.2.1.2 Pacific Bluefin (Thunnus thynnus) (ISC 2014)

Pacific bluefin tuna is a single Pacific-wide stock with trans-Pacific migratory patterns. The U.S. West Coast catch is taken opportunistically by purse seiners and, in small amounts, recreationally, typically in Mexican waters.

Using fishery data from 1952 through 2010, the 2012 stock assessment for Pacific bluefin tuna reported biomass at or near the lowest levels in the time series, and catch per unit effort (CPUE) and catch data through 2011 suggested the risk of decline in spawning stock biomass in future years. An updated stock assessment using 2011 and 2012 catch, CPUE, and size composition data was approved in 2013.

The updated stock assessment showed a slight increase in spawning stock biomass in 2012 compared to 2010 levels (26,324 mt and 25,476 mt, respectively). However, the 2012 recruitment level and the average recruitment level between 2007 and 2012 had been relatively low. Average fishing mortality between 2009 and 2011 surpassed target and biological reference points commonly used by fisheries managers. Although data from 1952-2012 suggests historical catch is predominantly composed of juveniles, the catch of age 0 bluefin has increased significantly since the 1990s. The stock assessment concluded that overfishing is occurring and the stock is overfished.

From the 2001/2002 through 2013/2014 fishing seasons, Pacific Bluefin tuna have been caught in the DGN fishery at a rate of 41.3 fish per 100 observed sets.

3.2.2.1.3 Skipjack (Katsuwonus pelamis) (Maunder 2014)

Stock status of skipjack tuna in the eastern Pacific is assessed every 1–2 years by the Inter-American Tropical Tuna Commission (IATTC). Previous assessments were considered preliminary because of uncertainties about stock structure, the vulnerabilities of all age classes, and how well fishery catch/effort

data tracks abundance. These issues are also relevant to other assessments, including the most recent stock assessment in 2014.

It was not possible to estimate the status of the stock relative to MSY because of uncertainties in estimates of natural mortality and growth. However, the status of skipjack can be inferred from the status of bigeye tuna. The current assessment for bigeye estimates that fishing mortality is less than F_{MSY}. Therefore, it can also be assumed that skipjack fishing mortality is less than F_{MSY}. Both effort and skipjack biomass have remained relatively constant over the previous decade, therefore it is also assumed that skipjack biomass is above B_{MSY}. Additionally, skipjack have higher productivity than bigeye, and both exploitation rates and average weight have stabilized in recent years. The IATTC concluded that there is no credible risk to skipjack stocks and no additional action over and above the action adopted for bigeye is needed..

From the 2001/2002 through 2013/2014 fishing seasons, skipjack tuna have been caught in the DGN fishery at a rate of 97.7 fish per 100 observed sets.

3.2.2.2 Major Non-Target Sharks

3.2.2.2.1 Blue Shark (Prionace glauca) (ISC 2014)

Blue sharks are rarely landed or marketed in the DGN fishery, with most caught in the longline fishery. Recent estimates show DGN accounts for only 11.1 percent of blue shark catch, with longline responsible for 85.2 percent of total catch. From 2004 to 2014, blue shark estimated catch has remained steady at an average of 46,000 mt annually. The blue shark is currently listed as "near threatened" by the IUCN.

Recent blue shark stock assessments occurred in 2013 and 2014. These models calculated a range of *MSY* for the north Pacific blue shark stock using catch, effort, and size composition data for the period 1972 to 2012, and accounted for a broad range of uncertainties about blue shark stock dynamics. The data were grouped into 18 fisheries, however, Japan, Chinese Taipei, Mexico, and USA account for 95 percent of the estimated catch. Both assessments indicate that, relative to *MSY*, the north Pacific blue shark stock is not overfished and overfishing is not occurring. In 2011, stock biomass and spawning biomass exceeded *MSY*, and annual fishing mortality was estimated to be well below F_{MSY}.

From the 2001/2002 through 2013/2014 fishing seasons, blue shark have been caught in the DGN fishery at a rate of 111.9 fish per 100 observed sets.

3.2.2.2.2 Shortfin Mako Shark (Isurus oxyrinchus) (From PFMC 2003)

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 and Bedford 1983; Holts and Sosa-Nishizaki 1998).

Shortfin mako is the leading HMS FMP shark species 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. Historically, makos have been esteemed as a prized game fish along the East Coast of the U.S. 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.

Because basic population dynamic parameters for this species of shark are unknown, it is being managed under the HMS FMP with a precautionary harvest guideline of 150 mt. Clear effects of exploitation have not been shown, and the local stock tentatively is assumed to be not overfished. The IUCN currently lists the shortfin mako as "Near Threatened" due to a lack of evidence that population levels have been sufficiently depleted to warrant a "Vulnerable" status. An updated ISC assessment is planned for 2015.

From the 2001/2002 through 2013/2014 fishing seasons, shortfin mako shark have been caught in the DGN fishery at a rate of 126.2 fish per 100 observed sets.

3.2.2.3 Other Major Non-Target Finfish

3.2.2.3.1 Common Mola (Mola mola)

There is scant information available on the population dynamics for this species.

From the 2001/2002 through 2013/2014 fishing season, common mola have been caught in the DGN fishery at a rate of 891.7 fish per 100 observed sets.

3.2.2.3.2 Opah (Lampris guttatus) (From Taylor and Bedford 2001)

Between 1990 and 1999, over 660 mt of opah were landed in California, with annual landings ranging from 37 mt to 112 mt. The highest landings of the decade occurred in 1998; associated the 1997–98 El Niño. Although the majority of opah landed in California since 1990 were landed from San Luis Obispo County south (about 50 percent from San Diego County alone), landings were reported as far north as Crescent City.

Sport fishermen targeting albacore from British Columbia to Baja California occasionally catch opah. Within California, many sport caught opah are taken from the northern Channel Islands south to the Coronado Islands, just below the U.S.-Mexico border.

From the 2001/2002 through 2013/2014 fishing seasons, opah have been caught in the DGN fishery at a rate of 93.2 fish per 100 observed sets.

3.2.2.3.3 Louvar (Luvarus imperialis) (From Taylor and Bedford 2001)

Off California, louvar tend to be seasonal transients associated with warm water currents late in the year. Although primarily taken in the DGN fishery, landings from other gear types such as set gillnet, hook-and-line, harpoon, trawl, and round haul nets have been recorded. The majority of catches occur off the SCB, with success being highest in the area encompassing Pt. Loma, San Clemente Island, and Cortez Bank. In as much as louvar are strongly associated with warmer water currents, catches of this species typically increase during the late summer thro
ugh fall and show a dramatic rise during strong El Niño events. There is not a significant recreational fishery for louvar.

From 1990 through 1999, a total of 44 mt were landed in California. The size of the louvar population worldwide or off California is not known. Louvar are solitary fish and few are taken at any one time. Because the population is worldwide in tropical and temperate seas, the California fishery probably has little impact on the species as a whole. It is not known whether local subpopulations exist or how far individual louvar travel.

From the 2001/2002 through 2013/2014 fishing seasons, louvar have been caught in the DGN fishery at a rate of 10.5 fish per 100 observed sets.

3.2.2.3.4 Pacific Mackerel (Scomber japonicus)

Pacific mackerel range from Mexico to southeastern Alaska. They are most abundant south of Pt. Conception, California, and usually appear within 20 mi offshore. The "northeastern Pacific" stock of Pacific mackerel is harvested by fishers in the U.S. and Mexico. Pacific mackerel are an important prey item for a variety of fish, mammals and sea birds. Pacific mackerel are managed under the auspices of the Council as part of the Coastal Pelagic Species Fishery Management Plan (FMP) (PFMC 1998). The FMP establishes a Pacific mackerel harvest guideline for 2005–06 season of 17,419 mt. Of this total, 13,419 mt has been allocated for a directed fishery and the remainder of the harvest guideline (4,000 mt) has been set aside for incidental take following the closure of the directed fishery.

From the 2001/2002 through 2013/2014 fishing seasons, Pacific mackerel have been caught in the DGN fishery at a rate of 66.3 fish per 100 observed sets.

3.2.2.3.5 Bullet Mackerel (Auxis rochei)

Bullet mackerel frequent California waters in association with El Niño events. Bullet mackerel were caught in significant numbers in southern California in 1983–86 (Karpov and Albin 1995). Their northernmost and peak occurrence during the 1983–86 event was in the Santa Barbara/Ventura district in 1984.

From the 2001/2002 through 2013/2014 fishing seasons, bullet mackerel have been caught in the DGN fishery at a rate of 14.8 fish per 100 observed sets.

3.2.2.3.6 Pacific Bonito (CA Dept. of Fish & Wildlife 2015; CA Fisheries Fund 2008; 2014 CPS SAFE Tables)

Pacific bonito range from Chile to the Gulf of Alaska; however, they are most abundant in the warmer waters between Baja, CA to Point Conception, CA. Bonito are fished recreationally, and, from 1997 to 2007, approximately 1.1 million were caught. They are typically found in deeper waters offshore, but can also be found in near-shore kelp beds, and prey primarily on other coastal pelagic species (anchovies, sardines, squid). Bonito may be taken incidentally as bycatch in other fisheries, although the total amount taken is typically very low. For example, from 2008 through 2013, only 3 metric tons were caught incidentally in the market squid fishery[6].

[6] Incidental catch was reported on landing receipts with greater than 50% market squid for round haul gear.

From the 2001/2002 through 2013/2014 fishing seasons, Pacific bonito have been caught in the DGN fishery at a rate of 30.2 fish per 100 observed sets.

3.2.3 Prohibited Species

Three species of shark, as well as Pacific halibut and pacific salmon are designated as prohibited species under the HMS FMP. They cannot be retained, or can be retained only underspecified conditions, by persons fishing with a HMS fishing permit.

3.2.3.1 Great White Shark

From the 2001/2002 through 2013/2014 fishing seasons, there have been no great white sharks observed caught in the DGN fishery.

3.2.3.2 Megamouth Shark

From the 2001/2002 through 2013/2014 fishing seasons, there have been five megamouth sharks observed caught in the DGN fishery. All five were released alive.

3.2.3.3 Basking Shark

From the 2001/2002 through 2013/2014 fishing seasons, there have been two basking sharks observed caught in the DGN fishery. One was released alive and one was released dead.

3.2.3.4 Pacific Halibut

From the 2001/2002 through 2013/2014 fishing seasons, there have been no Pacific halibut observed caught in the DGN fishery.

3.2.3.5 Pacific Salmon

From the 2001/2002 through 2013/2014 fishing seasons, there have been no Pacific salmon observed caught in the DGN fishery.

3.2.4 Protected Species

This section describes the protected species in the proposed action area. Table 12 summarizes the ESA status, ITS values, and annual DGN M&SI for marine mammals and sea turtles.

Table 12. ESA status, ITS values and DGN M&SI of protected species in the action area.

Species/Stock in Action Area	Hard Cap Action Alternatives	ESA-status (July 2015)	Annual ITS Value (2013 DGN BO)	Mean Annual DGN M&SI (Carretta, et al. 2013)
Marine Mammals				
Sperm whale	1,2,3,4,5	Endangered	2	3.2
Humpback whale **	1,2,3,4,5	Endangered *(revision pending)* *Note: On April 21, 2015, NMFS proposed to remove the current range-wide listing and identified 14 DPSs and proposed to list two as threatened and two as endangered (80 FR 22304). Final listing decision is expected in 2016.*	2	0
Fin whale	1,4,5	Endangered	1	0
Short-finned pilot whale • CA/OR/WA stock	 4,5			 0
Common dolphin • Long-beaked spp. • Short-beaked spp.	 2,5 2,5			 4 47
Bottlenose dolphin • California coastal stock • C/O/W stock	 2 4,5			 0 1.6
Risso's dolphin	2			1.4
Pacific white-sided dolphin	2			11.6
Northern right whale dolphin	2			3.6
Gray whale • western North Pacific stock • eastern Pacific stock		 Endangered De-listed	 N/A	 0 0
Dall's porpoise				0
Dwarf Sperm whale				0
Pygmy Sperm whale				0
Killer whale • southern resident DPS • Eastern north Pacific		 Endangered	 N/A	 0 0

offshore stock				
Baird's beaked whale				0
Cuvier's beaked whale				0
Mesoplodon spp.				0
Striped dolphin				0
Blue whale		Endangered	N/A	0
Minke whale				0
Sei whale		Endangered	N/A	0
California sea lion	2			41
Northern elephant seal	2			8
Guadalupe fur seal		Threatened	N/A	0
Northern fur seal				0
Harbor seal				0
Sea Turtles				
Leatherback turtle	1,2,3,4,5	Endangered	3	N/A
Loggerhead turtle • North Pacific Ocean DPS	1,2,3,4,5	Endangered	3	N/A
Olive Ridley turtle	1,4,5	Endangered/Threatened	1	N/A
Green turtle**	1,4,5	Endangered/Threatened *(revision pen.)* *<u>Note:</u> On March 20, 2015, NMFS proposed to remove the current range-wide listing and list eight DPSs as threatened and three as endangered (80 FR 15271). Final listing decision is expected in 2016.*	1	N/A

3.2.4.1 Marine Mammals

All marine mammals in the waters of the United States are protected under the MMPA. The MMPA and its implementing regulations set out strict guidance for monitoring marine mammal stocks and estimating human impacts on these stocks. Marine mammals addressed within this EA include members of two distinct orders: *Cetacea*, which includes whales, dolphins and porpoises; and *Pinnipedia*, which includes seals and sea lions (the walrus [*Odobenus rosmarus*] is also included in this order, but is not relevant to this proposed action). Annually, NMFS is required to produce a Stock Assessment Report (SAR) that provides updated status and population estimates for each marine mammal stock in a region, based on the most recent available information. In addition to estimating the stock's population, NMFS must identify sources of human-caused mortalities and calculate the maximum anthropogenic mortalities that can be sustained by the stock, if the stock is to persist at its current population or increase. PBR is the maximum number of animals, not including natural mortalities, which may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population.

This section describes the status of each marine mammal stock that may be found in the area where the DGN fishery currently operates. Most of this information may be found in the most recent published U.S. Pacific Marine Mammal SARs (Carretta, *et al.* 2013) and SARs currently in press. Under the MMPA,

"strategic" stocks are those marine mammal stocks that are: (1) listed as endangered or threatened under the ESA, (2) likely to become listed under the ESA, or (3) when annual human-caused mortality and serious injury is greater than sustainable levels. "Depleted" includes those species or stocks that have been determined to be below their optimum sustainable population or are listed as endangered or threatened under the ESA. For marine mammals found in the area, the following are considered both strategic and depleted:

- sperm whale, eastern north Pacific southern resident killer whale, blue whale, fin whale, humpback whale, northern right whale, and sei whale; and Guadalupe fur seal.

Information from the 1997 Pacific Offshore Cetacean Take Reduction Plan Environmental Assessment about marine mammals has been incorporated by reference.

3.2.4.1.1 *Marine Mammals for which Hard Caps are Proposed*

Sperm whale (*Physeter macrocephalus*): The SARs divided sperm whales into three discrete groups for management purposes, including waters off CA/OR/WA, Hawaii, and Alaska. Based on pooled 1993 and 1996 ship line transect surveys within 300 nmi of the U.S. west coast, there were an estimated 1,407 (CV=0.39) sperm whales in California, Oregon, and Washington waters during summer/fall. There were an estimated 2,593 (CV= 0.30) sperm whales from a survey of the same area in 2001. A 2005 survey of this area resulted in an abundance estimate of 3,140 (CV=0.40) whales, which is corrected for diving animals not seen during surveys. The most recent ship survey of the same area in 2008 resulted in an estimate of only 300 (CV = 0.51) sperm whales. The 2008 estimate is lower than all previous estimates within this region and may be due to interannual variability of sperm whale distribution. The most recent estimate of abundance for this stock is the geometric mean of the 2005 and 2008 summer/autumn ship survey estimates, or 971 (CV = 0.31) sperm whales. With a minimum population abundance estimate of 751 sperm whales, PBR for this stock is estimated to be 1.5 animals (*in* Carretta *et al.* 2013). The mean annual serious injury and mortality in commercial fisheries is ≥ 3.8 (CV=0.95) sperm whale, based on data collected from 2006–2010. Fisheries documented to have taken sperm whales include the DGN fishery (average 3.2 over 5 years based on the observed serious injury mortality of 2 sperm whales in 2010, which extrapolated to 16 animals for that year) and unknown fisheries, based on stranded whales. One ship strike of a sperm whale was reported during 2006 - 2010. This stock is considered a both depleted and strategic, as defined under the MMPA because it is listed as endangered under the ESA (Carretta, *et al.* 2013).

Humpback whale (*Megaptera novaeangliae*): The most precise and least biased estimate of this stock's population abundance is based on mark-recapture estimates from photo-identification collections in adjacent pairs of years. Calambokidis et al. (2009) estimated humpback whale abundance in their feeding areas from 1991 to 2008 using Petersen mark-recapture estimates based on photo-identification collections in adjacent pairs of years. The 2007/2008 mark-recapture population estimate for California and Oregon (2,043, CV=0.10) is higher than any previous mark-recapture estimates. The estimate of 2,043 humpback whales in 2007/2008 is also a negatively biased estimate of this stock because it excludes some whales in Washington. The best estimate of abundance for this stock is the mark-recapture estimate of 2,043 (CV=0.10), which is also the most precise estimate. With a minimum population estimate of 1,878 humpback whales,the PBR for this stock is 22.5 humpback whales per year; however, because this stock spends approximately 50 percent of its time outside U.S. waters, the PBR allocation for U.S. waters is 11.3 humpback whales per year. The mean annual estimated serious injury and mortality in U.S. commercial fisheries from 2004-2008 was at least 3.2 animals per year, with the majority of entanglements attributed to pot/trap fisheries and the average number of mortalities due to ship strikes is

0.4 humpbacks per year during this period (Carretta, *et al.* 2013). Because the humpback whale is listed as an endangered species under the ESA, the stock is classified as depleted and strategic under the MMPA (Carretta, *et al.* 2013).

Fin whale (*Balaenoptera physalus*): The SARs recognized three stocks of fin whales in the North Pacific: the CA/OR/WA stock; the Hawaii stock; and the Alaska stock. The best estimate of fin whale abundance in California, Oregon, and Washington waters out to 300 nm is the geometric mean of line transect estimates from summer/autumn ship surveys conducted in 2005 (3,281, CV=0.25) and 2008 (2,825, CV = 0.26) (Forney 2007, Barlow 2010), or 3,044 (CV=0.18) whales. This is probably an underestimate because it almost certainly excludes some fin whales which could not be identified in the field and which were recorded as "unidentified rorqual" or "unidentified large whale." With a minimum population estimate of 2,624 animals, the PBR for this stock is 16 animals. The mean annual serious injury and mortality in known commercial U.S. fisheries is zero fin whales, based on data from 2004 through 2008. Ship strikes were implicated in the deaths of four fin whales and the injury of another from 2004 to 2008, NMFS, unpublished stranding data). During 2004-2008, there were an additional eight injuries of unidentified large whales attributed to ship strikes. Additional mortality from ship strikes probably goes unreported because the whales do not strand or, if they do, they do not always have obvious signs of trauma. The average observed annual mortality and injury due to ship strikes is 1.0 fin whales per year for the period 2004-2008. Fin whales are listed as endangered under the ESA; therefore, this stock of fin whales is considered depleted and strategic under the MMPA (Carretta, *et al.* 2013).

Short-finned pilot whale (*Globicephala macrorhynchus*): For the purposes of the SARs, short-finned pilot whales in the EEZ off CA/OR/WA are considered one stock. Short-finned pilot whales were once common off the coast of southern California. However, since a strong El Niño event in 1982–83, few sightings were made between 1984–92, despite increased survey efforts. Sightings still remain rare. The best estimated population abundance based on the geometric mean abundance estimate from the 2005 and 2008 ship-board surveys is 760 (CV=0.64) animals, with a minimum estimated population of 465 short-finned pilot whales. The PBR for this stock is 4.6 animals/year. The mean annual estimated serious injury and mortality of short-finned pilot whales in commercial fisheries is zero animals, based on data from 2004-2008. The mean annual human-caused mortality is less than the PBR; therefore, this stock is not classified as strategic under the MMPA (Carretta, *et al.* 2013).

Bottlenose dolphin (*Tursiops truncatus*)—California coastal stock: California coastal bottlenose dolphins are found within about 1 km from shore, primarily from Pt. Conception south into Mexican waters, and at least as far south as Ensenada, though for management purposes, the SARs are restricted to U.S. waters. Based on photographic mark-recapture surveys conducted along the San Diego coast in 2004 and 2005, the most recent estimate of population size is 323 dolphins (coefficient of variation (CV) = 0.13, 95 percent CI 259-430; Dudzik et al. 2006). This population size has been stable for approximately 20 years. Based on the minimum population estimate of 290, the PBR for this stock is 2.9 coastal bottlenose dolphins per year. Because this stock spends some of its time outside the U.S. EEZ, the PBR allocation for U.S. waters is 2.9 x 0.82 = 2.4 dolphins per year. No recent fishery takes have been documented in the CA DGN, based on information from 2002 through 2006, likely due to coastal area closures of set gillnet and trammel net fisheries. Because the total fishery mortality and serious injury for this stock can be considered insignificant and approaching zero, coastal bottlenose dolphins are not considered a strategic stock under the MMPA (Carretta, *et al.* 1998; Carretta *et al.* 2013).

Bottlenose dolphin (*Tursiops truncatus*)— California/Oregon/Washington (CA/OR/WA) offshore stock: The offshore bottlenose dolphin differs from the coastal bottlenose dolphin in that they have a larger body, are darker in color, and have smaller flippers. The SARs designated offshore bottlenose dolphins

found in the waters off CA/OR/WA as one stock. The most comprehensive multi-year average abundance is the geometric mean abundance estimate for California, Oregon and Washington waters based on the 2005 and 2008 ship surveys, or 1,006 (CV=0.48) offshore bottlenose dolphins (Carretta *et al.*. 2013). , With a minimum population estimate of 684 animals, the calculated PBR level for this stock is 5.5 animals per year. The average annual estimated mortality of this stock in U.S. commercial fisheries is 0.2 animals, based on data from 2004 through 2008. This stock is not classified as strategic under the MMPA (Carretta, *et al.* 2013).

Common dolphin (*Delphinus sp.)*: Common dolphins off California are classified into two stocks, the short-beaked CA/OR/WA stock and the long-beaked California stock. Because the long-beaked common dolphin has been recognized as a different species from the short-beaked common dolphin only in the last decade (Heyning and Perrin 1994; Rosel, *et al.* 1994), much of the available information has not differentiated between the two. The two species are often found together, making it difficult to distinguish the different stocks.

Long-beaked common dolphin (*Delphinus capensis*) – California stock: The most recent abundance estimates for this stock are 62,447 (CV=0.80) and 183,396 (CV=0.41) dolphins, based on 2008 and 2009 ship line-transect surveys, respectively. The geometric mean abundance estimate for California, Oregon and Washington waters based on two ship surveys conducted in 2008 and 2009 is 107,016 (0.42) long-beaked common dolphins. With a minimum population estimate of 76,224 animals PBR is estimated to be 610 animals per year. The estimated mean annual take (serious injury and mortality) for long-beaked common dolphins in U.S. commercial fisheries is 13 animals, based on data from 2006–10. Fisheries threats include the CA/OR shark/swordfish drift gillnet fishery, the CA angel shark/halibut and other species large mesh set gillnet fishery, tuna purse seine and other unknown fisheries. This stock is not classified as strategic under the MMPA (Carretta, *et al.* 20013).

Short-beaked common dolphin (*Delphinus delphis*) – CA/OR/WA stock: Surveys show wide distribution from the coast and out to at least 300 nm from shore. The 2005-2008 geometric mean abundance estimate for California, Oregon and Washington waters based on the two ship surveys is 411,211 (CV= 0.21) short-beaked common dolphins, with a minimum population estimate of 343,990 animals and an estimated PBR of 3,440 animals per year. The estimated mean annual take (serious injury and mortality) for short-beaked common dolphins in U.S. commercial fisheries is 65 (CV=0.29) animals, based on information from 2004-2008. This stock is not classified as strategic under the MMPA (Carretta, *et al.* 2013).

Risso's dolphin (*Grampus griseus*): Risso's dolphins in CA/OR/WA waters are considered one stock in the SARs. The best estimate of population abundance for this stock is 6,272 (CV=0.30), with a minimum population estimate of 4,913 animals. PBR for this stock is estimated to be 39 animals per year. The mean annual serious injury and mortality in commercial fisheries for this stock is estimated to be 1.6 (CV=0.99) animals, based on data from 2004 through 2008 with an average of 1.4 attributed per year to the DGN fishery. This stock is not considered a strategic stock under the MMPA (Carretta, *et al.* 2013).

Pacific white-sided dolphin (*Lagenorhyncus obliquidens*): The SARs have grouped Pacific white-sided dolphins into two discrete, non-contiguous areas, waters off CA/OR/WA (northern and southern stocks) and Alaskan waters. Based on the geometric mean estimate from the 2005 and 2008 ship-board surveys, the population abundance estimate for the CA/OR/WA stock is 26,930 (CV=0.28) animals, with a minimum population estimate of 21,406 animals. The calculated PBR is 193 animals per year. The mean annual serious injury and mortality in U.S. commercial fisheries for this stock is estimated to be 10.5 (CV = 0.65) animals per year, based on data from 2004-2008, with 8.6 (CV=0.77) attrivuted to the DGN

fishery. This stock of Pacific white-sided dolphins is not classified as strategic under the MMPA (Carretta, *et al.* 2013).

Northern right-whale dolphin (*Lissodelphis borealis*): The SARs designated northern right-whale dolphin found in the waters of CA/OR/WA as one stock. The estimated population abundance for this stock based on the geometric mean abundance estimate from the 2005 and 2008 surveys is 8,334 (CV=0.40) animals, with a minimum population estimate of 6,019 animals. Based on this minimum population, the estimated PBR is 48 animals per year. The mean annual serious injury and mortality of northern right whale dolphins in U.S. commercial fisheries is estimated to be 3.6 animals, based on observer data in the CA DGN fishery from 2004 through 2008. This is not classified as a strategic stock under the MMPA (Carretta, *et al.* 2013).

California sea lion (*Zalophus californianus*): The population abundance estimate for this stock was based on a 2008 pup census and was estimated to be around 296,750 animals, with a minimum population estimate of 153,337. The PBR for this stock is calculated to be 9,200 animals per year. Estimated mean annual take in commercial fisheries is greater than 337 (CV=0.56) animals, based on data from 2003-2009, but this is an underestimate based on stranding data. Takes have been documented during those years in the DGN fishery, the California set gillnet fishery for halibut and angel shark (over 4 times more interactions than in the DGN fishery from data collected during 2005-2009), the CA/OR/WA groundfish trawl fishery, the WA/OR salmon net pen fishery, and the salmon pen fishery operating out of British Colombia. Other threats to this stock include shooting, entrainment in power plants, marine debris, and boat collisions. The stock is not classified as strategic under the MMPA (Carretta, *et al.* 2013).

Northern elephant seal (*Mirounga angustirostris*): The best estimate of population abundance for the California breeding stock is 124,000 from 2005, with a minimum population estimate of 74,913 animals. PBR for this stock is calculated to be of 4,382 animals per year (Carretta *et al.* 2013). Threats to this stock include mortality and injury in fishing gear (greater than 8.8 mean annual takes per year, based on data from 2000 through 2004). Takes have been documented in the DGN fishery, the California set gillnet fishery for halibut and angel shark, and the CA/OR/WA groundfish trawl fishery. Other threats include boat collisions, collisions with automobiles, shootings, and entanglement in marine debris. The stock is not considered a strategic stock under the MMPA (Carretta, *et al.* 2013).

3.2.4.1.2 *Other Marine Mammals in the Proposed Action Area*

Dall's porpoise (*Phocoenoides dalli*): The SARs designated Dall's porpoise in CA/OR/WA as one stock. The most recent estimate of Dall's porpoise abundance is the geometric mean of estimates from 2005 and 2008 shipboard surveys of California, Oregon, and Washington waters, or 42,000 (CV = 0.33) animals, with a minimum population estimate of 32,106 Dall's porpoise. The estimated PBR for this stock is 257 animals per year. The average minimum estimated annual mortality and serious injury for Dall's porpoise in U.S. commercial fisheries is greater than or equal to 0.4 animals per year, based on data through 2008. There were no documented takes in the DGN fishery from 2004-2008. This stock is not designated as a strategic stock under the MMPA (Carretta *et al* 2013).

Dwarf sperm whale (*Kogia sima*): The SARs designated the dwarf sperm whales offshore CA/OR/WA as one stock, and it was distinguished from the pygmy sperm whale in 1966. The species is distributed in deep waters throughout ocean basins and along the continental slopes of the North Pacific. No information is available to estimate the population size of this stock, and thus a PBR level is not possible to estimate. The dwarf sperm whale has not been seen in recent surveys off the U.S. west coast and there

have been no incidental taking of dwarf sperm whales observed in U.S. fisheries, based on information from the most recent years of data. Given this, this stock of dwarf sperm whales are not classified as strategic under the MMPA, and (Carretta, *et al.* 2013).

Pygmy sperm whale (*Kogia breviceps*): For the purpose of the SARs, pygmy sperm whales found within the EEZ off the coasts of CA/OR/WA are considered one stock. At-sea sightings of *Kogia* species are very rare, so seasonality and distribution have not been identified. The rarity of sightings likely reflects the cryptic nature of this species (they are detected almost exclusively in extremely calm sea conditions), rather than an absence of animals in the region. The best estimate of abundance for this stock is the mean of 2005 and 2008 shipboard line-transect surveys, or 579 (CV=1.02) animals, , with a minimum population estimate of 271. PBR for this stock of pygmy sperm whales is 2.7 animals per year. The mean annual serious injury and mortality in U.S. commercial fisheries is estimated to be zero animals, based on data from 2004-2009. Other possible threats include anthropogenic noise, including air guns, although injuries or mortalities due to this would be difficult to document. Since the average annual incidental take is not greater than the PBR for this stock of pygmy sperm whale, it is not classified as strategic under the MMPA (Carretta, *et al.* 2013).

Killer whale (*Orcinus orca*): While there is no reliable way to distinguish the two main stocks of killer whales that might be found off the U.S. west coast (eastern north Pacific offshore stock and the west coast transient stock) from sightings at sea, photographs of individual animals can provide a rough proportion. The best estimate of the population size of both stocks within 300 nm of the coasts of CA/OR/WA is 1,340 (CV=0.31) animals, with 466 comprising the eastern north Pacific offshore stock (minimum estimate of 361 animals). Because this stock is transboundary, it is difficult to estimate PBR; however, given the minimum population estimate, estimated PBR for the eastern north Pacific offshore stock is 3.6 animals. There have been zero killer whales of this stock observed taken in U.S. commercial fisheries, based on data from 1997–2001. Because the estimated mean annual takes is less than this stock's PBR, this killer whale stock is not classified as strategic under the MMPA (Carretta, *et al.* 2005). The west coast transient stock is also a transboundary stock and includes killer whales from British Columbia. Based on the most recent SARs for the U.S. west coast and Alaska, the population of the west coast transient stock ranges from 314-874 animals (Angliss and Outlaw, 2005; Carretta, et al. 2006). A minimum estimate of the population of west coast transient killer whales is 314 animals. Given this, the PBR for this stock is 3.1 animals (Angliss and Outlaw 2005). The minimum mortality rate estimated from commercial fisheries is zero, although there is little known regarding the serious injury or mortality of killer whales incidental to Canadian commercial fisheries. Collisions with vessels have also been documented for killer whales, but none have been estimated for this stock. Given the level of human-caused mortality and serious injury (0 animals per year), this stock is not classified as a strategic stock (Carretta, *et al.* 2006).

The eastern north Pacific southern resident stock is most commonly seen in the inland waters of Washington state and southern Vancouver Island. Individuals from this stock have been observed in Monterey Bay, California in January, 2000 and March, 2003, near the Farallon Islands in February 2005 and off Point Reyes in January 2006. The estimated population size of this stock is 84 animals and PBR is 0.8 whales per year. The total fishery mortality and serious injury for this stock is estimated to be zero. Following a 2004 status review, this stock was identified as a distinct population segment and listed as endangered under the ESA on November 18, 2005 (70 FR 69903). Risks to the population include changes in prey availability caused by fluctuations in environmental conditions, high levels of contaminants, noise generated from vessels, diseases and parasites, declines in salmon stocks, and catastrophes (e.g. oil spills, harmful algal blooms) (*in* Carretta *et al.* 2006). Because this stock is listed as endangered under the ESA, this stock is classified strategic and depleted under the MMPA.

Baird's beaked whale (*Berardius bairdii*): The SARs designated Baird's beaked whales in the EEZ waters off the coasts of California, Oregon, and Washington as one stock. Sightings of Baird's beaked whale have been rare, even during ship and aerial transect surveys. The best population estimate currently available is 907 (CV= 0.49)) animals, with a minimum population estimate of 615. There is no information on trends in abundance, and the PBR for this stock is 6.2 animals per year. Mean annual take levels by U.S. commercial fisheries are estimated to be zero animals, based on data from 2004 through 2008. There have been *zero* observed beaked whales interacting with the DGN fishery since the pinger regulations were put in place (1997). Additional threats may be anthropogenic noise, especially military sonars, or other commercial and scientific activities involving the use of air guns. The total fishery and serious injury for this stock can be considered insignificant and approaching zero and it is not classified as a strategic stock under the MMPA (Carretta, *et al.* 2013).

Cuvier's beaked whale (*Ziphius cavirostris*): The SARs designated the Cuvier's beaked whales in the EEZ waters off CA/OR/WA as one stock. Sightings of Cuvier's beaked whale off the U.S. West Coast have been infrequent, although they are the most commonly encountered beaked whale off the West Coast. Seasonal trends are not apparent from stranding records. Based on the best available data, the geometric mean abundance estimate from 2005 and 2008, the best population estimate for this stock of Cuvier's beaked whale is 2,143 (CV=0.65) animals, with a minimum population estimate of 1,298 animals. The estimated PBR for this stock is 13 animals per year, and the average annual estimated take (serious injury and mortality) in the U.S. commercial fisheries is zero animals. As mentioned above, since pingers were used in this fishery since 1996, no beaked whales have been observed taken in the DGN fishery. As with other beaked whales, anthropogenic noise may also threaten the Cuvier's beaked whale, particularly mid-frequency active sonars, although the extent of this threat is unknown. Since the estimated annual average incidental mortality of this stock of Cuvier's beaked whale does not exceed its PBR level, it is not considered strategic under the MMPA (Carretta, *et al.* 2013).

Mesoplodont beaked whales (*Mesoplodon* spp.): There are least 14 species in the genus *Mesoplodon*, but due to the difficulty in identifying the six species of Mesoplodont beaked whales found in the area, including Hubbs' (*M. carlhubbsi*), pygmy beaked whale or lesser beaked whale (*M. peruvianus*), gingko-toothed (*M. gingkodens*), Blainville's (*M. densirostris*), Perrin's (*M. perrini*) and Stejneger's (*M. stejnegeri*) beaked whales and the rarity of sightings, little species-specific information is currently available

During the 2005-2008 surveys, one *Mesoplodon* was identified to species; therefore, the abundance of Blainville's beaked whales for California, Oregon, and Washington is 603 (CV=1.16). The abundance estimate for mesoplodont beaked whales of unknown species, based on the same 2005-2008 surveys is 421 (CV=0.88). The combined estimate of abundance for all species of *Mesoplodon* beaked whales in California, Oregon, and Washington waters out to 300 nmi is 1,024 (CV=0.77) animals. This estimate does not include sightings of 'unidentified beaked whales' made during 2005 and 2008, some of which may have included beaked whales of the genus *Mesoplodon.*(Carretta *et al.* 2013)..With a minimum population estimate of 576 animals, the estimated PBR for this group of species is 5.8 mesoplodont beaked whales per year and the average serious injury and annual mortality of mesoplodont beaked whales in U.S. commercial fisheries is estimated to be zero animals, based on data from 2004-2008. This group of species is not classified as a strategic stock under the MMPA ((Carretta, *et al.* 2013).

Striped dolphin (*Stenella coeruleoalba*): The most recent estimate of stock abundance is 10,908 (CV=0.34) striped dolphins, with a minimum population estimate of 8,231 animals. The PBR for this stock is 82 animals per year. Data from 2004-2008 revealed that no striped dolphins were observed taken

in U.S. commercial fisheries, although based on one stranded animal during this period that may have interacted w/ gear, at least 0.2 animals per year could have been attributed to human causes. This stock is not classified as strategic under the MMPA because the estimated mean annual removal level is lower than its PBR (Carretta, *et al.* 2013).

Blue whale (*Balaenoptera musculus*): The SARs recognize the eastern North Pacific stock of blue whales as one stock. The best estimate of population abundance for this stock of blue whales is 2,497 (CV = 0.24) animals, with a minimum population estimate of 2,046 blue whales. The PBR for this stock is estimated at 12.2 animals per year; however, because this stock spends three-quarters of their time outside of the U.S. EEZ, PBR is 3.1 animals per year. The mean annual serious injury and mortality in known commercial U.S. fisheries is zero blue whales, based on data from 2004 through 2008 (Carretta, *et al.* 2013). Blue whales are also threatened by ship strikes. Documented mortalities of blue whales due to ship strikes have occurred during 1980, 1986, 1987, 1993, and 2002. Ship strikes were implicated in the deaths of five blue whales, from 2004-2008 (NMFS SWR Stranding Database). Four of these deaths occurred in 2007, the highest number recorded for any year. During 2004-2008, there were an additional eight injuries of unidentified large whales attributed to ship strikes. Blue whale mortality and injuries attributed to ship strikes in California waters averaged 1.0 per year for 2004-2008.The blue whale is listed as endangered under the ESA; therefore, this stock is classified as depleted and strategic under the MMPA (Carretta, *et al.* 2013).

Gray whale (*Eschrichtius robustus*): The revised estimates for the most recent years are 16,369 (CV=6.1%) in 2000/01, 16,033 (CV=6.9%) in 2001/02, and 19,126 (CV=7.1%) in 2006/07. Using the 2006/07 abundance estimate of 19,126 and its associated CV of 0.071, the minimum population estimate for this stock is 18,017. The PBR for this stock is 360 animals per year. The mean annual serious injury and mortality in known commercial U.S. fisheries is greater than 3.3 gray whales, based on data from 1999 through 2003 for some fisheries and 2003 through 2007 for other fisheries (see Angliss and Outlaw 2013, in Carretta *et al.* 2013). There have also been numerous strandings or sightings of gray whales entangled in fishing gear and there have been reports of ship strikes through 2009 (Carretta *et al*. 2013). The gray whale was removed from the ESA list in 1994 due to its strong recovery, and it is not considered a strategic stock under the MMPA (Angliss and Outlaw 2005).

Minke whale (*Balaenoptera acutorostrata*): The SARs designated minke whales offshore CA/OR/WA as one stock. The population abundance for this stock of minke whales is 478 (CV=1.36), based on ship surveys from 2005 and 2008, with a minimum population estimate of 202 whales. The PBR for this stock is 2.0 whales/year. The mean annual take (serious injury and mortality) of minke whales due to known U.S. commercial fisheries is zero animals, based on data from 2004–2008. Minke whales are not considered strategic under the MMPA due to the low estimated number of ship strikes and takes in commercial fisheries (Carretta, *et al.* 2013).

Northern right whale (*Eubalaena japonicus*): Photographic and genotype data through 2008 were used to calculate the first mark-recapture estimates of abundance for right whales in the Bering Sea and Aleutian Islands, resulting in estimates of 31 (95% CL 23-54,CV=0.22) and 28 (95% CL 24-42), respectively (Wade et al. 2011). The minimum estimate of abundance of North Pacific right whales is 25.7 based on the 20th percentile of the photo-identification estimate of 31 (CV=0.226; Wade et al. 2011). PBR level for this stock is therefore considered zero animals per year). There have been no recent known anthropogenic threats to this stock, but that may be based on the rarity of sightings. The low population estimates and the scarcity of sightings have contributed to the northern right whale being listed as endangered under the ESA and depleted and strategic under the MMPA (Carretta *et al.* 2013).

Sei whale (*Balaenoptera borealis*): The SARs have divided sei whales in the North Pacific into two stocks: the eastern North Pacific stock (east of longitude 180°) and the western North Pacific stock (Carretta, *et al.* 2005). Since sightings are so rare, there have been no direct estimates of sei whale abundance in the North Pacific based on sighting surveys (Carretta, *et al.* 2005). Only two confirmed sightings and five possible sightings of sei whales were made in California, Oregon, and Washington waters during extensive ship and aerial surveys from 1991–2001. The best estimate of abundance for California, Oregon,and Washington waters out to 300 nmi is the unweighted geometric mean of the 2005 and 2008 estimates, or 126 (CV=0.53) sei whales. With a minimum population estimate of 83 animals,he PBR for this stock is 0.17 animals per year. There have been zero interactions with U.S. commercial fishing gear from 2004-2008, and zero documented ship strikes The sei whale is listed as an endangered species under the ESA and it is considered depleted and strategic under the MMPA (Carretta, *et al.* 2013).

Guadalupe fur seal (*Arctocephalus townsendi*): In 1993, the abundance of Guadalupe fur seals was estimated to be 7,408 animals, with a minimum population of 6,443 animals. There are no recent estimates of this stock found in the SARs. The estimated PBR level is 91 animals per year, where the vast majority of the estimate would apply towards mortality in Mexico. There has been no reported taking of Guadalupe fur seals in commercial fisheries in the United States, based on data from 1994 through 1998. Incidental take in Mexican fisheries is unknown. This species is listed as a threatened species under the ESA and it is therefore considered strategic and depleted under the MMPA (Carretta, *et al.* 2005).

Harbor seal (*Phoca vitulina richardsi*): Based on the most recent harbor seal counts (19,608 in May-July 2009; NMFS unpublished data) and the Harvey and Goley (2011)
correction factor, the harbor seal population in California is estimated to number 30,196 seals (CV=0.157).Given a minimum population estimate of 26,667 animals in the California stock, the PBR for this stock is 1,600 harbor seals per year (Carretta, *et al.* 2013). Estimated mean annual take in commercial fisheries is 18 (CV=0.73) animals, based on data from 2005–2009. Entrainment in power plants account for more serious injuries/mortalities to harbor seals, as does research. This stock is not classified as strategic under the MMPA (Carretta, *et al.* 2013).

Northern fur seal: (*Callorhinus ursinus*): The SARs recognize two separate stocks of northern fur seals within U.S. waters: (1) an Eastern north Pacific stock, mostly found on the Pribilof Islands in the Bering Sea, and (2) a San Miguel Island stock. In 2007 the total pup count at San Miguel Island was 2,492. Based on the 2007 count and an expansion factor, the most recent population estimate of the San Miguel Island stock is 9,968 northern fur seals. Currently, a coefficient of variation (CV) for the expansion factor is unavailable. With a conservative minimum population estimate of 5,395 animals, the PBR for this stock is 324 animals per year. While northern fur seals taken incidentally in commercial fisheries off California, Oregon, and Washington could have originated from the Pribilof Islands, NMFS considers any takes of this species to be from the San Miguel Island stock. There have been very few documented takes in U.S. commercial fisheries (none documented from 2004-2008 and few mortalities due to other human causes, although there were some northern fur seal mortalities documented in research science cruises in recent years and are being analyzed and mitigated/permitted. This stock is not listed as strategic under the MMPA (Carretta, *et al.* 2013).

3.2.4.2 Sea Turtles

The following is a brief presentation of the information on the status of the sea turtle populations in the Pacific Ocean that may encounter the DGN fishery under the proposed action.

On October 10, 2012, NMFS announced a five year review of Kemp's ridley (*Lepidochelys kempii*), olive ridley (*Lepidochelys olivacea*), leatherback (*Dermochelys coriacea*), and hawksbill (*Eretmochelys imbricata*) sea turtles under the Endangered Species Act of 1973, as amended (ESA) (77 FR 61573). A five year review is based on the best scientific and commercial data available at the time of the review. NMFS issued a request for information as the first part of the review process. The last review of these species occurred in 2007.

3.2.4.2.1 Leatherback Turtles

The leatherback turtle is listed as endangered under the ESA throughout its global range. Leatherbacks are found throughout the world and populations and trends vary in different regions and nesting beaches. In 1980, the leatherback population was estimated at approximately 115,000 (adult females) globally (Pritchard 1982b). By 1995, one estimate claimed this global population of adult females had declined to 34,500 (Spotila *et al.* 1996). A current global population estimate is not available at this time, but details on what is known of populations are provided below.

In the Pacific leatherback populations are declining at all major Pacific basin nesting beaches, particularly in the last two decades (Spotila *et al*. 1996; Spotila *et al*. 2000; NMFS and USFWS 2007a). Migratory routes of leatherback turtles originating from eastern and western Pacific nesting beaches are not entirely known for the entire Pacific population; however, satellite tracking of post-nesting females and foraging males and females, as well as genetic analyses of leatherback turtles caught in U.S. Pacific fisheries or stranded on the West Coast of the U.S. indicate that the leatherbacks found off the U.S. West Coast are from the western Pacific nesting populations, specifically boreal summer nesters. Unlike western Pacific leatherbacks which nest year round, eastern Pacific leatherbacks all nest in the winter (December through March) and postnesting movements indicate that they stay within the eastern South Pacific (Eckert and Sarti 1997; Shillinger *et al*. 2008) and therefore are not expected to be found within the proposed action area.

Based on satellite tracking data from leatherbacks nesting on Western Pacific beaches or foraging off California, 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). Leatherbacks will move into areas of high abundance and density of gelatinous prey, e.g., *Chrysaora fuscescens* and *Aurelia spp*, along the West Coast when upwelling relaxes and sea surface temperatures increase and retention areas develop (Benson *et al.* 2011). These coastal foraging areas are primarily upwelling "shadows," regions where larval fish, crabs, and jellyfish are retained in the upper water column during relaxation of upwelling.

Three main areas of foraging have been documented on the U.S. west coast; in California over the coastal shelf in waters of 14-16° C, particularly off of central CA; along the continental shelf and slope off of Oregon and Washington, particularly off the Columbia River plume; and offshore of central and northern CA 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 leatherbacks (1995) to 366 leatherbacks (1990) (Benson *et al*. 2007b). Bioenergetics studies reveal that adults consume on average 65-117 kg jellyfish per day to meet their energetic demands (Jones *et al*. 2012). With jellyfish populations increasing in the Pacific, leatherbacks are likely not resource limited (*in* Jones *et al.* 2012), although the distribution of

these dense prey patches may cause leatherbacks, which are primarily prey specialists, to concentrate in particular hot spots, as described above.

From the 2001/2002 through 2013/2014 fishing seasons, there have been two leatherback sea turtles observed caught in the DGN fishery. Both were released alive.

3.2.4.2.2 North Pacific Ocean DPS Loggerhead Turtles

On September 22, 2011, the USFWS and NMFS published a final rule listing nine DPS of loggerhead sea turtles (76 FR 58868). The North Pacific Ocean DPS of loggerheads was listed as endangered. In the proposed action area, loggerheads comprise the North Pacific Ocean DPS.

The North Pacific loggerhead DPS nests primarily in Japan (Kamezaki *et al*. 2003), although low level nesting may occur outside of Japan in areas surrounding the South China Sea (Chan *et al*. 2007; Conant *et al*. 2009). Nesting beach monitoring in Japan began in the 1950s on some beaches, and grew to encompass all known nesting beaches starting in 1990 (Kamezaki *et al*. 2003). Along the Japanese coast, nine major nesting beaches (greater than 100 nests per season) and six "submajor" beaches (10–100 nests per season) exist, including Yakushima Island where 40 percent of nesting occurs (Kamezaki *et al*. 2003). Census data from 12 of these 15 beaches provide composite information on longer-term trends in the Japanese nesting assemblage. As a result, Kamezaki *et al*. (2003) concluded a substantial decline (50–90 percent) in the size of the annual loggerhead nesting population in Japan since the 1950s. As discussed in the 2011 final ESA listing determination, current nesting in Japan represents a fraction of historical nesting levels (Conant *et al*. 2009; 76 FR 58868). Nesting declined steeply from an initial peak of approximately 6,638 nests in 1990–1991, to a low of 2,064 nests in 1997. During the past decade, nesting increased gradually to 5,167 nests in 2005 (Conant *et al*. 2009), declined and then rose again to a record high of 11,082 nests in 2008, and then 7,495 and 10,121 nests in 2009 and 2010, respectively (STAJ 2008, 2009, 2010). At the November 2011 Sea Turtle Association of Japan annual sea turtle symposium, the 2011 nesting numbers were reported to be slightly lower at 9,011 (NMFS 2012d - Asuka Ishizaki, pers. comm. November 2011).

Thus, for the 20-year period 1990-2010, the total number of nests per year for the North Pacific DPS ranged between 2,064 – 11,082 nests. Assuming a clutch frequency of four nests per female per year (Van Houtan 2011), the number of nesting females recorded per year between 1990 and 2010 ranged between 516 – 2,771. The total number of adult females in the population was estimated at 7,138 for the period 2008-2010 by Van Houtan (2011).

Loggerheads that have been documented off the U.S. west coast are primarily found south of Point Conception, California in the SCB. In Oregon and Washington, records have been kept since 1958, with nine strandings recorded over approximately 54 years (less than one stranding every 6 years) (NMFS Northwest Region stranding records database, 1958–2012, unpublished data).

From the 2001/2002 through 2013/2014 fishing seasons, there have been two loggerhead sea turtles observed caught in the DGN fishery. Both were released alive.

3.2.4.2.3 Green Turtles

There are numerous populations with different status under the ESA. NMFS has recently established a biological review team to evaluate the status of the populations of green turtles to determine if nesting

populations should be divided in to distinct population segments (similar to the agency's action on loggerhead sea turtles) and whether the listing status of some of the populations should be changed.

Green turtles in the eastern Pacific are considered one of the most depleted populations of green turtles in the world. Molecular genetic techniques have helped researchers gain insight into the distribution and ecology of migrating and nesting green turtles. Throughout the Pacific, nesting assemblages group into two distinct regional areas: 1) western Pacific and South Pacific islands, and 2) eastern Pacific and central Pacific, including the rookery at French Frigate Shoals, Hawaii. In the eastern Pacific, greens forage coastally from southern California in the north to Mejillones, Chile in the South. The primary green turtle nesting grounds in the eastern Pacific are located in Michoacán, Mexico, and the Galapagos Islands, Ecuador (NMFS and USFWS 1998b). Based on mtDNA analyses, green turtles found on foraging grounds along Chile's coast originate from the Galapagos nesting beaches, while those greens foraging in the Gulf of California originate primarily from the Michoacan nesting stock. Green turtles foraging in southern California and along the Pacific coast of Baja California originate primarily from rookeries of the Islas Revillagigedos (Dutton 2003).

An estimated 3,319 – 3,479 eastern Pacific females nested annually (NMFS and USFWS 2007c), and nesting has been steadily increasing at the primary nesting sites in Michoacan, Mexico, and in the Galapagos Islands since the 1990s (Delgado and Nichols 2005; Senko *et al*. 2011). Recent information suggests that up to 10,000 nesting females may nest annually at Michoacan (SWOT 2011). Colola beach is the most important green turtle nesting area in the eastern Pacific; it accounts for 75 percent of total nesting in Michoacan and has the longest time series of monitoring data since 1981. Nesting trends at Colola have continued to increase since 2000 with the overall eastern Pacific green turtle population also increasing at other nesting beaches in the Galapagos and Costa Rica (Wallace *et al*. 2010; NMFS and USFWS 2007c).

Two populations of green turtles are found in two areas adjacent to the proposed action area and may be affected by the proposed action. South San Diego Bay serves as important habitat for a resident population of up to about 60 juvenile and adult green turtles in this area (Eguchi *et al*. 2010). There is also an aggregation of green sea turtles that appear to be persistent in the San Gabriel River and surrounding coastal area in the vicinity of Long Beach (Lawson *et al*. 2011). This group of turtles has only recently been identified and very little is known about their abundance, behavior patterns, or relationship with the population in San Diego Bay.

From the 2001/2002 through 2013/2014 fishing seasons, there have been no green sea turtles observed caught in the DGN fishery.

3.2.4.2.4 Olive Ridley Turtle

Although the olive ridley turtle is regarded as the most abundant sea turtle in the world, olive ridley nesting populations on the Pacific coast of Mexico are listed as endangered under the ESA; all other populations are listed as threatened.

The eastern Pacific population is thought to be increasing, while there is inadequate information to suggest trends for other populations. The global status of olive ridleys is described in the 5-year status review (NMFS and USFWS 2007d). Eastern Pacific olive ridleys nest primarily in large *arribadas* on the west coasts of Mexico and Costa Rica. Since reduction or cessation of egg and turtle harvest in both countries in the early 1990s, annual nest totals have increased substantially. On the Mexican coast alone,

in 2004-2006, the annual total was estimated at 1,021,500 – 1,206,000 nests annually (NMFS and USFWS 2007d). Eguchi *et al*. (2007) counted olive ridleys at sea, leading to an estimate of 1,150,000 – 1,620,000 turtles in the eastern tropical Pacific in 1998-2006. The 5-year status review (NMFS and USFWS 2007d) describes *arribadas* occurring in northeastern India at Gahirmatha and Ryshikulya, with 1,000 to 100,000 turtles and 10,000 to 200,000 turtles, respectively, occurring per *arribada*. A number of other locations in western and eastern India are also described as sites of potential solitary nesting activity, but nesting activity is unquantified at these locations (NMFS and USFWS 2007d). Survey effort on India beaches has fluctuated over the years and methods used to census nesting populations have also changed. As a result, reported trends and abundance numbers may be somewhat speculative and potentially unreliable. The most reliable abundance estimate for Gahirmatha during the 1999 *arribada* was approximately 180,000 nesting females, with long-term data indicating the population may be in decline (NMFS and USFWS 2007c). In contrast, there are no known *arribadas* of any size in the western Pacific, and apparently only a few hundred nests scattered across Indonesia, Thailand and Australia (Limpus and Miller 2008). Data are not available to analyze trends (NMFS 2005; NMFS and USFWS 2007d).

Because the proposed action is most likely to occur primarily east of 140° west longitude, thus closer to the Eastern Pacific nesting and foraging sites, it is reasonable to assume that this eastern Pacific population would be more likely to be affected by the proposed action. This is a large population. The largest known *arribadas* in the eastern Pacific are off the coast of Costa Rica (~475,000 - 650,000 females estimated nesting annually) and in southern Mexico (~1,000,000+ nests/year at La Escobilla, in Oaxaca (Marquez-M. *et al*. 2005)). On the Mexican coast alone, the annual total of nests was estimated to average between 1.0 and 1.2 million from 2004-2006 (NMFS and USFWS 2007d). An independent estimate based on the number of turtles observed in the water at sea produced an estimate of 1.2 to 1.6 million turtles in the eastern tropical Pacific in 1998-2006 (Eguchi *et al*. 2007).

From the 2001/2002 through 2013/2014 fishing seasons, there have been no olive ridley sea turtles observed caught in the DGN fishery.

3.2.4.3 Seabirds

The seabirds that are likely to affected by the proposed action are those that have been observed caught in the DGN fishery from the 2001/2002 fishing season through the 2013/2014 fishing season.

3.2.4.3.1 Cassin's Auklet (Ptychoramphus aleuficu)

Cassin's auklet occur in marine pelagic waters from Alaska to Baja, California. Auklets are abundant throughout their range, with an estimated 88,000 birds (Seattle Audubon Society 2006). In California, the auklet occurs year round, where 80 percent of the breeding population is found on the Farallon Islands; 17 percent are found on Prince Island and elsewhere in the Channel Islands; and 3 percent are found on Castle Rock, off Del Norte County and Green Rock, off Humboldt County (California Interagency Wildlife Task Group 2006). Cassin's auklet is not listed as either threatened or endangered by the State of California, or with the Federal government.

From the 2001/2002 through 2013/2014 fishing seasons, there has been one Cassin's auklet observed caught in the DGN fishery. It was released dead.

3.2.4.3.2 Northern Fulmar (Fulmarus glacialis)

The northern fulmar occurs globally (Phillips, *et al.* 1999) from the Aleutians and the coasts of Alaska and Canadian Arctic to southern California and in the north Atlantic south to North Carolina, as well as northern Eurasia (U.S. Geoglocial Survey 2006). Fulmars are a pelagic species, coming to shore only to breed. Fulmars are an abundant seabird, with a world population approximated at 15 to 20 million breeding pairs (Phillips, *et al.* 1999) of which an estimated 1.4 million breeding individuals occurring in the North Pacific (Nevins and Harvey 2003).

The fulmar can be seen feeding at the surface (Seattle Audubon Society 2006), diving for its prey, or commonly behind fishing vessels foraging on fish waste thrown overboard (Phillips, *et al.* 1999). Prey consists of crustaceans, fish, small squid, and jellyfish. Studies have suggested that commercial fishing may have contributed to the expansion in breeding numbers and range of the northern fulmar over the last two centuries (Phillips, *et al.* 1999). The Northern fulmar is not listed as endangered or threatened.

From the 2001/2002 through 2013/2014 fishing seasons, there have been 19 Northern fulmar observed caught in the DGN fishery. Eighteen were released alive and one was released dead.

3.3 Essential Fish Habitat and Critical Habitat

Essential fish habitat has not been designated in the action area for any of the species likely to be affected by the proposed action.

Critical habitat has not been designated or proposed within the action area for most ESA-listed marine mammals, sea turtles, fish or invertebrates. Designated critical habitat for Steller sea lions (eastern DPS) is within the action area, including waters surrounding Año Nuevo Island, Sugarloaf Island, and the southeast Farallon Islands in California; and Pyramid Rock at Rogue Reef, and Long Brown Rock and Seal Rock at Orford Reef in Oregon (50 CFR 226). Critical habitat includes associated aquatic zones 3,000 feet seaward in State and Federally managed waters from the baseline of each rookery (50 CFR 226.202(b)). The DGN fishery does not operate within 3,000 feet of any shoreline and, therefore, will not affect Steller sea lion critical habitat. As noted above, most of the DGN effort occurs well south of the islands that are designated as critical habitat. The proposed action is not likely to affect Steller sea lion critical habitat, and it will not be considered further in this document.

Critical habitat was recently designated off the U.S. west coast for leatherback sea turtles (77 FR 4170, January 26, 2012), which does include areas that are seasonally open to the DGN fishery off the central coast of California. In the final rule designating leatherback critical habitat, NMFS identified one primary constituent element essential for the conservation of leatherbacks in marine waters off the U.S. West Coast: the occurrence of prey species, primarily scyphomedusae of the order Semaeostomeae (e.g., *Chrysaora*, *Aurelia*, *Phacellophora*, and *Cyanea*), of sufficient condition, distribution, diversity, abundance and density necessary to support individual as well as population growth, reproduction, and development of leatherbacks. However, the critical habitat designation does not specifically define or develop standards or measurable criteria for any of these particular aspects of prey occurrence. Observers in the DGN fishery do occasionally report the bycatch of invertebrate species (Table 3 *in* Larese and Coan 2008). This bycatch includes pelagic tunicates (likely salps) and other unidentified invertebrate species, presumed to be passively snagged by these nets as the gear drifts in the water or is being hauled through

the water and onboard the net reel of fishing vessels. The fate of these species upon release is very difficult to judge. The critical habitat designation emphasizes that the preferred prey of leatherbacks off the California coast is jellyfish, with other gelatinous prey, such as salps (a pelagic tunicate), considered of lesser importance (77 FR 4170). While jellyfish bycatch may occur in the DGN fishery, the extent is believed to be rare and cannot be quantified (NMFS 2012a). In addition, significant portions of the designated critical habitat are not open to DGN during the PLCA restriction when leatherbacks would be expected to be foraging on prey (i.e., summer and early fall). The proposed action is not likely to affect leatherback sea turtle critical habitat, and will not be considered further in this document.

3.4 Climate Variability and Climate Change

Two mesoscale climate phenomena likely affect frontal activity and the distribution of tuna, other target and non-target finfish, and protected species found in the proposed action area. The first is El Niño-Southern Oscillation (El Niño), which is characterized by a relaxation of the Indonesian Low and subsequent weakening or reversal of westerly trade winds, causing warm surface waters in the western Pacific to shift eastward. Although the effects can be global, an El Niño event brings warm waters and a weakening of coastal upwelling off the west coast. Tunas and billfish are found farther north during El Niño years (Field and Ralston 2005). La Niña, a related condition, results in inverse conditions, including cooler water in the eastern tropical Pacific and CCS.

The second mesoscale climate phenomenon likely to affect the distribution of species in the proposed action area is the Pacific Decadal Oscillation (PDO). It has important ecological effects in the CCS. Regime shifts indicated by the PDO have a periodicity operating at both 15-25 and 50–70 year intervals (Schwing 2005). The PDO indicates shifts between warm and cool phases. The warm phase is characterized by warmer temperatures in the Northeast Pacific (including the west coast), and cooler-than-average sea surface temperatures and lower-than-average sea level air pressure in the Central North Pacific; opposite conditions prevail during cool phases.

Recent reports by the Intergovernmental Panel on Climate Change (IPCC) have made it clear that the earth's climate is changing, and with it the environmental conditions in the ocean are also changing (IPCC 2007a). Climate change can affect the marine environment by impacting the established hydrologic cycle (a change in precipitation and evaporation rates) and by increasing the incidence of disease in aquatic organisms (Roessig *et al*. 2004). Climate change has been associated with other effects to the marine environment, including rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels, and circulation (IPCC 2007b). These effects are leading to shifts in the range of species, changes in algal, plankton, and fish abundance (IPCC 2007b), and causing damage to coral reefs (Scavia *et al*. 2002). Plankton studies demonstrate that climate change is affecting phytoplankton, copepod herbivores, and zooplankton carnivores, which effect ecosystem services, such as oxygen production, carbon sequestration, and biogeochemical cycling and conclude that fish, seabirds, and marine mammals will need to adapt to a changing spatial distribution of primary and secondary production within pelagic marine ecosystems (Richardson *et al*. 2004).

The California Current is known have large natural fluctuations in its oceanography and coastal pelagic species abundance, which could have a direct impact on the abundance and location of PBF in the EPO. Baumgartner *et al.* (1992) and Field *et al.* (2009) looked at deposits of coastal pelagic fish scales and were

able to identify historic periods or regimes of anchovy and sardine abundance that they suggest are linked to large scale climate phenomena. For example, during the 1930's through the 1950's when the California Current was undergoing a "warm" period as reflected in the PDO (Mantua *et al.* 1997) sardines were highly abundant; however, these populations experienced steep declines as the California Current and the North Pacific entered a cool period.

Studies conducted by Perry *et al*. (2005) indicate that climate change is affecting marine fish distributions in ways that may have important ecological impacts on fish as well as important impacts on commercial fisheries. Impacts to commercial fisheries include: (1) increases in ocean stratification leading to less primary production, which in turn leads to less overall energy for fish production; (2) shifts in mixing areas of water zones leading to decreases in spawning habitat and decreased stock sizes; and (3) changes in currents that may lead to changes in larval dispersals and retention among certain habitats, which could lead to decreases in stock sizes or availability of resources to certain fisheries (Roessig *et al.* 2004).

3.5 Socioeconomic Environment

The socioeconomic environment affected by the proposed action includes producers who participate as fishers in the drift gillnet fishery, consumers of swordfish and other market species which are caught and landed by the DGN fishery, processors and other providers of supporting services to the industry, and fishing communities where operation of the DGN fishery provides direct and indirect revenue and employment impacts.

Fishers in the drift gillnet fishery incur fixed and variable operating costs (Shafer et al.). Fixed costs include recurring annual costs of participation, such as purchase and maintenance of vessel capital, license fees, insurance, repayment of loans used to purchase vessels or equipment, mooring or berth fees, and taxes. Variable operating costs include equipment repair and replacement costs, fuel and oil, and crew costs. Fishers additionally need to earn a sufficient income from DGN fishing compared to alternative forms of employment to justify the economic opportunity cost of their continued participation.

Participants in the DGN fishery generate revenues through landing and selling their marketable catch. Variable profits are the amount by which revenues from sale of fish exceed variable operating costs. In order for participation in the DGN fishery to remain economically viable, fishers must generate sufficient revenues to cover their fixed and variable costs of fishing plus their opportunity cost of participation in the fishery. Conversely, an insufficient level of variable profits will result in an economic loss due to DGN operations, leading to attrition from participation in the fishery and loss of positive economic impacts on producers, consumers and affected communities.

The alternatives under consideration in the proposed action have the potential to generate adverse economic impacts on the fishery by reducing the amount of allowable DGN effort due to in-season closure. A choice between alternatives will involve tradeoffs between potentially lower conservation impacts and a risk of lost economic benefits to impacted producers, consumers and fishing communities. Management by hard caps may reduce conservation risk but introduces the chance of eliminating potential fishing effort and variable profits if a cap is reached before the end of the season, closing the fishery. The reduction in allowable effort over which DGN fishers can generate variable profits can lead to loss of economic viability and reduction in economic benefits to producers, consumers and affected communities.

A baseline for analyzing the economic impacts of the proposed alternatives was established by considering recent DGN fishery operation. The baseline assumes twenty active fishing vessels, a close proxy for recent levels of participation, and assumes that effort is limited as under current management by the PLCA closure and other regulatory measures that have been in effect since 2001, but not by hard caps.

4 ENVIRONMENTAL CONSEQUENCES

This section analyzes the effects of the proposed action and alternatives to the resources described in Chapter 3. These resources include target, non-target, and prohibited species captured in the DGN fishery; protected species; and the socioeconomic environment. This chapter first presents an analysis of the biological environment and then the socioeconomic environment.

4.1 Hard Caps

Historical observed DGN catch of hard cap species (species for which hard caps are proposed under each Alternative) from the 1990/1991 fishing season through 2013/2014 fishing season is presented and used to determine the anticipated impacts of each of the alternatives. This chapter provides an analysis showing how many fishing seasons the DGN fishery would have closed if hard caps were in place in the past under each Alternative scenario. This analysis uses the period of the 2001/2002 fishing year through 2013/2014. The 2001/2002 season was chosen for this since the PLCA was put in place in 2001 and the time and area fished by DGN has remained the same since then. If future catch of hard cap species remains unchanged from the 2001/2002 through 2013/2014 period, hard caps would be expected to close the DGN fishery at the same frequency as they would have if caps were in place in the past. Vessel operators may modify their fishing areas or techniques to avoid catching hard cap species in the future. If vessel operators are successful in reducing the frequency of hard cap species catch, the DGN fishery would close less often than if fishing behavior did not change.

4.1.1 No Action Alternative

Hard caps would not be established for HPPS. Fishing practices and catch rates would be expected to remain the same as past performance.

4.1.1.1 Target, Non-Target and Prohibited Species

There would be no effect to these species. Catch rates would remain the same as baseline conditions.

4.1.1.2 Protected Species

There would be no effect to these species. Catch rates would remain the same as baseline conditions.

4.1.2 Action Alternative 1 - Species Listed in the ITS

Table 13 shows historical DGN fishery performance under hard caps in Alternative 1. From 2001/2002 through 2013/2014, the DGN fishery would have closed one time (2010/2011) if annual hard caps were in place (sub-option 1). The fishery would also have closed one time during the same fishing season if five-year hard caps were in place (sub-option 2). The DGN fishery would be expected to meet or exceed a hard cap and be closed during one out of thirteen future fishing seasons under this Alternative for both

sub-options 1 and 2. If vessel operators are successful in reducing the frequency of hard cap species catch in the future, the DGN fishery would close less often.

Table 13. Historical performance of the DGN fishery under Alternative 1. (Numbers of M&SI are expanded based on observer coverage level, and include all individuals released in an "unknown" state. Red cells indicate a cap being met or exceeded and the resulting closure of the fishery.)

Species	Alternative 1 Annual M&SI Caps	Alternative 1 Five-Year M&SI Caps	ESTIMATED NUMBER OF M&SI												
			Season:												
			01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14
Fin whale	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale	2	8	0	0	0	0	0	0	0	0	0	16	0	0	0
Leatherback sea turtle	3	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Loggerhead sea turtle	3	7	0	0	0	0	0	0	0	0	0	0	0	0	0
Olive ridley sea turtle	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Green sea turtle	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Estimated number of sets:			*1,678*	*1,673*	*1,433*	*1,022*	*1,075*	*1,353*	*998*	*1,060*	*832*	*396*	*525*	*408*	*559*

4.1.2.1 Target, Non-Target and Prohibited Species

This Alternative would result in a direct minor beneficial effect to these species during those fishing seasons when a hard cap is met or exceeded. The DGN fishery would close, and no more individuals of these species would be caught for the remainder of the season. These effects are expected to occur during one out of thirteen future fishing seasons under the one-year (sub-option 1) or five-year (sub-option 2) hard cap options, based on historical observed DGN catch of hard cap species. The amount of the beneficial effect would depend on when during the fishing season a hard cap is met or exceeded. A hard cap met or exceeded early in a fishing season would have a greater beneficial effect on the species than if a hard cap were met or exceeded late in a fishing season.

4.1.2.2 Protected Species

This Alternative would result in a direct minor beneficial effect to these species during those fishing seasons when a hard cap is met or exceeded. The DGN fishery would close, and no more individuals of these species would be caught for the remainder of the season. These effects are expected to occur during one out of thirteen future fishing seasons under the one-year or five-year hard cap options, based on historical observed DGN catch of hard cap species. The amount of the beneficial effect would depend on when during the fishing season a hard cap is met or exceeded. A hard cap met or exceeded early in a fishing season would have a greater beneficial effect on the species than if a hard cap were met or exceeded late in a fishing season.

This Alternative may also result in an indirect beneficial effect to hard cap species if DGN vessel operators are successful in reducing the frequency of future hard cap species catch in order to avoid fishery closures.

4.1.3 Action Alternative 2 - Recently Caught Marine Mammals and Select Sea Turtles

Table 14 shows historical DGN fishery performance under hard caps in Alternative 2. From 2001/2002 through 2013/2014, the DGN fishery would have closed three times if annual hard caps were in place

(sub-option 1). The fishery would have closed once (2010/2011) if five-year hard caps were in place (sub-option 2). The DGN fishery would be expected to meet or exceed a hard cap and be closed during three out of thirteen future fishing seasons under the one-year hard cap sub-option in this Alternative, or one season under the five-year hard cap sub-option . If vessel operators are successful in reducing the frequency of hard cap species catch in the future, the DGN fishery would close less often.

Table 14. Historical performance of the DGN fishery under Alternative 2. (Numbers of M&SI are expanded based on observer coverage level, and include all individuals released in an "unknown" state. Red cells indicate a cap being met or exceeded and the resulting closure of the fishery.)

Species	Alternative 2 Annual M&SI Caps	Alternative 2 Five-Year M&SI Caps	ESTIMATED NUMBER OF M&SI												
			Season:												
			01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14
Humpback whale	11	55	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale	2	8	0	0	0	0	0	0	0	0	0	16	0	0	0
Short-fin pilot whale CA/OR/WA	5	23	0	0	5	0	0	0	0	0	0	0	0	0	6
Pinniped Group	4,316	21,580	47	58	24	27	14	57	51	51	39	0	97	29	9
Dolphin Group	13,582	67,910	88	49	117	18	66	38	76	102	23	46	43	15	35
Leatherback sea turtle	3	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Loggerhead sea turtle	3	7	0	0	0	0	0	0	0	0	0	0	0	0	0
		Estimated number of sets:	***1,678***	***1,673***	***1,433***	***1,022***	***1,075***	***1,353***	***998***	***1,060***	***832***	***396***	***525***	***408***	***559***

4.1.3.1 Target, Non-Target and Prohibited Species

This Alternative would result in a direct minor beneficial effect to these species during those fishing seasons when a hard cap is met or exceeded. The DGN fishery would close, and no more individuals of these species would be caught for the remainder of the season. These effects are expected to occur during three out of thirteen future fishing seasons under the one-year sub-option, or one out of thirteen future fishing seasons under the five-year hard cap sub-option, based on historical observed DGN catch of hard cap species. The amount of the beneficial effect to the species would depend on when during the fishing season a hard cap is met or exceeded. A hard cap met or exceeded early in a fishing season would have a greater beneficial effect to the species than if a hard cap were met or exceeded late in a fishing season.

4.1.3.2 Protected Species

This Alternative would result in a direct minor beneficial effect to these species during those fishing seasons when a hard cap is met or exceeded. The DGN fishery would close, and no more individuals of these species would be caught for the remainder of the season. These effects are expected to occur during three out of thirteen future fishing seasons under the one-year sub-option, or one out of thirteen future fishing seasons under the five-year hard cap sub-option, based on historical observed DGN catch of hard cap species. The amount of the beneficial effect would depend on when during the fishing season a hard cap is met or exceeded. A hard cap met or exceeded early in a fishing season would have a greater beneficial effect to the species than if a hard cap were met or exceeded late in a fishing season.

This Alternative may also result in an indirect beneficial effect to hard cap species if DGN vessel operators are successful in reducing the frequency of future hard cap species catch in order to avoid fishery closures.

4.1.4 Action Alternative 3 - Select ESA-listed Marine Mammals and Sea Turtles

Table 15 shows historical DGN fishery performance under hard caps in Alternative 3. From 2001/2002 through 2013/2014, the DGN fishery would have closed one time (2010/2011) if annual hard caps (sub-option 1) were in place. The fishery would also have closed one time during the same fishing season if five-year hard caps (sub-option 2) were in place. The DGN fishery would be expected to meet or exceed a hard cap and be closed during one out of thirteen future fishing seasons under this Alternative. If vessel operators are successful in reducing the frequency of hard cap species catch in the future, the DGN fishery would close less often.

Table 15. Historical performance of the DGN fishery under Alternative 3. (Numbers of M&SI are expanded based on observer coverage level, and include all individuals released in an "unknown" state. Red cells indicate a cap being met or exceeded and the resulting closure of the fishery.)

Species	Alternative 3 Annual M&SI Caps	Alternative 3 Five-Year M&SI Caps	ESTIMATED NUMBER OF M&SI												
			Season:												
			01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14
Humpback whale	5	25	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale	3	15	0	0	0	0	0	0	0	0	0	16	0	0	0
Leatherback sea turtle	4	13	0	0	0	0	0	0	0	0	0	0	0	0	0
Loggerhead sea turtle	4	9	0	0	0	0	0	0	0	0	0	0	0	0	0
		Estimated number of sets:	***1,678***	***1,673***	***1,433***	***1,022***	***1,075***	***1,353***	***998***	***1,060***	***832***	***396***	***525***	***408***	***559***

4.1.4.1 Target, Non-Target and Prohibited Species

This Alternative would result in a direct minor beneficial effect to these species during those fishing seasons when a hard cap is met or exceeded. The DGN fishery would close, and no more individuals of these species would be caught for the remainder of the season. These effects are expected to occur during one out of thirteen future fishing seasons under the one-year or five-year hard cap sub-options, based on historical observed DGN catch of hard cap species. The amount of the beneficial effect would depend on when during the fishing season a hard cap is met or exceeded. A hard cap met or exceeded early in a fishing season would have a greater beneficial effect to the species than if a hard cap were met or exceeded late in a fishing season.

4.1.4.2 Protected Species

This Alternative would result in a direct minor beneficial effect to these species during those fishing seasons when a hard cap is met or exceeded. The DGN fishery would close, and no more individuals of these species would be caught for the remainder of the season. These effects are expected to occur during one out of thirteen future fishing seasons under the one-year or five-year hard cap sub-options, based on historical observed DGN catch of hard cap species. The amount of the beneficial effect would depend on when during the fishing season a hard cap is met or exceeded. A hard cap met or exceeded early in a fishing season would have a greater beneficial effect to the species than if a hard cap were met or exceeded late in a fishing season.

This Alternative may also result in an indirect beneficial effect to hard cap species if DGN vessel operators are successful in reducing the frequency of future hard cap species catch in order to avoid fishery closures.

4.1.5 Action Alternative 4 - HPPS and Marine Mammals over ZMRG (Council PPA)

Table 16 shows historical DGN fishery performance under one-year hard caps in Alternative 5 sub-option 1. From 2001/2002 through 2013/2014, the DGN fishery would have closed three times if annual hard caps were in place. The DGN fishery would be expected to meet or exceed a hard cap and be closed during three out of thirteen future fishing seasons under the one-year hard cap sub-option in this Alternative. If vessel operators are successful in reducing the frequency of hard cap species catch in the future, the DGN fishery would close less often.

In comparison, **Table** 17 shows the historical performance of the DGN fishery under the two-year sub-option. The two-year caps are aligned with the Council's biennial management cycle. With this cap window, the fishery would have closed once for a period of less than two consecutive full seasons; the remainder of the 2010-11 season and the entirety of the 2011-12 season. The fishery would close less often under the two-year cap sub-option, since this option uses the average M&SI over two fishing seasons, instead of annual M&SI under the one-year sub-option. The DGN fishery would be expected to meet or exceed a hard cap and be closed once during thirteen future fishing seasons under the two-year hard cap sub-option in this Alternative. The length of the closure would depend on when during the two-year period the cap is met or exceeded. The DGN fishery would close for the remainder of a single fishing season if the cap is reached during the second year of the two-year cap window. The DGN fishery would close for the remainder of the current fishing season plus the entire following season if the cap were reached in the first year of the two-year cap window.

The two-year cap could be aligned with the Council's fixed biennial management cycle, or with a two-year rolling window. The rolling window would always consider M&SI during the previous fishing season along with the current fishing season to determine whether a two-year average hard cap has been met or exceeded. Historical DGN performance is the same under either of these two-year windows.

Table 16. Historical performance of the DGN fishery under Alternative 4 one-year card caps. (Numbers of M&SI are expanded based on observer coverage level, and include all individuals released in an "unknown" state. Red cells indicate a cap being met or exceeded and the resulting closure of the fishery.)

Species	Alternative 4 Annual M&SI Caps	ESTIMATED NUMBER OF M&SI												
		Season:												
		01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14
Fin whale	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale	2	0	0	0	0	0	0	0	0	0	16	0	0	0
Leatherback sea turtle	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Loggerhead sea turtle	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Olive ridley sea turtle	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Green sea turtle	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Short-fin pilot whale CA/OR/WA	5	0	0	5	0	0	0	0	0	0	0	0	0	6
Bottlenose Dolphin CA/OR/WA	6	0	0	0	0	0	0	0	0	0	8	0	0	0
Estimated number of sets:		*1,678*	*1,673*	*1,433*	*1,022*	*1,075*	*1,353*	*998*	*1,060*	*832*	*396*	*525*	*408*	*559*

Table 17. Historical performance (2000-2013) of the DGN fishery under Alternative 4 two-year hard caps. (Red cells indicate a cap being met or exceeded and the resulting closure of the fishery.)

Species	Alternative 4 Two-Year Average M&SI Cap	ESTIMATED NUMBER OF M&SI													
		00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14
Fin whale	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale	2	0	0	0	0	0	0	0	0	0	0	16	0	0	0
Leatherback sea turtle	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Loggerhead sea turtle	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olive ridley sea turtle	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green sea turtle	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Short-fin pilot whale C/O/W	5	0	0	0	5	0	0	0	0	0	0	0	0	0	6
Common bottlenose dolhpin C/O/W	6	0	0	0	0	0	0	0	0	0	0	8	0	0	0
Estimated number of sets:		1,953	1,678	1,673	1,433	1,022	1,075	1,353	998	1,060	832	396	525	408	559
Highest average annual SI/M		0.5		0.5		0.5		0.5		0.5		8		3	
Would the fishery close?		*NO*		*NO*		*NO*		*NO*		*NO*		*YES*		*NO*	

4.1.5.1 Target, Non-Target and Prohibited Species

This Alternative would result in a direct minor beneficial effect to these species during those fishing seasons when a hard cap is met or exceeded. The DGN fishery would close, and no more individuals of these species would be caught for the remainder of the season. These effects are expected to occur during three out of thirteen future fishing seasons under the one-year sub-option, or once during thirteen future fishing seasons under the two-year hard cap sub-option, based on historical observed DGN catch of hard cap species. The amount of the beneficial effect would depend on when during the fishing season a hard cap is met or exceeded. A hard cap met or exceeded early in a fishing season would have a greater beneficial effect to the species than if a hard cap were met or exceeded late in a fishing season.

4.1.5.2 Protected Species

This Alternative would result in a direct minor beneficial effect to these species during those fishing seasons when a hard cap is met or exceeded. The DGN fishery would close, and no more individuals of these species would be caught for the remainder of the season. These effects are expected to occur during three out of thirteen future fishing seasons under the one-year sub-option, or once during thirteen future fishing seasons under the two-year hard cap sub-option, based on historical observed DGN catch of hard cap species. The amount of the beneficial effect would depend on when during the fishing season a hard cap is met or exceeded. A hard cap met or exceeded early in a fishing season would have a greater beneficial effect to the species than if a hard cap were met or exceeded late in a fishing season.

This Alternative may also result in an indirect beneficial effect to hard cap species if DGN vessel operators are successful in reducing the frequency of future hard cap species catch in order to avoid fishery closures.

4.1.6 Action Alternative 5 - Observed Entanglement Caps (CDFW PPA)

Table 18 shows historical DGN fishery performance under one-year hard caps in Alternative 5 sub-option 1. From 2001/2002 through 2013/2014, the DGN fishery would have closed seven times if annual hard caps were in place. The DGN fishery would be expected to meet or exceed a hard cap and be closed during seven out of thirteen future fishing seasons under the one-year hard cap option in this Alternative. If vessel operators are successful in reducing the frequency of hard cap species catch in the future, the DGN fishery would close less often.

In comparison, **Table** 19 shows the historical performance of the DGN fishery under the two-year sub-option. The two-year caps are aligned with the Council's biennial management cycle. With this cap window, the fishery would have closed once for a period of less than two consecutive full seasons; the remainder of the 2010-11 season and the entirety of the 2011-12 season. The fishery would close less often under the two-year cap sub-option, since this option uses the average M&SI over two fishing seasons, instead of annual M&SI under the one-year sub-option. The DGN fishery would be expected to meet or exceed a hard cap and be closed once during thirteen future fishing seasons under the two-year hard cap option in this Alternative. The length of the closure would depend on when during the two-year period the cap is met or exceeded. The DGN fishery would close for the remainder of a single fishing season if the cap is reached during the second year of the two-year cap window. The DGN fishery would close for the remainder of the current fishing season plus the entire following season if the cap were reached in the first year of the two-year cap window.

The two-year cap could be aligned with the Council's fixed biennial management cycle, or with a two-year rolling window. The rolling window would always consider M&SI during the previous fishing season along with the current fishing season to determine whether a two-year average hard cap has been met or exceeded. Historical DGN performance is the same under either of these two-year windows.

While the hard caps in Alternatives 1-4 are based on estimated M&SI, the hard caps in this Alternative are based on observed entanglements at the current 30 percent observer coverage rate. If observer coverage rises beyond 30 percent, it is expected that more hard cap species entanglements would be observed, and the DGN fishery would close more often.

Table 18. Historical performance of the DGN fishery under Alternative 5 one-year hard caps. (Red cells indicate a cap being met or exceeded and the resulting closure of the fishery.)

Species	Alternative 5 Annual Observed Entanglement Caps	NUMBER OF OBSERVED ENTANGLEMENTS												
		Season:												
		01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14
Fin whale	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Sperm whale	1	0	0	0	0	0	0	0	0	0	2	0	0	0
Leatherback sea turtle	1	0	0	0	0	0	0	0	0	1	0	0	1	0
Loggerhead sea turtle	1	1	0	0	0	0	1	0	0	0	0	0	0	0
Olive ridley sea turtle	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Green sea turtle	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Short-fin pilot whale CA/OR/WA	2	0	0	1	0	0	0	0	0	0	0	0	0	2
Bottlenose Dolphin CA/OR/WA	2	0	0	0	0	0	0	0	0	0	1	0	0	0
Estimated number of sets:		*1,678*	*1,673*	*1,433*	*1,022*	*1,075*	*1,353*	*998*	*1,060*	*832*	*396*	*525*	*408*	*559*

Table 19. Historical performance (2000/2001 through 2013/2014 fishing seasons) of the DGN fishery under Alternative 5 two-year hard caps. (Red cells indicate a cap being met or exceeded and the resulting closure of the fishery.)

Species	Alternative 5 Two-Year Average Observed Entanglement Cap	OBSERVED NUMBER OF TAKES													
		00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14
Fin whale	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Sperm whale	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Leatherback sea turtle	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Loggerhead sea turtle	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0
Olive ridley sea turtle	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green sea turtle	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Short-fin pilot whale C/O/W	2	0	0	0	1	0	0	0	0	0	0	0	0	0	2
Common bottlenose dolhpin C/O/W	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Estimated number of sets:		1,953	1,678	1,673	1,433	1,022	1,075	1,353	998	1,060	832	396	525	408	559
Highest aerage annual take		0.5		0.5		0.5		0.5		0.5		1		1	
Would the fishery close?		*NO*		*NO*		*NO*		*NO*		*NO*		*YES*		*NO*	

4.1.6.1 Target, Non-Target and Prohibited Species

This Alternative would result in a direct minor beneficial effect to these species during those fishing seasons when a hard cap is met or exceeded. The DGN fishery would close, and no more individuals of these species would be caught for the remainder of the season. These effects are expected to occur during seven out of thirteen future fishing seasons under the one-year option, or once during thirteen future fishing seasons under the two-year hard cap option, based on historical observed DGN catch of hard cap species. The amount of the beneficial effect would depend on when during the fishing season a hard cap is met or exceeded. A hard cap met or exceeded early in a fishing season would have a greater beneficial effect to the species than if a hard cap were met or exceeded late in a fishing season.

4.1.6.2 Protected Species

This Alternative would result in a direct minor, but more beneficial effect than alternatives 1-4 to these species during those fishing seasons when a hard cap is met or exceeded, since the DGN fishery may close more often. The DGN fishery would close, and no more individuals of these species would be caught for the remainder of the season. These effects are expected to occur during seven out of thirteen future fishing seasons under the one-year option, or once during thirteen future fishing seasons under the two-year hard cap option, based on historical observed DGN catch of hard cap species. The amount of the beneficial effect would depend on when during the fishing season a hard cap is met or exceeded. A hard cap met or exceeded early in a fishing season would have a greater beneficial effect to the species than if a hard cap were met or exceeded late in a fishing season.

This Alternative may also result in an indirect beneficial effect to hard cap species if DGN vessel operators are successful in reducing the frequency of future hard cap species catch in order to avoid fishery closures.

4.2 Economic Effects of Hard Cap Alternatives

A bootstrap methodology was used to evaluate the performance of the drift gillnet fishery under hard caps alternatives in terms of economic results and conservation impacts on protected species proposed for hard caps (Council Agenda Item H.4.b HMSMT Report, March 2015). The Pacific Fishery Management Council's Scientific and Statistical Committee reviewed the proposed methodology at their March 2015 meeting and offered recommendations for improvements (Council Agenda Item H.4.b Supplemental SSC

Report, March 2015) which were incorporated into the methodology and are reflected in the results presented here.

The analysis uses recent data on DGN effort, landings, revenues, marine mammal and turtle bycatch, retained finfish catch, and fishing costs to simulate the operation of the DGN fishery under the baseline ("No Action") and hard caps alternatives. The methodology offers the advantages of explicitly quantifying random factors which affect DGN fishery economic performance and protected species impacts, and allowing comparison of the performance of the DGN fishery under the baseline scenario and hard caps alternatives over a large number of replicated fishing seasons. Random factors which affect fishery operation enter the simulation results in a consistent manner with past observed experience.

Data sources used for the analysis include PacFIN data to characterize the recent distribution of annual effort per vessel and to measure landings and revenues, trip- and set-level DGN observer retained finfish catch and protected species entanglements and mortality and serious injury counts for simulation of protected species impacts and timing of closure, and Southwest Fisheries Science Center cost and earnings survey data to estimate average variable cost per set, used in conjunction with simulated revenues to estimate variable profits.

Results for different performance metrics are reported down the rows of the tables shown below including total sets for the season (Sets), total fleet revenues (Total Revenues), total fleet variable profits (Total Variable Profits), average variable profit per vessel (Average Variable Profits), and full-season mortality and serious injury (M&SI) counts for high priority bycatch species subject to caps under at least one of the alternatives, including leatherback turtles, loggerhead turtles, olive ridley turtles, green turtles, fin whales, humpback whales, sperm whales, short-fin pilot whales and bottlenose dolphins. A range of summary statistics are displayed down the columns of the table, including the fifth, twenty-fifth, fiftieth, seventy-fifth and ninety-fifth percentiles (Q5, Q25, Q50, Q75 and Q95) plus the mean and standard deviation (standard error) of simulation results. The results are summarized for 10,000 simulated seasons.

Table 20 shows the observed numbers of M&SI (Alternatives 1-4) or entanglements (Alternative 5) that would trigger a closure if the fishery was managed at 30% observer coverage, using an expansion estimator to estimate the total number of interactions. The observed cap numbers are the product of 0.3 (30% coverage rate) times the corresponding expanded values in Table 1, rounded up to the nearest whole number (parenthesized values). The analysis considers the operation of the DGN fishery under these caps at both the anticipated current 30% and proposed future 100% observer coverage levels. If the fishery was managed under 100% observer coverage, the caps shown in Table 1 would trigger a closure.

Table 5. Observed hard cap levels that would trigger a DGN fishery closure under 30% coverage.

	Alternative 1		Alternative 2		Alternative 3		Alternative 4	Alternative 5
Number of Years	1	5	1	5	1	5	1	1
Fin Whale	0.3 (1)	0.6 (1)					0.6 (1)	0.6 (1)
Humpback Whale	0.6 (1)	1.2 (2)	3.3 (4)	16.5 (17)	1.5 (2)	7.5 (8)	0.6 (1)	0.6 (1)
Sperm Whale	0.6 (1)	2.4 (3)	0.6 (1)	2.4 (3)	0.9 (1)	4.5 (5)	0.6 (1)	0.6 (1)
Leatherback Turtle	0.9 (1)	3.0 (3)	0.9 (1)	3.0 (3)	1.2 (2)	3.9 (4)	0.9 (1)	0.9 (1)
Loggerhead Turtle	0.9 (1)	2.1 (3)	0.9 (1)	2.1 (2)	1.2 (2)	2.7 (3)	0.9 (1)	0.9 (1)
Olive Ridley Turtle	0.3 (1)	0.6 (1)					0.6 (1)	0.6 (1)
Green Turtle	0.3 (1)	0.6 (1)					0.6 (1)	0.6 (1)
Short-fin Pilot Whale			1.5 (1)	6.9 (7)			1.5 (2)	1.5 (2)
Bottlenose Dolphin							1.8 (2)	1.8 (2)
Pinniped Group			1,294.8 (1,295)	6,474.0 (6,474)				
Dolphin Group			4,074.6 (4,075)	20,373.0 (20,373)				

Table 21 shows results for the No Action (Baseline / "No Caps") scenario and hard caps Alternatives 1 and 2 using post-2000 data and assuming 100% observer coverage would be used to manage the fishery. Table 22 shows comparable results for Alternatives 3-5. Generally speaking, the economic performance of the fishery declines under all of the alternatives under consideration, while impacts in terms of M&SI decrease with the adoption of hard caps, due both to the direct effect of shutting down the fishery once a cap is reached and to the indirect effect of less allowable fishing effort on expected impacts for all protected species.

Potential adverse economic affects appear to be limited except for in the case of Alternative 5, which is expected to result in a large loss of allowable fishing effort, total revenues, total and average variable profits and market species landings. The appearance of significant adverse economic impacts under Alternative 5 is consistent with the indications of the table in Section 4.1.6, **Historical performance of the DGN fishery under Alternative 5 one-year hard caps**.

Table 23 shows results for versions of Alternatives 4 and 5 which would apply the caps against the trailing two-year average numbers of interactions. The version of the two-year cap analyzed here assumes the two-year average would be computed on a rolling basis, using the sum total of previous year's interactions (M&SI for Alt. 4, entanglements for Alt. 5) and current season interactions divided by 2. Results show a slightly higher mean level of allowable effort and economic results for Alternative 4 and considerably higher effort and economic results under Alternative 5 if two-year hard caps were used. This is offset by an increase in the standard deviation of results, likely reflecting the risk that a closure from the previous period may remain in effect or may trigger a closure earlier in the current season than if one-year caps were used.

Table 24 displays the results for analysis of Alternatives 4 and 5 based on 30% observer coverage. Observer data for seasons after 2000 are used to represent recent operation of the fishery. Comparing Table 22 results for Alternatives 4 and 5 to Table 24 results suggests the possibility of a slight decline in economic viability under Alternative 4 with an accompanying reduction in risk (standard deviation / StdDev), with a more substantial decline in economic performance and risk (measured by StdDev) under Alternative 5, reflecting that entanglement caps were not adjusted in moving to 100% observer coverage under Alternative 5, leading to a much greater risk of reaching an entanglement cap based on 100% observer coverage.

Table 6. Bootstrap results for No Action (Baseline) Scenario and Alternatives 1-2 using post-2000 data with 100% observer coverage.

	No Action: No Caps						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	776	1,002	1,187	1,394	1,727	1,211	290
Total Revenues	$1,088,434	$1,448,174	$1,744,482	$2,077,080	$2,600,251	$1,780,480	$460,768
Total Variable Profits	$236,854	$403,446	$537,220	$695,657	$947,411	$558,802	$218,289
Average Variable Profits	$11,843	$20,172	$26,861	$34,783	$47,371	$27,940	$10,914
Landings	175.5	233.7	280.7	333.5	417.1	286.5	73.3
Leatherback Turtles	0	0	0	0	0	0.00	0.00
Loggerhead Turtles	0	0	0	0	0	0.00	0.00
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	0	0.00	0.00
Fin Whales	0	0	0	0	0	0.00	0.00
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	2	4	0.96	1.40
Short-fin Pilot Whales	0	1	1	2	4	1.43	1.24
Bottlenose Dolphins	0	0	0	1	2	0.47	0.70
	Alternative 1: 1-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	668	880	1,058	1,265	1,613	1,086	288
Total Revenues	$895,567	$1,234,906	$1,519,903	$1,854,750	$2,400,286	$1,570,311	$465,088
Total Variable Profits	$171,960	$316,513	$447,449	$602,594	$872,192	$474,699	$216,765
Average Variable Profits	$8,598	$15,826	$22,372	$30,130	$43,610	$23,735	$10,838
Landings	149.1	202.3	246.6	299.6	383.8	254.4	72.5
Leatherback Turtles	0	0	0	0	0	0.00	0.00
Loggerhead Turtles	0	0	0	0	0	0.00	0.00
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	0	0.00	0.00
Fin Whales	0	0	0	0	0	0.00	0.00
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	2	2	0.75	0.97
Short-fin Pilot Whales	0	0	1	2	3	1.05	1.16
Bottlenose Dolphins	0	0	0	1	2	0.47	0.70
	Alternative 2: 1-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	668	880	1,058	1,264	1,611	1,085	287
Total Revenues	$895,567	$1,234,906	$1,519,645	$1,853,814	$2,397,808	$1,569,120	$463,405
Total Variable Profits	$171,960	$316,411	$447,300	$601,880	$871,066	$474,265	$216,098
Average Variable Profits	$8,598	$15,821	$22,365	$30,094	$43,553	$23,713	$10,805
Landings	149.1	202.3	246.6	299.5	383.3	254.2	72.3
Leatherback Turtles	0	0	0	0	0	0.00	0.00
Loggerhead Turtles	0	0	0	0	0	0.00	0.00
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	0	0.00	0.00
Fin Whales	0	0	0	0	0	0.00	0.00
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	2	2	0.75	0.97
Short-fin Pilot Whales	0	0	1	2	3	1.05	1.14
Bottlenose Dolphins	0	0	0	1	2	0.47	0.70

Table 22. Bootstrap results for Alternatives 3-5 using post-2000 data with 100% observer coverage.

	Alternative 3: 1-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	749	974	1,157	1,361	1,697	1,181	289
Total Revenues	$1,038,377	$1,396,800	$1,690,020	$2,023,450	$2,552,470	$1,730,463	$462,641
Total Variable Profits	$220,942	$381,991	$517,283	$675,023	$930,226	$538,980	$219,332
Average Variable Profits	$11,047	$19,100	$25,864	$33,751	$46,511	$26,949	$10,967
Landings	169.4	226.4	272.3	325.4	406.4	278.8	72.9
Leatherback Turtles	0	0	0	0	0	0.00	0.00
Loggerhead Turtles	0	0	0	0	0	0.00	0.00
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	0	0.00	0.00
Fin Whales	0	0	0	0	0	0.00	0.00
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	2	4	0.92	1.30
Short-fin Pilot Whales	0	0	1	2	4	1.34	1.22
Bottlenose Dolphins	0	0	0	1	2	0.47	0.70
	Alternative 4: 1-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	668	880	1,058	1,263	1,611	1,085	287
Total Revenues	$895,567	$1,234,686	$1,519,541	$1,853,576	$2,397,808	$1,568,999	$463,389
Total Variable Profits	$171,960	$316,235	$447,288	$601,749	$871,066	$474,217	$216,083
Average Variable Profits	$8,598	$15,812	$22,364	$30,087	$43,553	$23,711	$10,804
Landings	149.1	202.2	246.6	299.4	383.3	254.2	72.3
Leatherback Turtles	0	0	0	0	0	0.00	0.00
Loggerhead Turtles	0	0	0	0	0	0.00	0.00
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	0	0.00	0.00
Fin Whales	0	0	0	0	0	0.00	0.00
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	2	2	0.75	0.97
Short-fin Pilot Whales	0	0	1	2	3	1.05	1.14
Bottlenose Dolphins	0	0	0	1	2	0.47	0.70
	Alternative 5: 1-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	18	38	115	247	892	217	279
Total Revenues	$4,621	$14,192	$99,747	$257,869	$1,258,430	$255,504	$410,322
Total Variable Profits	-$54,707	-$27,683	-$14,526	$30,165	$374,362	$36,286	$141,261
Average Variable Profits	-$2,735	-$1,384	-$726	$1,508	$18,718	$1,814	$7,063
Landings	1.4	4.3	19.8	45.7	205.4	44.0	66.0
Leatherback Turtles	0	0	0	0	0	0.00	0.00
Loggerhead Turtles	0	0	0	0	0	0.00	0.00
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	0	0.00	0.00
Fin Whales	0	0	0	0	0	0.00	0.00
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	0	0	0.06	0.35
Short-fin Pilot Whales	0	0	0	0	1	0.21	0.51
Bottlenose Dolphins	0	0	0	0	1	0.06	0.29

Table 23. Bootstrap results for two-year hard caps alternatives using post-2000 data and 100% observer coverage.

	Alternative 4: 2-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	1	908	1,107	1,318	1,661	1,089	383
Total Revenues	$1,601	$1,283,258	$1,603,594	$1,953,953	$2,494,851	$1,588,766	$591,691
Total Variable Profits	$593	$332,052	$478,515	$640,745	$909,809	$489,864	$244,253
Average Variable Profits	$30	$16,603	$23,926	$32,037	$45,490	$24,493	$12,213
Landings	0.6	209.1	258.8	313.7	397.3	256.4	93.9
Leatherback Turtles	0	0	0	0	0	0.00	0.00
Loggerhead Turtles	0	0	0	0	0	0.00	0.00
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	0	0.00	0.00
Fin Whales	0	0	0	0	0	0.00	0.00
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	2	4	0.82	1.18
Short-fin Pilot Whales	0	0	1	2	3	1.19	1.21
Bottlenose Dolphins	0	0	0	1	2	0.45	0.68
	Alternative 5: 2-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	1	1	140	701	1,247	358	446
Total Revenues	$81	$1,601	$130,487	$943,627	$1,846,407	$483,715	$661,582
Total Variable Profits	-$43,414	-$947	$593	$205,143	$617,472	$122,978	$226,925
Average Variable Profits	-$2,171	-$47	$30	$10,257	$30,874	$6,149	$11,346
Landings	0.0	0.6	24.8	157.5	295.1	79.7	106.1
Leatherback Turtles	0	0	0	0	0	0.00	0.00
Loggerhead Turtles	0	0	0	0	0	0.00	0.00
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	0	0.00	0.00
Fin Whales	0	0	0	0	0	0.00	0.00
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	0	2	0.19	0.59
Short-fin Pilot Whales	0	0	0	0	2	0.38	0.77
Bottlenose Dolphins	0	0	0	0	1	0.13	0.42

Table 24. Bootstrap results using post-2000 data with 30% observer coverage.

	Alternative 4: 1-year Caps, 30% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	689	939	1,125	1,337	1,677	1,144	312
Total Revenues	$933,548	$1,339,978	$1,641,406	$1,978,503	$2,521,681	$1,670,955	$497,954
Total Variable Profits	$180,484	$361,332	$497,665	$656,929	$916,629	$516,832	$226,578
Average Variable Profits	$9,024	$18,067	$24,883	$32,846	$45,831	$25,842	$11,329
Landings	153.9	216.7	265.0	317.7	404.0	269.4	78.5
Leatherback Turtles	0	0	0	0	0	0.00	0.00
Loggerhead Turtles	0	0	0	0	0	0.00	0.00
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	0	0.00	0.00
Fin Whales	0	0	0	0	0	0.00	0.00
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	2	4	0.84	1.24
Short-fin Pilot Whales	0	0	1	2	3	1.27	1.15
Bottlenose Dolphins	0	0	0	1	2	0.48	0.70
	Alternative 5: 1-year Caps, 30% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	28	165	660	1,076	1,481	659	505
Total Revenues	$8,497	$157,736	$864,623	$1,574,869	$2,220,077	$920,047	$782,379
Total Variable Profits	-$46,075	-$13,086	$171,951	$474,771	$783,430	$255,035	$292,228
Average Variable Profits	-$2,304	-$654	$8,598	$23,739	$39,171	$12,752	$14,611
Landings	2.3	29.7	143.5	253.5	355.9	150.1	124.2
Leatherback Turtles	0	0	0	0	0	0.00	0.00
Loggerhead Turtles	0	0	0	0	0	0.00	0.00
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	0	0.00	0.00
Fin Whales	0	0	0	0	0	0.00	0.00
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	0	2	0.40	0.95
Short-fin Pilot Whales	0	0	0	1	3	0.73	1.01
Bottlenose Dolphins	0	0	0	0	1	0.26	0.57

Appendix: Bootstrap Results Based on All NMFS Observer Data Since 1990

To address the Scientific and Statistical Committee's suggestion to use alternative time periods as sensitivity analyses, bootstrap results were also produced using all available observer data back to 1990. Since the alternatives do not include options for reopening the PLCA during the closed season, the pre-2001 data were limited to non-PLCA closure effort as an implicit control on the operating characteristics of the fishery. While pre-2001 data may be less representative of the recent operation of the fishery, the longer period of observer data may produce more reliable estimates of rates of entanglement and M&SI for species with rare event interactions, such as the high priority protected species proposed for hard caps.

Tables 25-28 show bootstrap results corresponding to those in Tables 21-24, but using all data since 1990 in the analysis. The economic results, which average in pre-2001 retained market species catch rates, are slightly less favorable than if data are limited to post-2000 observations. M&SI statistics are higher for a number of species when pre-2000 data are included; it is not clear whether this reflects significant differences in M&SI for these species over the two periods, or a lack of sufficient data in the post-2000 period to accurately measure M&SI rates for species with rare event interactions.

The economic performance results for the impacts of alternatives using all data are qualitatively similar to those using post-1990 data, except that moving from 30% to 100% observer coverage would result in an improvement in mean economic performance under Alternative 4.

Table 25. Bootstrap results for No Action (Baseline) Scenario and Alternatives 1-2 using post-1990 data with 100% observer coverage.

	No Action: No Caps						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	662	869	1,034	1,221	1,528	1,057	264
Total Revenues	$1,175,298	$1,591,070	$1,921,789	$2,315,402	$2,930,211	$1,976,620	$543,993
Total Variable Profits	$447,685	$681,757	$873,470	$1,100,351	$1,490,127	$910,027	$321,172
Average Variable Profits	$22,384	$34,088	$43,674	$55,018	$74,506	$45,501	$16,059
Landings	166.2	222.8	269.4	323.5	412.0	276.9	75.6
Leatherback Turtles	0	0	0	1	2	0.47	0.68
Loggerhead Turtles	0	0	0	1	2	0.63	0.81
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	1	0.15	0.39
Fin Whales	0	0	0	0	1	0.15	0.39
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	1	3	0.78	1.05
Short-fin Pilot Whales	0	0	1	1	2	0.78	0.91
Bottlenose Dolphins	0	0	0	0	1	0.16	0.40
	Alternative 1: 1-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	504	722	902	1,104	1,403	917	285
Total Revenues	$879,987	$1,309,066	$1,673,641	$2,073,800	$2,713,182	$1,710,958	$581,637
Total Variable Profits	$321,774	$559,666	$754,024	$982,306	$1,370,798	$786,403	$328,569
Average Variable Profits	$16,089	$27,983	$37,701	$49,115	$68,540	$39,320	$16,428
Landings	127.9	187.5	236.4	291.1	379.5	241.6	79.7
Leatherback Turtles	0	0	0	1	2	0.35	0.60
Loggerhead Turtles	0	0	0	1	2	0.57	0.76
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	1	0.14	0.34
Fin Whales	0	0	0	0	1	0.14	0.34
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	1	2	0.60	0.81
Short-fin Pilot Whales	0	0	0	1	2	0.66	0.85
Bottlenose Dolphins	0	0	0	0	1	0.16	0.40
	Alternative 2: 1-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	558	781	954	1,145	1,438	965	282
Total Revenues	$971,689	$1,423,577	$1,775,671	$2,158,178	$2,780,784	$1,804,294	$575,867
Total Variable Profits	$359,201	$607,573	$801,679	$1,028,863	$1,406,157	$830,997	$329,342
Average Variable Profits	$17,960	$30,379	$40,084	$51,443	$70,308	$41,550	$16,467
Landings	141.4	201.9	249.8	302.1	388.8	253.8	79.3
Leatherback Turtles	0	0	0	1	2	0.38	0.62
Loggerhead Turtles	0	0	0	1	2	0.59	0.77
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	1	0.15	0.38
Fin Whales	0	0	0	0	1	0.15	0.38
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	1	2	0.68	0.84
Short-fin Pilot Whales	0	0	0	1	2	0.70	0.86
Bottlenose Dolphins	0	0	0	0	1	0.16	0.40

Table 26. Bootstrap results for Alternatives 3-5 using post-1990 data with 100% observer coverage.

	Alternative 3: 1-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	640	844	1,008	1,195	1,495	1,031	262
Total Revenues	$1,130,586	$1,543,367	$1,877,922	$2,262,079	$2,885,699	$1,928,040	$541,662
Total Variable Profits	$427,282	$661,617	$849,699	$1,080,105	$1,466,067	$888,080	$319,390
Average Variable Profits	$21,364	$33,081	$42,485	$54,005	$73,303	$44,404	$15,970
Landings	161.0	217.1	263.7	316.6	403.8	270.4	74.9
Leatherback Turtles	0	0	0	1	2	0.44	0.67
Loggerhead Turtles	0	0	0	1	2	0.61	0.80
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	1	0.15	0.39
Fin Whales	0	0	0	0	1	0.15	0.39
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	1	3	0.76	0.98
Short-fin Pilot Whales	0	0	1	1	2	0.76	0.89
Bottlenose Dolphins	0	0	0	0	1	0.16	0.40
	Alternative 4: 1-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	552	776	951	1,142	1,433	961	282
Total Revenues	$962,373	$1,416,256	$1,769,063	$2,152,384	$2,773,237	$1,797,253	$576,087
Total Variable Profits	$355,784	$605,093	$798,671	$1,025,836	$1,402,523	$827,660	$329,176
Average Variable Profits	$17,789	$30,255	$39,934	$51,292	$70,126	$41,383	$16,459
Landings	140.1	201.0	249.0	301.4	388.2	252.9	79.3
Leatherback Turtles	0	0	0	1	2	0.38	0.62
Loggerhead Turtles	0	0	0	1	2	0.59	0.77
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	1	0.15	0.38
Fin Whales	0	0	0	0	1	0.15	0.38
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	1	2	0.68	0.84
Short-fin Pilot Whales	0	0	0	1	2	0.69	0.86
Bottlenose Dolphins	0	0	0	0	1	0.16	0.40
	Alternative 5: 1-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	15	35	69	183	640	157	207
Total Revenues	$7,560	$25,035	$61,326	$270,785	$1,201,265	$244,268	$401,865
Total Variable Profits	-$31,482	-$12,187	$117	$77,259	$545,459	$86,232	$200,568
Average Variable Profits	-$1,574	-$609	$6	$3,863	$27,273	$4,312	$10,028
Landings	1.4	5.4	11.3	41.6	171.2	36.9	57.0
Leatherback Turtles	0	0	0	0	0	0.04	0.19
Loggerhead Turtles	0	0	0	1	1	0.26	0.44
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	0	0.01	0.09
Fin Whales	0	0	0	0	0	0.01	0.09
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	0	0	0.04	0.22
Short-fin Pilot Whales	0	0	0	0	1	0.13	0.40
Bottlenose Dolphins	0	0	0	0	0	0.02	0.13

Table 27. Bootstrap results for two-year hard caps alternatives using post-1990 data and 100% observer coverage.

	Alternative 4: 2-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	588	829	999	1,189	1,493	1,009	296
Total Revenues	$1,031,928	$1,512,540	$1,858,789	$2,249,912	$2,877,550	$1,886,045	$598,708
Total Variable Profits	$382,041	$643,785	$840,770	$1,072,445	$1,458,185	$868,498	$338,780
Average Variable Profits	$19,102	$32,189	$42,038	$53,622	$72,909	$43,425	$16,939
Landings	147.4	212.5	261.3	315.0	402.8	264.7	83.0
Leatherback Turtles	0	0	0	1	2	0.43	0.66
Loggerhead Turtles	0	0	0	1	2	0.60	0.79
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	1	0.15	0.39
Fin Whales	0	0	0	0	1	0.15	0.39
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	1	3	0.74	0.98
Short-fin Pilot Whales	0	0	1	1	2	0.74	0.89
Bottlenose Dolphins	0	0	0	0	1	0.15	0.40
	Alternative 5: 2-year Caps, 100% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	1	1	45	393	1007	241	358
Total Revenues	$150	$461	$33,823	$663,288	$1,929,369	$427,280	$687,984
Total Variable Profits	-$25,592	-$851	$436	$256,093	$936,483	$184,494	$335,807
Average Variable Profits	-$1,280	-$43	$22	$12,805	$46,824	$9,225	$16,790
Landings	0.0	0.2	6.8	97.5	272.3	61.4	96.5
Leatherback Turtles	0	0	0	0	1	0.07	0.29
Loggerhead Turtles	0	0	0	0	1	0.23	0.48
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	0	0.03	0.19
Fin Whales	0	0	0	0	0	0.03	0.19
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	0	1	0.13	0.45
Short-fin Pilot Whales	0	0	0	0	1	0.18	0.50
Bottlenose Dolphins	0	0	0	0	0	0.04	0.20

Table 28. Bootstrap results using post-1990 data with 30% observer coverage.

	Alternative 4: 1-year Caps, 30% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	52	598	857	1,075	1,393	801	403
Total Revenues	$38,767	$1,065,626	$1,585,987	$2,029,528	$2,687,307	$1,487,795	$803,483
Total Variable Profits	-$15,450	$419,313	$706,922	$957,222	$1,362,226	$680,052	$420,889
Average Variable Profits	-$772	$20,966	$35,346	$47,861	$68,111	$34,003	$21,044
Landings	7.6	152.2	223.2	284.8	374.8	209.8	111.1
Leatherback Turtles	0	0	0	1	1	0.31	0.55
Loggerhead Turtles	0	0	0	1	2	0.53	0.68
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	1	0.11	0.33
Fin Whales	0	0	0	0	1	0.11	0.33
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	1	2	0.57	0.89
Short-fin Pilot Whales	0	0	0	1	2	0.58	0.81
Bottlenose Dolphins	0	0	0	0	1	0.13	0.37
	Alternative 5: 1-year Caps, 30% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	24	84	435	839	1,224	500	419
Total Revenues	$14,715	$78,545	$726,394	$1,563,512	$2,356,504	$901,483	$827,984
Total Variable Profits	-$26,267	$2,373	$280,276	$708,321	$1,175,442	$396,682	$419,309
Average Variable Profits	-$1,313	$119	$14,014	$35,416	$58,772	$19,834	$20,965
Landings	3.0	13.7	108.5	220.3	329.4	128.8	115.0
Leatherback Turtles	0	0	0	0	1	0.18	0.44
Loggerhead Turtles	0	0	0	1	2	0.43	0.63
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	1	0.06	0.24
Fin Whales	0	0	0	0	1	0.06	0.24
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	0	2	0.28	0.67
Short-fin Pilot Whales	0	0	0	1	2	0.39	0.68
Bottlenose Dolphins	0	0	0	0	1	0.08	0.29

4.3 Monitoring

These Alternatives would require various levels of monitoring of DGN fishing vessels, through on-board observers or EM. Monitoring requirements would not directly affect any of the species encountered in the DGN fishery since monitoring does not affect catch rates. Alternatives which increase DGN monitoring may have minor indirect beneficial effects to these species by increasing the precision of catch and bycatch estimates extrapolated from observer data. Better catch and bycatch data would provide more certainty when proposing future management measures for the DGN fishery.

DGN vessel owners/operators would experience significant adverse economic effects under any Alternative which requires monitoring higher than the 30 percent observer coverage, which is currently funded by NMFS. It is likely that any increase in monitoring would be non-government funded, and paid for by vessel owners/operators. Industry-funded DGN seas days are anticipated to cost, at a minimum,

$500 per day. This is based on prevailing industry-funded observer day cost in the West coast groundfish catch shares fishery. The estimated cost of industry-funded EM is not known at this time.

Some Alternatives would prohibit DGN vessels from fishing if they are deemed unobservable for safety or accommodations requirements or are unable to carry EM equipment. Owners of these vessels would experience significant adverse economic effects since they would be prohibited from participating in the DGN fishery.

4.3.1 No Action Alternative

NMFS would continue to place observers on board DGN vessels, targeting 30 percent coverage of total fishing effort each fishing season.

4.3.1.1 Target, Non-Target and Prohibited Species

There would be no direct effect to these species. Catch rates would remain the same as baseline conditions.

4.3.1.2 Protected Species

There would be no direct effect to these species. Catch rates would remain the same as baseline conditions.

4.3.1.3 Economics

There would be no economic effect to DGN vessel owners/operators. NMFS would continue to fund the target 30 percent observer coverage.

4.3.2 Action Alternative 1 - Observers for Biological Sampling and 100% EM

Target observer coverage to a level sufficient for biological sampling and require EM on all DGN vessels that fish.

4.3.2.1 Target, Non-Target and Prohibited Species

There would be no direct effect to these species. Catch rates would remain the same as baseline conditions. This Alternative may have minor indirect beneficial effects to these species by increasing the precision of catch and bycatch estimates through use of EM.

4.3.2.2 Protected Species

There would be no direct effect to these species. Catch rates would remain the same as baseline conditions. This Alternative may have minor indirect beneficial effects to these species by increasing the precision of catch and bycatch estimates through use of EM.

4.3.2.3 Economics

DGN vessel owners/operators would experience significant adverse economic effects under this Alternative, through the cost of industry-funded EM on all vessels. The estimated cost of industry-funded EM is not known at this time, though the economic effect could be significantly adverse. Owners of vessels which are unable to carry EM equipment would experience significant adverse economic effects since they would be prohibited from participating in the DGN fishery.

4.3.3 Action Alternative 2 - 50% Observer Coverage

This Alternative would require a minimum of 50 percent observer coverage level on each vessel in the DGN fishery. Unobservable vessels would be prohibited from fishing in DGN fishery.

4.3.3.1 Target, Non-Target and Prohibited Species

There would be no direct effect to these species. Catch rates would remain the same as baseline conditions. This Alternative may have minor indirect beneficial effects to these species by increasing the precision of catch and bycatch estimates through increased observer coverage.

Increasing observer coverage to 50 percent, if established in conjunction with hard cap Alternative 5, may cause an indirect beneficial effect to these species. The hard caps in Alternative 5 are based on observed entanglements at the current 30 percent observer coverage rate, and the hard cap numbers do not change with any increase in observer coverage. If observer coverage rises beyond 30 percent, it is expected that more hard cap species entanglements would be observed. The DGN fishery would close more often, and less of these species would be caught.

4.3.3.2 Protected Species

There would be no direct effect to these species. Catch rates would remain the same as baseline conditions. This Alternative may have minor indirect beneficial effects to these species by increasing the precision of catch and bycatch estimates through increased observer coverage.

Increasing observer coverage to 50 percent, if established in conjunction with hard cap Alternative 5, may cause an indirect beneficial effect to these species. The hard caps in Alternative 5 are based on observed entanglements at the current 30 percent observer coverage rate, and the hard cap numbers do not change with any increase in observer coverage. If observer coverage rises beyond 30 percent, it is expected that more hard cap species entanglements would be observed. The DGN fishery would close more often, and less of these species would be caught.

4.3.3.3 Economics

DGN vessel owners/operators would experience significant adverse economic effects under this Alternative, since they would pay for the increased observer coverage beyond the 30 percent funded by the government. Owners of unobservable vessels would experience significant adverse economic effects since they would be prohibited from participating in the DGN fishery.

4.3.4 Action Alternative 3 - 100% Monitoring (Council PPA/CDFW PPA)

This Alternative would require 100 percent monitoring in the DGN fishery, using on-board observers and/or EM, by 2018. Vessels which are unobservable or unable to carry EM would be prohibited from fishing in DGN fishery when 100 percent monitoring is required. Maintain NMFS current 30 percent target observer coverage level until 100 percent monitoring is required.

4.3.4.1 Target, Non-Target and Prohibited Species

There would be no direct effect to these species. Catch rates would remain the same as baseline conditions. This Alternative may have minor indirect beneficial effects to these species by increasing the precision of catch and bycatch estimates through increased monitoring.

Increasing monitoring to 100 percent may increase the minor beneficial effects to these species under hard cap Alternatives 1-4. Hard cap alternatives 1-4 are based on estimated M&SI, which would be extrapolated from observer data in-season. With 100 percent monitoring there would be no need to extrapolate observer data in-season and the DGN fishery could be closed more quickly once a hard cap is met or exceeded. Less of these species would be caught if the fishery was closed more quickly.

Increasing monitoring to 100 percent, if established in conjunction with hard cap Alternative 5, may cause an indirect beneficial effect to these species. The hard caps in Alternative 5 are based on observed entanglements at the current 30 percent observer coverage rate, and the hard cap numbers do not change with any increase in monitoring. If monitoring rises beyond 30 percent, it is expected that more hard cap species entanglements would be observed. The DGN fishery would close more often, and less of these species would be caught.

4.3.4.2 Protected Species

There would be no direct effect to these species. Catch rates would remain the same as baseline conditions. This Alternative may have minor indirect beneficial effects to these species by increasing the precision of catch and bycatch estimates through increased monitoring.

Increasing monitoring to 100 percent may increase the minor beneficial effects to these species under hard cap Alternatives 1-4. Hard cap alternatives 1-4 are based on estimated M&SI, which would be extrapolated from observer data in-season. With 100 percent monitoring there would be no need to extrapolate observer data in-season and the DGN fishery could be closed more quickly once a hard cap is met or exceeded. Less of these species would be caught if the fishery was closed more quickly.

Increasing monitoring to 100 percent, if established in conjunction with hard cap Alternative 5, may cause an indirect beneficial effect to these species. The hard caps in Alternative 5 are based on observed entanglements at the current 30 percent observer coverage rate, and the hard cap numbers do not change with any increase in monitoring. If monitoring rises beyond 30 percent, it is expected that more hard cap species entanglements would be observed. The DGN fishery would close more often, and less of these species would be caught.

4.3.4.3 Economics

DGN vessel owners/operators would experience significant adverse economic effects under this Alternative, since they would pay for the increased observer coverage beyond the 30 percent funded by the government, or EM. The estimated cost of industry-funded EM is not known at this time, though the economic effect is likely to be significantly adverse. Owners of vessels which could not carry an observer or EM would experience significant adverse economic effects since they would be prohibited from participating in the DGN fishery.

4.4 Climate Variability and Climate Change

The proposed action and alternatives are not expected to significantly affect climate variability or climate change. The hard cap alternatives would lead to less DGN fishing effort during fishing seasons when a hard cap is reached and the DGN fishery is closed. DGN vessels could continue fishing in other fisheries, or stop all fishing for the rest of the season. Potential reductions in carbon emissions due to less fishing are not likely to be significant since the DGN fishery is small, with 25 or fewer vessels participating annually from 2010 to 2014 (see Section 3.1.1).

Climate variability and climate change may impact the catch rates of species affected by the proposed action and alternatives. Changes in ocean temperature and currents could change the distribution and abundance of these species in the action area, leading to more, or fewer, hard cap species caught in the DGN fishery. This may affect the frequency of hard caps being met or exceeded, resulting in more or less frequent DGN fishery closures.

4.5 Cumulative Effects

Since the hard cap and monitoring alternatives are not expected to have any adverse effects to the resources described in Chapter 3, the proposed action would not contribute to any cumulative adverse effects. This section describes past, present, and reasonably foreseeable actions which may affect the resources affected by the proposed action and alternatives.

4.5.1 High Seas Longline Fishery for Swordfish and Tuna

California prohibits pelagic longline fishing within the EEZ. Both these prohibitions are incorporated in the Council's HMS FMP. Longline vessels fishing outside the West Coast EEZ intermittently land swordfish and tuna in West Coast ports.

Vessels operating outside of the EEZ can land fish in West Coast ports if the operator has the necessary state and Federal permits. The operator must comply with the High Seas Fishing Compliance Act, which requires U.S. vessel operators to maintain logbooks if they fish beyond the EEZ. Additionally, the HMS FMP requires a federal permit with a pelagic longline gear endorsement for all U.S. vessels that pursue HMS on the high seas (seaward of the EEZ) and land their catch in California, Oregon, or Washington.
With implementation of the HMS FMP in 2004, federal regulations were promulgated to protect endangered sea turtles east and west of 150° W longitude and north of the equator, prohibiting West Coast-based shallow-set longline fishing to target swordfish. Vessels permitted under the WPFMC Pelagics Fishery Ecosystem Plan (FEP) may use shallow-set longline gear to target swordfish and may

land their catch on the West Coast. West Coast swordfish landings by Hawaii-based vessels have trended upward since the fishery reopened in 2004. Landings have occurred almost exclusively in California ports.

Targeting tunas with deep-set longline gear is permitted outside the EEZ under the HMS FMP. Currently only two vessels on the west coast participate in the tuna longline fishery.

High seas longline fisheries adversely affect target, non-target, and protected species.

4.5.2 Deep-Set Buoy Gear and Longline Exempted Fishing Permits

On July 2, 2014, Council solicited Exempted Fishing Permit (EFP) proposals to test alternative gears and/or new approaches or methods for the California large-mesh drift gillnet fishery to target swordfish and other HMS. Applications for EFPs were submitted on February 9, 2015, to the Council for consideration during the March 2015 meeting. On March 20, 2015, the Council made recommendations to NMFS to consider issuing EFPs for three proposals to use deep-set buoy gear (DSBG) and a single proposal to use deep-set and shallow-set longline gear in the EEZ off of the West Coast of the United States. The EFPs would exempt a limited number of federally permitted commercial fishing vessels from requirements of the HMS FMP pertaining to non-authorized gear types and areas currently closed to longline fishing. The EFP applications requested authorization of up to 11 DSBG vessels and one longline vessel to fish year-round in areas within the Federal U.S. EEZ off of the West Coast. Aside from the exemptions described above (e.g., allowing non-authorized gear types to fish), vessels fishing under the EFP would be subject to all other regulations implementing the HMS FMP, including measures to protect sea turtles, marine mammals, and seabirds. The EFP applications request issuance for two fishing seasons or two calendar years.

The Council recommended additional conditions beyond those contained in the submitted applications. For all EFPs that the Council recommended move forward, they suggested that the following to apply: (1) 100 percent observer coverage (2) EFP fishing prohibited in waters north of the Washington/Oregon border and in the first year EFP fishing prohibited in waters north of the Oregon/California border (3) NMFS close fishing under any EFP for the remainder of the year if the number of an ESA listed species taken in that EFP fishery is the lower of either double the amount of incidental take estimated in an ESA biological opinion prepared for that activity or 10 animals (4) EFPs testing buoy gear only be permitted in Federal waters. Additionally, for the longline fishing EFP, the Council recommended specific conditions that prohibit fishing within 50 miles of the mainland shore and islands, and that NMFS develop a bycatch limit for marlins that, if reached, would close EFP fishing for the rest of the year.

Appropriate National Environmental Policy Act documents will be completed prior to the issuance of the EFPs. The significance of any adverse effects under the EFPs is unknown at this time, and would be dependent on any conditions placed on the EFPs.

4.5.3 PFMC Action to Authorize Longline Fishing on the High Seas

During and subsequent to the development of the HMS FMP the Council has considered authorizing a pelagic longline fishery targeting swordfish. The conventional method for targeting swordfish involves setting the gear at night at shallower depths; this technique is commonly referred to as shallow-set longline (SSLL). Currently, the use of SSLL is prohibited except when fishing under a western Pacific longline limited entry permit issued pursuant to 50 CFR 660.21, and authorized under the WPFMC

Pelagics FEP. In addition, the use of longline gear to target HMS is prohibited within the West Coast EEZ (50 CFR 660.712(a)).

The Council has again decided to revisit the question of authorizing a West Coast SSLL fishery outside the West Coast EEZ. The Council is scheduled to begin the scoping process to authorize SSLL fishing at its September 2015 meeting.

This fishery would likely adversely affect the same species as California-based longline vessels fishing under the WPFMC Pelagics FEP. The significance of the adverse effects would depend on elements proposed when authorizing SSLL fishery under the HMS FMP. These elements could include a limit on SSLL permits, gear specifications, a cap on sea turtle catch, and seabird mitigation measures, and observer coverage requirements.

4.5.4 PFMC Action to Federalize the CDFW DGN Limited Entry Permit

The Council is scheduled to adopt a range of alternatives for this action at its November 2015 meeting. This action could limit DGN permits to fewer than are currently issued by CDFW, many of which are latent (unfished). A reduction in permits would likely have no adverse effect on target, non-target, protected, and prohibited species. Current CDFW DGN permit holders who do not qualify for a Federal DGN permit may experience an adverse economic effect through loss of a CDFW DGN permit's potential market value.

5 Consistency with the HMS FMP and MSA National Standards

5.1 FMP Goals and Objectives

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.

12. Promote effective monitoring and enforcement.

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 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.

5.2 National Standards

To be completed after Council final action.

5.3 Public Scoping under MSA

Scoping occurred through the Council process. Meetings are open to the public, and public comment is encouraged. Council advisory bodies provide stakeholder input. The Council received substantial public comment on the proposed action. Written public comment may be viewed on the Council's website, www.pcouncil.org.

6 Applicable Mandates

6.1 Coastal Zone Management Act (CZMA)

Section 307(c)(1) of the Coastal Zone Management Act as amended in 2006 requires all Federal actions that have reasonably foreseeable effects on any land or water use or natural resource of the coastal zone should be consistent with the enforceable policies of a coastal state's federally approved coastal management program to the maximum extent practicable. The proposed action would be implemented in a manner that is consistent to the maximum extent practicable with the enforceable policies of the approved coastal zone management programs of Washington, Oregon, and California.

6.2 Endangered Species Act (ESA)

NMFS would conduct the required analyses under the ESA to determine if the proposed action is likely to jeopardize the continued existence and recovery of any endangered or threatened species or result in the destruction or adverse modification of critical habitat.

6.3 Marine Mammal Protection Act (MMPA)

Under the MMPA, NMFS is responsible for the management and conservation of 153 stocks of whales, dolphins, porpoises, seals, sea lions, and fur seals. As amended in 1972, the MMPA is the principle Federal legislation that guides marine mammal species protection and conservation policy in the United States. Vessels that would be affected by the proposed action are in compliance with this act.

6.4 Migratory Bird Treaty Act (MBTA)

The MBTA of 1918 was designed to end the commercial trade of migratory birds and their feathers that, by the early years of the 20th century, had diminished the populations of many native bird species. The MBTA states that it is unlawful to take, kill, or possess migratory birds and their parts (including eggs, nests, and feathers) and implements a multilateral treaty between the United States, Canada, Japan, Mexico, and Russia to protect common migratory bird resources. The MBTA prohibits the directed take of seabirds, but the incidental take of seabirds does occur. The MBTA applies within three nautical miles of the U.S. coastline. All of the fishing that would be affected by the proposed action occurs in Federal waters (seaward of three nautical miles), so the fishery would not be subject to the MBTA.

6.5 EO 12866 Regulatory Impact Review (RIR)

EO 12866 requires that the economic impacts of proposed government regulations on the national economy be assessed before implementation. In most instances, the measurement of changes to gross domestic product is an accurate measure of impact. Section 1 of EO 12866 states, "In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory measures, including the alternative of not regulating." The emphasis of the analysis is on expected changes in net benefits that occur as a result of the proposed management measures. The government should choose only those sets of regulations that produce positive benefits while considering social and distributional effects. NMFS requires that this analysis be done through a RIR for all regulatory actions that are of

public interest. The RIR also includes analysis of distributive impacts and the costs of government administration and private compliance with the proposed measures. An RIR would be completed and published with a proposed rule for this action.

6.6 EO 12898 Environmental Justice

EO 12898 obligates Federal agencies to identify and address "disproportionately high adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations in the United States" as part of any overall environmental impact analysis associated with an action. National Oceanic Atmospheric Administration (NOAA) guidance, NOAA Administrative Order 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act, at Section 7.02, states that "consideration of EO 12898 should be specifically included in the NEPA documentation for decision-making purposes." Agencies should also encourage public participation, especially by affected communities during scoping, as part of a broader strategy to address environmental justice issues.

6.7 EO 13132 Federalism

EO 13132 enumerates eight fundamental federalism principles. The first of these principles states "Federalism is rooted in the belief that issues that are not national in scope or significance are most appropriately addressed by the level of government closest to the people." In this spirit, the EO directs agencies to consider the implications of policies that may limit the scope of or preempt States' legal authority. Preemptive action having such federalism implications is subject to a consultation process with the States; such actions should not create unfunded mandates for the States and any final rule published must be accompanied by a federalism summary impact statement.

6.8 EO 13175 Consultation and Coordination with Indian Tribal Governments

EO 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. The proposed action will not have tribal implications as defined in EO 13175.

6.9 EO 13186 Responsibilities of Federal Agencies to Protect Migratory Birds

EO 13186 supplements the MBTA. On June 14, 2012, a Memorandum of Understanding (MOU) between NMFS and the USFWS was signed to aid in the conservation of migratory birds. This MOU focuses on avoiding or minimizing to the extent practicable adverse impacts on migratory birds and strengthening migratory bird conservation through enhanced collaboration between NMFS and USFWS. Per this MOU and EO, NMFS must integrate migratory bird conservation principles, measures, and practices into NMFS activities and science and resource-management plans. NMFS must also ensure, to the extent practicable, that environmental analyses required by NEPA evaluate the effects of actions on seabirds and their habitats. The analysis in this document indicates that the proposed action will have no impact to seabirds when compared to baseline conditions.

6.10 EO 12114 Environmental Effects Abroad of Major Federal Actions

EO 12114 enables responsible officials of Federal agencies that have ultimate responsibility for authorizing and approving actions encompassed by this Order to be informed of pertinent environmental considerations and to take such considerations into account, with other pertinent considerations of national policy, in making decisions regarding such actions. This EO governs environmental actions and decisions relating to the environment outside the United States, its territories, and possessions. The responsible official must comply with the provisions of this EO when applicable. This document analyzes the impacts to the human environment from the proposed action and the alternatives and therefore, satisfies the requirements of EO 12114.

7 List of Preparers and Persons And Agencies Consulted

Preparer Names and Affiliations	Responsibility
Lyle Enriquez, Fishery Biologist, NMFS WCR	Primary author
Amber Rhodes, Fishery Policy Analyst, NMFS WCR	Document structure, edits and revisions
Steve Stohs, Economist, NMFS SWFSC	Economic analysis
Jennifer Ise, Acting HMS Management Branch Chief, NMFS WCR	Project management, edits and revisions
Persons and Agencies Consulted	**Roles and Responsibilities**
PFMC Highly Migratory Species Management Team	Development, refinement and analysis of Alternatives

Preliminary Analysis of Options for Council Bycatch Performance Metrics for the U.S. West Coast Large-Mesh Drift Gillnet Fishery

Prepared by NMFS West Coast Region
August 18, 2015

Introduction

The Pacific Fishery Management Council (Council) is considering establishing bycatch performance metrics for the U.S. West Coast large-mesh drift gillnet (DGN) fishery. In conjunction with the Council's proposed DGN hard caps and enhanced monitoring, the Council is interested in identifying levels of bycatch of finfish and/or non-ESA-listed marine mammals encountered in the existing DGN fishery for tracking how the DGN fishery performs at minimizing bycatch. These metrics would be informational only; they would not be catch limits used for management or enforcement purposes. The National Marine Fisheries Service (NMFS) prepared this preliminary analysis of options for Council consideration based on recommendations from the Council's Highly Migratory Species Management Team (HMSMT), public comment, and Council action at the June 2015 meeting.

Overview of the Analysis

The format of this preliminary analysis is similar to a National Environmental Policy Act (NEPA) analysis[1]; however, the proposal to identify one or more bycatch performance metrics is not being analyzed under NEPA because there is no federal action involved. Identification of these metrics is not driven by a requirement of the Magnuson-Stevens Act or other law; no new regulations would be required to support the metrics (e.g., data collection); and based on the preliminary list of options, no regulatory impacts are anticipated (i.e., no prescribed management actions would be taken if a catch level selected as a performance metric is exceeded). The Council and HMSMT would monitor DGN fishery performance relative to performance metrics based on data that are currently collected by NMFS, including observer data. The Council would use the metric(s) to review fishery performance at the end of each fishing season (May 1 through January 31) and may use them in conjunction with other fishery information to determine if any new management measures are needed to further minimize bycatch in the DGN fishery. The effects of proposed management measures recommended by the Council would be analyzed at that time of such a proposal.

Performance Metric Alternatives

Five alternatives are described below for consideration, including a "no action" alternative.

No Action

Performance metrics would not be established for the DGN fishery. NMFS would continue to monitor bycatch and protected species interactions through its observer program.

NMFS currently manages incidental catch of marine mammals under the MMPA. The catch of each marine mammal stock is compared to that stock's Potential Biological Removal (PBR). 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 TRT established for the DGN fishery evaluates the fishery's performance relative to PBR and recommends measures

[1] A suite of alternatives are identified, described, and analyzed as to their potential impacts and benefits. However, this analysis does not include a section on the affected environment. Please refer to the *Preliminary Draft Environmental Assessment of Drift Gillnet Hard Caps and Monitoring Alternatives* submitted under Agenda item G.2.

to keep the catch of each marine mammal stock below PBR. The TRT is also tasked with identifying measures to reduce human-caused M&SI of each stock of marine mammal to below its Zero Mortality Rate Goal (ZMRG). ZMRG is defined as 10 percent of a stock's PBR.

Alternative 1: Total Finfish Bycatch Based on Total Catch

Establish a performance metric for total finfish bycatch of 64.0 percent based on total catch. This performance metric is calculated by dividing landed catch during the baseline period by total finfish catch (retained catch plus alive/dead/unknown discards) during the baseline period. This results in a finfish retention rate of 36.0 percent (Table 9), and a bycatch rate of 64 percent. If the DGN finfish bycatch rate exceeds 64.0 percent in a single fishing season, the Council would determine if additional management measures are needed to further minimize bycatch.

Alternative 2: Total Finfish Bycatch Based on Total Catch minus Live Releases

Establish a performance metric for total finfish bycatch of 30.3 percent based on total catch minus live animals released. This Alternative differs from Alternative 1 in that animals released alive are not figured into calculation of the performance metric. This performance metric is calculated by dividing landed catch during the baseline period by total finfish catch mortality (retained catch plus dead/unknown discards) during the baseline period. This results in a finfish retention rate of 69.7 percent (Table 1), and a bycatch rate of 30.3%. If the DGN finfish bycatch rate exceeds 30.3% in a single fishing season, the Council would determine if additional management measures are needed to further minimize bycatch.

Table 1. Performance metrics for finfish bycatch (no. of individuals) in the DGN fishery, Alternative 1 and Alternative 2. Based on expanded average annual catch rates (2004-2014) from NMFS observer data.

Species	Estimated average annual **caught**	Estimated average annual **retained**	Estimated average annual **discarded**	Estimated average annual **discarded dead**	Estimated average annual **discarded alive**	Estimated average annual **discarded unknown**	Alternative 1: Estimated Percentage **retained/caught**	Alternative 2: Estimated Percentage **retained/retained+ dead+unkn**
Albacore	590	563	27	27	0	0	95.4%	95.4%
Bigeye Thresher Shark	116	59	57	55	1	1	51.0%	51.4%
Blue Marlin	1	0	1	1	0	0	0.0%	0.0%
Blue Shark	962	1	961	593	343	25	0.1%	0.1%
Bluefin Tuna	384	365	19	19	0	0	94.9%	94.9%
Bullet Mackerel	101	41	60	59	0	1	40.9%	40.9%
Common Mola	8,910	7	8,919	331	8,520	69	0.1%	1.8%
Common Thresher Shark	846	813	33	22	11	0	96.1%	97.3%
Opah	1,066	1,035	31	28	3	0	97.1%	97.3%
Pacific Bonito	352	111	241	228	13	0	31.5%	32.7%
Pacific Mackerel	632	95	537	501	36	0	15.1%	16.0%
Shortfin Mako Shark	998	932	66	40	26	1	93.4%	95.8%
Skipjack Tuna	1,142	417	725	710	12	3	36.5%	36.9%
Striped Marlin	36	0	36	36	0	0	0.0%	0.0%
Swordfish	2,131	2,070	62	58	4	0	97.1%	97.3%
Yellowfin Tuna	28	21	6	6	0	0	76.7%	76.7%
Other Finfish (40 species)*	327	179	150	91	55	5	54.6%	65.1%
Total Billfish (including swordfish)	2,168	2,070	99	95	4	0	95.4%	95.6%
Total Billfish (excluding swordfish)	37	0	37	37	0	0	0.0%	0.0%
Total Sharks (including blue)	2,953	1,813	1,140	730	383	27	61.4%	70.5%
Total Sharks (excluding blue)	1,991	1,812	179	137	40	2	91.0%	92.9%
Total Finfish Catch	18,622	6,708	11,933	2,806	9,022	105	36.0%	69.7%

Data source: NMFS Observer Data for CA DGN Fishery, 5/1/2003 - 1/31/2013. Estimated annual averages projected based on % observer coverage.

*Other finfish include species which had an annual average of less than 100 individuals caught, except for management unit species and blue marlin.

Alternative 3: Number of Discards by Finfish Species Groups

Establish performance metrics for selected bycatch species and groups of species as shown in Table 2. The performance metrics are the number of animals discarded during a fishing season or the estimated number of animals that are subject to post-release mortality. The species/species groups and performance metric values are taken from the August 8, 2014, public comment letter from Oceana, included in Agenda Item G.4.c, Public Comment, September 2014. If the DGN fishery reaches the performance metric for any species or species group in a single fishing season, the Council would determine if any additional management measures are needed to manage bycatch.

Table 2. Performance metrics based on Oceana public comment, September 2014 Council meeting.

Species/Species Group	Performance Metric	
	# of animals	Type
Billfish other than swordfish	28	Total discards
Megamouth, basking, and white sharks	2	Total discards
Hammerhead sharks	5	Total discards
Blue sharks	611	Discard mortality
Ocean sunfish (mola mola)	139	Discard mortality

Alternative 4 (Council Preliminary Preferred Alternative): Non-ESA-listed Marine Mammals Mortality & Serious Injury based on Ten-Year Observer Data

Establish performance metrics for non-ESA-listed marine mammals. These metrics are based on the 10-year maximum observed interactions (in any one season) over the 10 fishing seasons, 2004-2014. The performance metric is defined as mortality and serious injury (M&SI). In MMPA regulations, a serious injury to a marine mammal is defined as "any injury that will likely result in mortality" (50 CFR 229.2). If M&SI reaches the performance metric for any species in a single fishing season, the Council would determine if any additional management measures are needed to manage bycatch in the DGN fishery.

There are two sub-options:

Alt 4 Sub-option 1: The performance metric is observed M&SI, regardless of observer coverage level.

Alt 4 Sub-option 2: The performance metric is estimated total M&SI extrapolated from observer data.

Table 3 shows the performance metrics under this Alternative.

Table 3. Performance metrics under Alternative 4 (Council PPA).

Species	Annual performance metrics based on observed take	Annual performance metrics based on total estimated takes
Minke whale	1	5
Short beaked common dolphin	9	66
Long beaked common dolphin	5	24
Risso's dolphin	1	7
California sea lion	18	97
Northern elephant seal	1	6
Northern right whale dolphin	3	11
Gray whale	1	5
Pacific white-sided dolphin	3	22

Alternative 5: Non-ESA-listed Marine Mammals Mortality & Serious Injury based on Five-Year Observer Data

Establish performance metrics for non-ESA-listed marine mammals. These metrics are based on the five-year maximum observed interactions (in any one season) over the five fishing seasons, 2009-2014.

The performance metric is defined as M&SI. If M&SI reaches the performance metric for any species in a single fishing season, the Council would determine if any additional management measures are needed to manage bycatch in the DGN fishery.

There are two sub-options:

Alt 5 Sub-option 1: The performance metric is observed M&SI, regardless of observer coverage level.

Alt 5 Sub-option 2: The performance metric is estimated total M&SI extrapolated from observer data.

Table 4 shows the performance metrics under this Alternative.

Table 4. Performance metrics under Alternative 5.

Species	Annual performance metrics based on maximum annual observed take	Annual performance metrics based on total estimated takes
Minke whale	1	5
Short beaked common dolphin	9	26
Long beaked common dolphin	5	15
Risso's dolphin	1	5
California sea lion	18	97
Northern elephant seal	1	1*
Northern right whale dolphin	3	11
Gray whale	1	3
Pacific white-sided dolphin	3	15

*There were no observed takes of Northern elephant seals in the 2009/10 to 2013/14 seasons

Potential Environmental Consequences of Performance Metric Alternatives

The effects of the performance metric Alternatives on the following resources are analyzed here: target, non-target, and prohibited species captured in the DGN fishery; protected species; and the socioeconomic environment.

Species listed under a performance metric may experience indirect beneficial effects if vessel operators attempt to reduce their catch of those species to avoid exceeding a performance measure.

Table 5. Analysis of the anticipated effects of the Alternatives.

Alternatives	Anticipated Effects of Performance Metrics (PMs)	
	Target, Non-Target, and Prohibited Species	**Protected Species**
No Action -PMs would not be established. Fishing practices and catch rates would be expected to remain the same as in the past.	There would be no effect to these species. Catch rates would remain the same as baseline conditions.	There would be no effect to these species. Catch rates would remain the same as baseline conditions.
Alternative 1 - Establish a finfish bycatch PM at 64.0% of total finfish catch. - PM for protected species: N/A	**Target species** and other commonly retained species may experience indirect beneficial effects if their catch is reduced as vessel operators attempt to avoid finfish species which are commonly discarded as bycatch. **Non-marketable species** (common mola, blue shark) caught in the DGN fishery may experience indirect beneficial effects if vessel operators attempt to reduce their catch of these species to avoid exceeding the bycatch PM. Vessel operators may increase retention of marketable species which are commonly discarded dead (skipjack tuna, Pacific mackerel, Bullet mackerel, Pacific bonito). These species are commonly discarded because they are caught in low volumes and have a low market price. There will be no effect to these marketable species as they would be sold instead of discarded. **Prohibited species** (white shark, megamouth shark, basking shark, Pacific halibut, Pacific salmon) are rarely caught in the DGN fishery, and any changes in fishing behavior to avoid reaching a PM is unlikely to have any effect on these species.	Protected species may experience indirect beneficial effects if their catch is reduced as vessel operators attempt to avoid finfish species which are commonly discarded as bycatch.
Alternative 2 - Establish a finfish bycatch PM at 30.3% of total finfish mortality. - PM for protected species: N/A	Same as Alternative 1 (for all)	Same as Alternative 1

CONTINUED: Table 5. Analysis of the anticipated effects of the Alternatives.

Alternatives	Anticipated Effects of Performance Metrics (PMs)	
	Target, Non-Target, and Prohibited Species	**Protected Species**
Alternative 3 -Establish PMs for selected bycatch species and species groups (see Alt section) -PMs for protected species: N/A	**Target species and non-target species** may experience indirect beneficial effects if their catch is reduced as vessel operators attempt to avoid species for which PMs are established. Billfish, hammerhead and blue sharks, and common mola may experience indirect beneficial effects if vessel operators attempt to reduce their catch of these species to avoid exceeding their PMs. **Prohibited species** – Same as Alternative 1.	Protected species may experience indirect beneficial effects if their catch is reduced as vessel operators attempt to avoid species for which PMs are established.
Alternative 4 (Council PPA) - Establish PMs for non-ESA-listed marine mammals. -PM for finfish: N/A	**Target and non-target species** may experience indirect beneficial effects if their catch is reduced as vessel operators attempt to avoid catching marine mammal species for which PMs are established. **Prohibited species**– Same as Alternative 1.	Non-ESA-listed marine mammal species for which PMs are established may experience indirect beneficial effects if vessel operators attempt to avoid catching them. Other protected species may experience indirect beneficial effects as vessel operators attempt to reduce their catch of PM species.
Alternative 5 - Establish a PM for non-ESA-listed marine mammals. - PM for finfish: N/A	Same as Alternative 4 (for all)	Same as Alternative 4

Economic Effects of Performance Metric Alternatives

The economic effects of performance metrics are not analyzed since the Alternatives do not identify specific actions that would be taken if a performance metric is exceeded. The Council would review fishery performance in relation to the performance metrics after the end of each fishing season (May 1 through January 31) and determine if any management measures are needed to further minimize bycatch in the DGN fishery. The economic effects of any new management measures recommended by the Council would be analyzed at that time.

Vessel operators may experience reduced catch rates of marketable species if they try to avoid exceeding a bycatch or protected species performance metric. The economic effect cannot be quantified, as the amount of potentially reduced catch is unknown.