Agenda Item I.1.a
Supplemental NMFS Report 3
March 2018

NATIONAL MARINE FISHERIES SERVICE (NMFS) REPORT ON HIGHLY MIGRATORY SPECIES (HMS) ACTIVITIES

As result of a Pacific Fishery Management Council (Council) motion from September 2017 to revise the purpose and need statement for monitoring (See September 2017 Decision Summary Document), NMFS has completed a preliminary analysis on the effects of alternatives for increased monitoring in the California/Oregon large-mesh drift gillnet (DGN) fishery.

Introduction

Increased monitoring in the DGN fishery has been discussed for several years, and, although the purpose has evolved over time, Council members have remained interested in exploring increased monitoring. Council members have cited potential bias in observer data, fleet-wide accountability, and improved data on bycatch and protected species interactions as reasons to support increased monitoring.

In September 2015, the Council selected final preferred alternatives (FPAs) for DGN monitoring and "hard caps." The FPA pertaining to monitoring included:

- maintaining a minimum of 20[1] percent observer coverage and/or requiring electronic monitoring (EM) (for the purpose of catch and bycatch accounting),
- prohibiting unobservable vessel participation, and
- achieving 100 percent monitoring by 2018.

This report assesses both the costs and the benefits of several alternatives (as outlined in the Analysis of Alternatives section), recognizing that some costs and benefits are difficult to quantify.

Management Objectives / Statement of the Problem

The Council originally adopted a purpose and need to cover both increased monitoring and "hard caps." The Council adopted a revised purpose and need specifically for increased DGN monitoring at its September 2017 meeting. The Council's revised purpose and need for increased DGN monitoring reads as follows:

> "The purpose of the action is to ensure adequate information is being collected from the DGN fishery to support Council decision-making on management measures. The proposed action is needed to document bycatch and protected species interactions for evaluation of costs and benefits of the use of DGN gear. The evaluation will inform future Council and industry decision-making on any need and design of management measures. It also will allow the Council to better evaluate the catch versus bycatch fishery performance standards it established for the fishery in 2015. This action addresses the following National Standards: National Standard 9 and Section 303 of the Magnuson-Stevens Act to minimize bycatch and bycatch mortality and conserve non-target species

[1] Although the original FPA referenced maintaining observer coverage at 30 percent, the current NMFS observer coverage target is a minimum of 20 percent.

to the extent practicable; as well as National Standard 1 on optimum yield; and National Standard 7 on cost benefit."

Using the September 2015 Preliminary Draft Environmental Assessment as a guideline, the cost and benefits of the Council's four alternatives are evaluated here. The alternatives include:

- No action,
- targeting observer coverage to a level sufficient for biological sampling and requiring EM on all DGN vessels that fish,
- an increase to 50 percent observer coverage with unobservable vessels being prohibited from fishing in DGN fishery, and
- an increase to 100 percent monitoring through the use of on-board observers or EM, and vessels unable to carry an observer or EM would be prohibited from fishing.

Description of the fishery

Catch

California's swordfish fishery transformed from primarily a harpoon fishery to a DGN fishery in the early 1980s; landings soared to a historical high of 2,198 metric tons (mt) by 1985. Development of the DGN 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 in 1985. In the years following, swordfish replaced thresher shark as the primary target species. Greater consumer demand for swordfish brought harvesters a higher price-per-pound, and annual thresher shark landings declined as vessels switched to targeting swordfish to maximize economic returns. In 1986, the California Legislature restricted the DGN thresher shark fishing season to 30 days in May, which may have further accelerated the shift towards targeting swordfish. From 2013 through 2016, swordfish annual landings ranged from 96.18 mt to 192.64 mt and common thresher shark annual landings ranged from 25.58 mt to 48.46 mt in the DGN fishery (Table 1).

Table 1. Drift gillnet annual landings in metric tons (mt) for target and non-target species from 2013 through 2016. *Data has been withheld for confidentiality purposes. (Data taken from Pacific Fisheries Information Network APEX reports 2018).

Year	Swordfish (mt)	Common Thresher Shark (mt)	Albacore Tuna (mt)	Bluefin Tuna (mt)	Yellowfin Tuna (mt)	Skipjack Tuna (mt)	Bigeye Tuna (mt)	Unsp. Tuna (mt)	Shortfin Mako Shark (mt)	Dorado/ Dolphinfish (mt)
2013	101.83	48.46	4.89	7.25	0	0.05	0	0	16.18	0
2014	126.51	25.58	1	4.66	0	*	*	0	7.01	*
2015	96.18	31.05	*	4.44	0.8	0.2	0	0	7.23	0
2016	192.64	31.18	*	8.58	0.36	*	0	*	12.02	0

In addition to swordfish and common thresher shark, the fishery also catches and lands other Management Unit Species (MUS) under the the Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species (HMS FMP), including: five species of tuna (North Pacific albacore, yellowfin, bigeye, bluefin, and skipjack), shortfin mako shark, and dolphinfish. Table 1 presents DGN annual landings of MUS for 2013 through 2016. The DGN fishery also

catches and lands ecosystem component (EC) species, defined in the HMS FMP as common incidental catch, including: bigeye thresher shark, pelagic thresher shark, escolar, and louvar. The DGN fishery is also known to catch opah, which is neither an MUS nor an EC species under the HMS FMP. Together, these species make up the revenue portfolio for the fleet.

The fleet also catches other finfish that are discarded at sea because they are either not marketable or are prohibited from commercial sale. These other finfish include two MUS (striped marlin and blue shark) and two EC species (pelagic stingray and the common mola).

Protected species (e.g., marine mammals and sea turtles) are also known to interact with the DGN fishery. The most recent protected species interaction estimates for the DGN fishery can be found in a NOAA Technical Memorandum by Caretta, Moore, and Forney (2017).

A 2013 NMFS Biological Opinion (Opinion) concluded that, based on the best available scientific and commercial information, the continued management of the DGN fishery under the HMS FMP, including the protective measures to minimize the bycatch of protected species that had already been implemented, is not likely to jeopardize the continued existence of species listed under the Endangered Species Act (ESA)[2] or adversely modify or destroy any critical habitat designated under the ESA.

NMFS West Coast Region (WCR) Protected Resources Division (PRD) and Sustainable Fisheries Division (SFD) had discussions on the preparation and scope of the 2013 Opinion, as well as development of the Reasonable and Prudent Measures and Terms and Conditions of the Opinion, which are non-discretionary pursuant to Section 7(b)(4) of the ESA. Discretionary Conservation Recommendations were also contained in this Opinion. These recommendations include: (1) maximizing observer coverage as much as resources and the ability to deploy observers on DGN fishing vessels will allow; (2) continued pursuit of ways to better understand when and where ESA-listed species may encounter DGN fishing gear, as well as strategies to avoid those encounters; and (3) continued work on promoting marine mammal and sea turtle conservation and recovery efforts. NMFS WCR has reinitiated consultation on the DGN fishery due to the new ESA-listings for humpback whale distinct population segments and new information regarding an increasing number of reports of entanglements in commercial fishing gear along the U.S. West Coast. NMFS anticipates completing a new Biological Opinion in the spring of 2018.

Participation

The DGN fishery is managed by a limited entry permit system, with mandatory gear standards and seasonal area closures to address various conservation concerns. About 150 permits with DGN gear endorsements were issued when the State of California limited entry program was established in 1980. The number of permits in the fishery reached a peak of 251 permits in 1986. In recent years, the number of active permits has declined below 30 (Figure 1). 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

[2] Specifically, the 2018 Biological Opinion referred to the following ESA-listed species: fin whales, humpback whales, sperm whales, leatherback sea turtles, North Pacific distinct population segment loggerhead sea turtles, green sea turtles, and olive ridley sea turtles.

seasonal fishing restrictions, nearly all of the fishing effort in recent years has occurred from August 15 through January 31 and off the California coast.

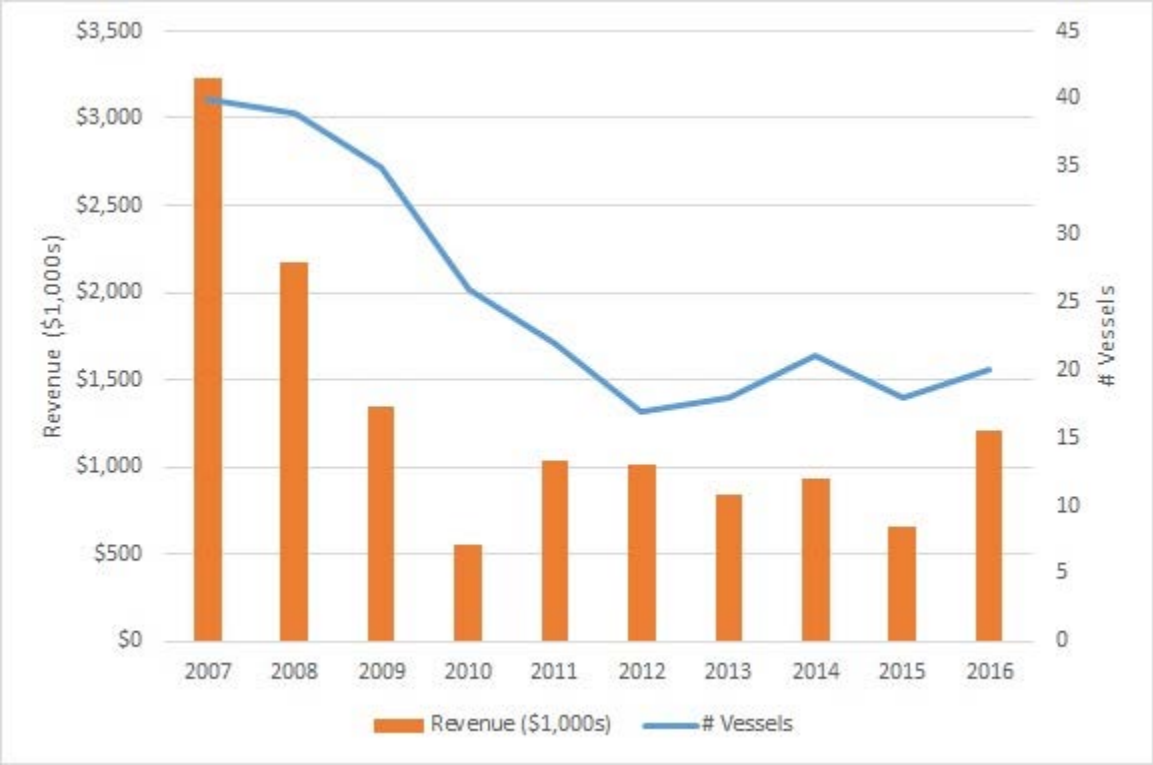

Figure 1. Number of vessels and real (inflation adjusted) ex-vessel revenue ($1,000s) in the U.S. West Coast large-mesh drift gillnet fishery, 2007 through 2016. (Source: 2017 HMS SAFE Report).

Both vessel 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 fishing effort to regulations implemented to protect marine mammals and endangered sea turtles. Figure 1 shows the overall trend in participation and ex-vessel revenue in the DGN fishery from 2007 through 2016. Despite a temporary increase in participation and ex-vessel revenue from 2004 through 2007, both have experienced a general downward trend since 2007. Real ex-vessel revenues declined from $3,790,000 in 2000 to $454,000 in 2015. Similarly, the number of participating vessels declined from 72 in 2000 to 20 in 2016. From 2013 through 2016, an average of 18 vessels participated in the DGN fishery each year (Table 2).

The DGN fishery has been subject to a number of seasonal closures over the years.

- Since 1982, the DGN fishery has been closed inside the entire U.S. West Coast exclusive economic zone (EEZ) from February 1 to April 30.
- In 1986, a closure was established within 75 miles of the California mainland from June 1 through August 14 to conserve common thresher sharks; this closure was extended to include May in 1990 and later years.
- In 2001, NMFS implemented two sea turtle conservation areas off the U.S. West Coast with seasonal DGN fishing prohibitions to protect endangered leatherback and loggerhead sea turtles. (1) The larger of the two closures spans the EEZ generally north of Point Conception, California, (34°27’ N. latitude) to mid-Oregon (45° N. latitude), and extends west to 129° W. longitude. Within this conservation area, DGN fishing is prohibited annually from August 15 to November 15 to protect leatherback sea turtles. (2)

A smaller closure was implemented to protect Pacific loggerhead sea turtles from DGN gear from June 1 to August 3 during a forecasted or concurrent El Niño event, and is located south of Point Conception, California, and east of 120° W. longitude (72 FR 31756).

In recent years, six or seven vessels have been determined to be unobservable due to their limited observer accommodations and/or safety concerns (Table 2). The estimated amount of effort that was observable and unobservable is presented in Table 3.

Table 2. Number of active observable, unobservable, and total drift gillnet vessels for 2013 through 2016 (C. Villafana, pers. Comm., February 12, 2018).

Calendar Year	Number of Active Vessels	Number of active Observable Vessels	Number of Active Unobservable Vessels
2013	18	12	6
2014	15	9	6
2015	17	11	6
2016	20	13	7

Table 3. Estimated observable and unobservable effort (in sets) for the drift gillnet fishery from 2013 through 2016.

Calendar Year	Total sets	Observable Sets	Unobservable Sets	Percent Unobservable
2013	470	421	49	10.4%
2014	409	264	145	35.5%
2015	361	216	145	40.2%
2016	737	490	247	33.5%

Estimates of Average Variable Profit per Day at Sea

Average variable profits per day at sea for the DGN fleet were estimated for observable and unobservable fishing vessels using 2013 through 2016 landings records, a list of unobservable vessels over the period, an Implicit Price Deflator to convert nominal revenue into real revenues in 2016 U.S. dollar values, and estimates of variable fishing costs per day at sea. The average real revenue per day at sea was calculated for observable and unobservable vessels by estimating average gross DGN revenue and obtaining four-year average revenues per day at sea. These averages are displayed in Table 4.

Table 4. Average DGN real revenue per day at sea from 2013 through 2016.

Year	Observable Vessels			Unobservable Vessels		
	Real Revenues	Days at Sea	Daily Average	Real Revenues	Days at Sea	Daily Average
2013	$885,542	471	$1,880	$69,313	91	$762
2014	$887,106	382	$2,322	$89,811	150	$599
2015	$625,347	378	$1,654	$74,534	130	$573
2016	$1,068,755	621	$1,721	$249,516	307	$813
Total	$3,466,750	2,087	$1,872	$483,174	880	$713

Estimated variable fishing costs per day at sea include fuel consumption, crew and captain costs. *It is important to note that variable costs do not represent the full cost of DGN fishery participation, as fixed costs such as permitting, vessel maintenance, insurance and other costs of fishery participation are also incurred.* Variable fishing costs per day at sea were estimated as a share of revenues using two approaches. One approach used a 2008 through 2010 cost and earning survey conducted by the Southwest Fisheries Science Center, and the other approach used the same assumption as an Ecotrust study. The 2008 through 2010 survey documented an average cost per day at sea of approximately 55 percent of revenues, whereas the Ecotrust study assumed daily cost of 30 percent of revenues in estimating daily variable drift gillnet fishing profits. Anecdotal evidence suggests the 2008 through 2010 period was suboptimal for swordfish fishing off the U.S. West Coast, raising the possibility that variable costs per day at sea were unusually high when compared to revenues for the period; therefore, a range of estimated variable costs per day at sea for observable and unobservable vessels are provided, including a low-cost estimate based on the Ecotrust assumption, a high-cost estimate based on the survey results, and a mid-cost estimate based on the midpoint of these percentages. The the low-cost estimate was produced assuming daily costs were 30 percent of revenues, high-cost estimate was developed based on the cost percentage in the 2008 through 2010 survey, and the mid-cost estimate was produced as an average of these.

While fixed costs data were included in the 2008 through 2010 survey, it is impossible to accurately apportion the fixed costs between DGN fishing and other fisheries that a DGN fisherman may participate in; therefore, this analysis only considers the variable costs of DGN fishing. The range of daily variable cost estimates are presented in Table 5.

Table 5. Estimated average variable costs per DGN day at sea.

Estimate	Percentage	Observable	Unobservable
Low	30%	$562	$214
Mid	42.35%	$793	$302
High	54.69%	$1,024	$390

Finally, estimates of variable daily profit per DGN day at sea were calculated by subtracting each of the three daily cost estimates from the average (2013 through 2016) daily revenue:

Average Revenue per Day at Sea (Table 4) - Average Variable Costs per Day at Sea (Table 5) = Average Variable Profit per Day at Sea (Table 6)

The resulting average variable daily profit per DGN day at sea estimates are shown in Table 6.

Table 6. Estimated average variable profit per DGN day at sea.

Estimate	Observable	Unobservable
High	$1,310	$499
Mid	$1,079	$411
Low	$848	$323

Observer Coverage

NMFS has operated an at-sea observer program in the DGN fishery from July 1990 to the present, while the California Department of Fish and Wildlife (CDFW) operated a DGN observer program from 1980 through 1990. The NMFS Observer Program has been entirely government-funded since 1990. The objectives of the NMFS Observer Program are to document the catch and disposition of target and non-target fish species, marine mammals, sea turtles, and seabirds. These observer data are relied upon to produce estimates of protected species bycatch and forecast potential impacts of future fishing effort on these species. NMFS currently pays for observer days at sea. The estimated industry-funded portion of the costs of observer coverage would be approximately $600 per sea day (PFMC 2017). This would not include the NMFS program management costs.

In accordance with the proposed action of associated ESA Biological Opinions—most recently, the 2013 Opinion—NMFS has had a target of 20 percent observer coverage of the DGN fishery effort each year since 1990. If the average observer coverage falls significantly below 20 percent in a given 5-year period, NMFS would request reinitiation of consultation with PRD, as provided for under Section 7 of the ESA.

Recent history of observer coverage based on fishing effort (in sets) for calendar years 2013 through 2016 is presented in Table 7. From 2013-2016, the average annual observer coverage was 24.95 percent of total fishing sets. Note, because some DGN vessels are unobservable, the observable vessels have been observed at a rate higher than 20 percent—27 to 42 percent from 2013 through 2016.

Table 7. Summary of estimated total fishing effort (in sets), total number of observed sets, and percent observer coverage for the California/Oregon large-mesh DGN Observer Program from 2013 through 2016 (calendar fishing year January through December).

Calendar Year	Estimated Total Fishing Effort (Sets)	Total Number of Observed Sets	Percent Observer Coverage
2013	470	176	37.4%
2014	409	97	23.7%
2015	361	74	20.5%
2016	737	132	18.2%*

* Coverage was less than 20 percent due to effort in 2016 being double that of 2015, and there was a large increase in the number of observed sets.

Use of Electronic Monitoring in the Drift Gillnet Fishery

Many other federal fisheries began their EM programs through the exempted fishing permit (EFP) process, which has allowed each program to adopt necessary changes to achieve the stated goals of the EFP. The DGN fishery could benefit from EFP work, but a lack of interest among DGN vessels has impeded progress: the Nature Conservancy received a federal grant for a research project with DGN vessels in 2016, but was unable to secure participants. This also raises concerns about the success of any EM program because EM is most successful in fisheries where there is support from fishermen. EM programs shift many of the duties of an onboard observer to the captain and crew, who have to be willing to take on the extra work. Programs that do not have industry support may have a longer learning curve and suffer from chronic compliance issues.

EM can be a less costly monitoring alternative to human observers. However, this largely depends on the design of the program including: the level of coverage, the amount and purpose of the video review, and the amount of fishing effort. EM was tested in this fishery previously: in 2006 for the purpose of fish and protected species counts and identification, and, in 2007, added hydrophone detection of pingers. However, at this time, further testing of EM is needed to determine whether it could address the Council's purpose and need (documenting bycatch and protected species interactions). To ensure EM could provide these data, the following would likely need to be evaluated: camera placement, video run times, and the level of footage review. Without understanding the feasibility of implementing EM in the DGN fleet, the best cost estimate[3] shows that industry-funded EM would cost $361.22 per sea day (PFMC 2017).

NMFS is currently scoping a study with the objective of answering remaining questions about the feasibility of EM to supplement observer coverage in the DGN fishery. NMFS has secured funding and intends to engage with the fishing industry to develop the first phase with a few vessels in 2018, and intends to pursue additional funding for a broader project in 2019.

If NMFS cannot secure funding for a broader project, other potential funding opportunities for stakeholders regarding EM on DGN vessels are summarized in Table 8 below. NMFS staff have

[3] Derived from the West Coast Groundfish EM Exempted Fishing Permit program.

worked with applicants in the past to review and develop applications for these programs and would be available to do so again.

Table 8. Potential EM funding opportunities by program foci and annual due dates.

Program	Program Focus	Approximate Due Dates
Bycatch Reporting and Engineering Program (BREP)	Gear modification, alternative fishing gears	January
National Fish and Wildlife Foundation (NFWF)	Electronic monitoring, electronic reporting	April
Saltonstall-Kennedy Grant Program (S-K)	Fisheries development	October

List of DGN Monitoring Alternatives

The alternatives, which are presented here as they were written in the Preliminary Draft EA (2015), include a No Action Alternative and three Action Alternatives.

***No Action Alternative*:** NMFS would continue to place observers on board DGN vessels targeting 20[4] percent coverage of total fishing effort each calendar year[5]. Vessels that do not meet observer safety and accommodations requirements (50 CFR 600.746) would not be selected for observer coverage, and would be allowed to fish without an observer. The observable portion of the DGN fleet would be observed at a rate higher than 20 percent, in order to attain 20 percent coverage fleet-wide.

***Action Alternative 1*:** Target observer coverage to a level sufficient for biological sampling and require EM on all DGN vessels that fish.

***Action Alternative 2*:** 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.

***Action Alternative* 3:** Require 100 percent monitoring in the DGN fishery, using on-board observers and/or EM. 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 20 percent target observer coverage level until 100 percent monitoring is required.

[4] Though original PFMC alternatives identified observer rates as 30 percent, 20 percent was part of the proposed action described in the 2013 Biological Opinion. 30 percent coverage was recommended in the NMFS National Bycatch Report, but it is not a mandate. NMFS strives to achieve as much observer coverage as practical and feasible. The List of DGN Monitoring Alternatives section has been modified to reflect this.

[5] While the No Action Alternative in the Preliminary Draft EA stated that NMFS targets a percent of fishing effort each fishing season, this alternative has been revised to clarify that NMFS targets observer coverage levels on a calendar year basis.

Analysis of Alternatives

In this section, it is assumed that industry will bear the costs of any required monitoring under the action alternatives (i.e., not the no action alternative) at these rates (as described above):

- $600 per sea day for human observers
- $361.22 per sea day for EM

It is also assumed that the estimated range of variable daily profits for observable and unobservable vessels are, as described in Table 6:

- Between $848 and $1,310 for observable vessels
- Between $323 and $499 for unobservable vessels

Results of the analysis of alternatives are summarized in Table 9.

Table 9. Estimates of average variable profit per day at sea under the alternatives.

Action & Assumed Daily Costs	Estimate Type	Observable	Unobservable	Estimated percentage reductions in variable profit per day at sea	
				Observable	Unobservable
No Action	Low	$848	$323		
	Mid	$1,079	$411		
	High	$1,310	$499		
Alternative 1: Require EM $361.22	Low	$487	$0	-43%	-100%
	Mid	$718	$50	-33%	-88%
	High	$949	$138	-28%	-72%
Alternative 2: Minimum 50% monitoring $300	Low	$548	$23	-35%	-93%
	Mid	$779	$111	-28%	-73%
	High	$1,010	$199	-23%	-60%
Alternative 3: 100% observer monitoring $600	Low	$248	$0	-71%	-100%
	Mid	$479	$0	-56%	-100%
	High	$710	$0	-46%	-100%
Alternative 3: 100% EM $361.22	Low	$487	$0	-43%	-100%
	Mid	$718	$50	-33%	-88%
	High	$949	$138	-28%	-72%

No Action Alternative: *NMFS would continue to place observers on board DGN vessels targeting 20[6] percent coverage of total fishing effort each calendar year. Vessels that do not meet observer safety and accommodations requirements (50 CFR 600.746) would not be selected for observer coverage, and would be allowed to fish without an observer. The observable portion of the DGN fleet would be observed at a rate higher than 20 percent, in order to attain 20 percent coverage fleet-wide.*

NMFS would continue to target 20 percent observer coverage. Potential catch rates would likely remain the same as baseline conditions. There would be no expected economic effect to DGN vessel owners/operators.

Action Alternative 1: *Target observer coverage to a level sufficient for biological sampling and require EM on all DGN vessels that fish.*

There would likely be no direct effect to target, non-target, and protected or prohibited species. This Alternative may have minor indirect beneficial effects on these species if EM can improve the precision of catch and bycatch estimates, which could inform future management decisions and may eliminate a source of potential bias in observer data. With 100 percent monitoring and assuming EM can document all catch, there would not be a need to extrapolate observer data to estimate total bycatch or protected species interactions.

DGN vessel owners/operators would likely experience profit reductions under this Alternative. The estimated industry-funded cost of EM ($361.22 per sea day) would reduce variable daily profits by 28 to 43 percent for observable vessels and by 72 to 100 percent for unobservable vessels. Unobservable vessels would likely have a greater cost burden, potentially making participation in DGN fishery economically unfeasible.

Action Alternative 2: *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.*

There would likely be no direct effect to target, non-target, and protected or prohibited species. This Alternative may have minor indirect beneficial effects on these species if EM can improve the precision of catch and bycatch estimates, which could inform future management decisions and may eliminate a source of potential bias in observer data.

DGN vessel owners/operators would likely experience profit reductions under this Alternative. The estimated industry-funded cost for an observer is $600 per sea day. Observer coverage during 50 percent of a vessel's total days at sea is equivalent to $300 per sea day. This cost would reduce variable daily profits by 23 to 35 percent for observable vessels.

The prohibition on fishing for unobservable vessels would reduce variable daily profits for these vessels to $0 (i.e., by 100 percent) unless the vessel owner opted to modify the vessel to make it observable. Owners of vessels that are currently unable to carry observers would be required to bear the cost of making their vessels observable in order to continue fishing. Costs for the

[6] Though original PFMC alternatives identified observer rates as 30 percent, 20 percent was part of the proposed action described in the 2013 Biological Opinion. 30 percent coverage was recommended in the NMFS National Bycatch Report, but it is not a mandate. NMFS strives to achieve as much observer coverage as practical and feasible. The List of DGN Monitoring Alternatives section has been modified to reflect this.

inability to fish while making vessel modifications, as well as the modifications themselves, must also be considered. If they were to become observable and take on 50% observer coverage, then their variable daily profits would be reduced by 60 to 93 percent. Unobservable vessels would likely have a greater cost burden, potentially making participation in the DGN fishery economically unfeasible.

Action Alternative 3: *Require 100 percent monitoring in the DGN fishery, using on-board observers and/or EM. 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 20 percent target observer coverage level until 100 percent monitoring is required.*

There would likely be no direct effect to target, non-target, and protected or prohibited species. This Alternative may have minor indirect beneficial effects on these species if EM can improve the precision of catch and bycatch estimates, which could inform future management decisions and may eliminate a source of potential bias in observer data. With 100 percent monitoring, and assuming EM can document all catch, there would be no need to extrapolate observer data for estimating total bycatch or protected species interactions.

DGN vessel owners/operators would likely experience profit reductions under this Alternative. For simplicity, this analysis evaluates two scenarios: (1) 100 percent observer coverage and (2) 100 percent EM coverage; although, 100 percent monitoring could be achieved through varying percentages of observer coverage and EM.

The estimated daily cost to a DGN vessel/operator for 100 percent observer coverage is $600 per sea day (PFMC 2017). This may reduce estimated average variable daily profits by 46 to 71 percent for observable vessels. If there was a requirement for 100 percent observer coverage, unobservable vessels would be unable to fish, or would have profits reduced by 100 percent. If they modify their vessels to be able to carry observers, costs for the inability to fish while making vessel modifications, as well as the modifications themselves, must also be considered.

As calculated in Alternative 1, the estimated cost of 100 percent EM may reduce estimated average variable daily profits by 28 to 43 percent for observable vessels, and may diminish variable daily profits of unobservable vessels by 72 to 100 percent.

Next Steps

The purpose of this report is to provide the Council with a preliminary analysis of increased monitoring in the DGN fishery in advance of June 2018 meeting, during which the Council is scheduled to discuss swordfish management project planning, including increased monitoring. The Council's stated objective for increased monitoring in the DGN fishery is to "document bycatch and protected species interactions."

Although NMFS has collected observer data from this fishery for 28 years, there are concerns with the extrapolation of those data to the entire fleet. Specifically, there are concerns that the data may be biased because not all vessels take observers; furthermore, there is expressed concern that the levels of bycatch could potentially be higher in unobserved sets if DGN vessel operators fish more carefully in the presence of an observer. NMFS' WCR PRD, as mentioned above, is developing a new Biological Opinion (by Spring 2018) for this fishery. As a part of

that, they are working with the Permits and Monitoring Branch of SFD to do a new analysis on potential observer bias using vessel monitoring system data to analyze if unobserved trips fish in different areas than vessels with observers.

While increased monitoring has the potential to inform better management by providing more raw data about non-target species interactions, this analysis indicates that increasing monitoring under the current alternatives may have indirect benefits for species through improved management but negative impacts on the DGN fleet; some vessels will likely have to stop fishing rather than operate at an economic loss. However, the planned NMFS study using EM on a few unobservable vessels will provide insights into whether EM can achieve the Council's objectives stated in the Purpose and Need, as well as the real costs of doing so. NMFS requests any additional guidance from the Council before the issue of monitoring this fishery is revisited in June.

References

Pacific Fisheries Management Council (PFMC). 2017. National Marine Fisheries Service Report on Swordfish Management Project Planning. Agenda Item J.2.a, Supplemental NMFS Report 1, September 2017. 15 pages.

Villafana, Charles. 2018. Observer Program Coordinator, NMFS, West Coast Region. February 12, 2018. Personal communication, phone conversation with Tonya Wick (Ocean Associates, Inc.) regarding number of active vessels in DGN fishery.