HIGHLY MIGRATORY SPECIES MANAGEMENT TEAM REPORT ON PROPOSED CALIFORNIA DRIFT GILLNET FISHERY MANAGEMENT AND MONITORING PLAN INCLUDING MANAGEMENT ALTERNATIVES

1 Introduction

In November 2014 the Council decided to prepare a California Drift Gillnet (DGN) Fishery Management and Monitoring Plan. It directed the HMSMT and Council staff to prepare a draft Purpose and Need for the Plan, including its goal and objectives, for the Council's consideration in March 2015. The Council also adopted three sets of alternatives, including preliminary preferred alternatives (PPA) for managing and monitoring the DGN fishery. These alternatives include hard caps for protected species of concern, bycatch performance objectives, and fishery monitoring.

The next section of this Report includes a description of the proposed action, purpose and need statement, and goals and objectives for the Plan for Council consideration. A preliminary analysis of the alternatives is contained in the succeeding sections.

2 Proposed Statement of Purpose and Need, Goals and Objectives

2.1 Proposed Action

While the DGN fishery currently complies with all applicable laws, including the MSA, ESA, and MMPA, the Council seeks to establish more stringent standards with respect to these laws. Therefore, the proposed action is to implement management measures for the California large mesh drift gillnet (DGN) fishery to further reduce 1) bycatch including bycatch mortality, and 2) incidental take of ESA-listed species and other marine mammals. Using MSA authority, bycatch and takes would be reduced below the level currently documented for the DGN, noting that the current level is permitted by applicable law. The proposed action is intended to achieve these reductions while an economically viable west coast based swordfish fishery is maintained or enhanced. To promote economic viability, the proposed action will include requirements and incentives to support a swordfish fishery conducted by vessels with west coast home ports which substitutes swordfish imported into west coast states, either from elsewhere in the U.S. or overseas, with locally-caught swordfish.

2.2 Goals and Objectives

Goal 1: Reduce specified protected species takes.

Objectives (implementation steps):

- Implement hard caps for selected protected species such as ESA-listed sea turtle and marine mammal species and other marine mammals with population concerns. If hard caps are reached or exceeded during a fishing season, the fishery would be closed for the remainder of the season.

- Establish performance standards for other (e.g., non-ESA-listed) marine mammals. The Council will routinely review available information on takes of these species. If performance standards are not met the Council may recommend additional mitigation measures, as appropriate.
- Increase monitoring coverage rates above 2013 levels to facilitate implementation of bycatch reduction measures such as hard caps. The target for implementing full monitoring and accountability through onboard observers and/or electronic monitoring (EM) systems is 2018. The balance of the costs associated with observer coverage/EM requirements, beyond that funded by NMFS, would be non-government funded.
- Remove exemptions for unobservable vessels in the DGN fishery.
- Conduct research to further minimize protected species takes in the DGN fishery

Goal 2: Reduce finfish bycatch to the degree practicable.

Objectives:

- Establish performance standards for finfish bycatch. If performance standards are not met the Council will review available information and, as appropriate, recommend additional mitigation measures.
- Conduct research to further minimize bycatch in the DGN fishery.

Goal 3: Maintain an economically viable west coast swordfish fishery

Objectives:

- Reduce capacity in the DGN fishery through buyouts or other incentives.
- Implement a federal DGN limited entry program under MSA authority.
- Allow access to Pacific Leatherback Conservation Area (PLCA) with individual vessel and/or fishery accountability for bycatch using limits such as hard caps.
- Support collaboration between fishing communities, agencies, scientists, and nongovernmental organizations to develop alternative fishing gears.

2.3 Purpose and Need

The purpose of the proposed action is to further reduce bycatch, including incidental take of ESA-listed species and other 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 HMS FMP with enhanced protection of ESA-listed species and other marine mammals, and to address the requirement in National Standard 9 to minimize bycatch and bycatch mortality to the extent practicable.

3 Hard Caps

3.1 Range of Alternatives for Hard Caps

Under all the alternatives:

- The evaluation of the fishery against hard caps is based on a mortality and serious injury (M&SI) assessment.
- Application of hard caps would be aligned with the fishing season (May 1-January 31).[1]
- The fishery closes immediately when estimated M&SI equals the cap for any capped species.
- The cap numbers are expressed as estimated total–not observed–M&SI; if fishery monitoring is not at 100% then observed M&SI would be expanded to estimated total take based on the level of monitoring to determine whether a cap has been reached or exceeded.

3.1.1 No Action Alternative

Status quo with continued management of protected species bycatch through established MMPA and ESA Federal processes.

3.1.2 Alternative 1

Under this alternative hard caps are established for high priority protected species, which are those listed in the Incidental Take Statement (ITS) in the May 2, 2013, Biological Opinion (BO) for the California DGN fishery.

The hard cap values are based on the estimated total amount of expected take listed in Table 12 in the BO.

There are two sub-options: 1) Fishing season (annual) hard caps are assessed based on total estimated M&SI from August 15 each year; and 2) Five-year hard caps are established. The determination of whether a five-year cap has been reached/exceeded would be based on estimated M&SI during the previous five years from the date of the observed take. Table 1 shows the resulting hard cap values under this alternative.

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[1] 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 Pacific Leatherback Conservation Area. Very little, if any, fishing activity occurs between May 1 and August 14.

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

Species	One Year Take Cap	Five Year Take 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

3.1.3 Alternative 2

Under this alternative hard caps are established for marine mammals with 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. 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.

Both one-year and five-year cap sub-options are included in this alternative. For the five-year PBR-based hard caps annual PBR values are multiplied by five. Table 2 shows the take cap values for this alternative. Composite hard cap values for dolphins and pinnipeds would be based on summing the PBR values for the constituent stocks. Table 3 shows the constituent stocks and their PBR values for these two composite hard caps

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

Species	One-Year Take Cap	Five-Year Take 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 3. PBR values 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

3.1.4 Alternative 3

Hard caps are established 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. A jeopardy determination is made on a case-by-case basis. If actual estimated takes exceed the expected take levels listed in the ITS, consultation under section 7 of the ESA is reinitiated. Through that process the jeopardy determination is made. There is no guidance about 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 somewhat arbitrarily based on estimated fishery M&SI for marine mammals and values slightly above the expected take listed in the BO.

Both one-year and five-year cap sub-options are included in this alternative. Table 4 shows the hard cap values under this alternative.

Table 4. One and five year hard cap values for Alternative 3.

Species:	One-Year Take Cap	Five-Year Take 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

3.1.5 Alternative 4 (Preliminary Preferred Alternative)

Hard caps are established for high priority protected species and marine mammal species with an annual fishery M&SI of greater than or equal to 10% 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% of PBR; however, the PBR, 4.6 animals, is low. Marine mammals, where annual fishery M&SI exceeds 10% of PBR, were identified based on information provided in Appendix 3 to the 2013 Pacific Marine Mammal Stock Assessment Report. Table 5 shows reported PBR and fishery M&SI values for these stocks. It should be noted that fishery M&SI takes into account the effect of all fisheries, not just the DGN fishery. Therefore, in some cases fishery M&SI is higher than M&SI caused by 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 is used for the hard cap values.

This alternative only includes the one-year cap sub-option. Table 6 shows the one-year hard cap values based on the criteria used for the PPA.

Table 5. Information from the 2013 Pacific Stock Assessment Report for stocks where annual fishery M&SI is greater than or equal to 10% 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 6. Hard cap values for Alternative 4 (PPA)

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

*Fishery SI / M ≥ 10% PBR, see Table 5.

3.2 Implementation Issues

3.2.1 Determining M&SI Inseason

The PPA proposes to base hard caps on M&SI. In Agenda Item I.4.b, Supplemental NMFS Report, September 2014, NMFS points out that assessing M&SI inseason "may not be feasible given the current NMFS process under the MMPA for making these determinations. NMFS has an extensive and multi-step review process for distinguishing marine mammal serious injuries from non-serious injuries; the process takes several months to complete and occurs at the end of each calendar year after all of the data has been submitted and verified." This process stems from a national policy for distinguishing serious from non-serious injury that NMFS implemented in 2012. The policy involves the following seven steps: (1) initial injury determination, (2) Determination Staff Working Group (comprising NMFS Science Center staff) information exchange, (3) NMFS Regional Office review, (4) report preparation, (5) NMFS Scientific Review Group review, (6) report clearance (within each Science Center), and (7) inclusion of injury determinations in the annual SAR and marine mammal conservation management regimes. This process normally occurs only annually. A different process would have to be developed in order to make a more timely determination.

The False Killer Whale Take Reduction Plan (FKWTRP) offers an example of a closure triggered by a take cap. It was developed to reduce the risk of the Hawaii-based longline fisheries to false killer whales and implemented a deep-set longline fishery closed area for varying periods of time. This is the Southern Exclusion Zone (SEZ), an area within the US EEZ south of the Hawaiian Islands, which is triggered by an M&SI cap for false killer whales. An expedited process for species identification and M&SI determination for false killer whales *only* was implemented as a non-regulatory measure (see 77 FR 71260) in order to make this measure feasible.

In order to close the SEZ in response to a trigger (M&SI cap of false killer whales), a fast-track process was developed by NMFS in response to recommendations made by the False Killer Whale Take Reduction Team (FKWTRT) that involves prioritizing observer debriefings, shortening periods for determinations, and concurrent review. A May 29, 2013, presentation to the FKWTRT outlined the allotted time periods for each step in the fast track process. According to the presentation, the period of time between an observer debriefing to transmitting the determination to the NMFS Pacific Islands Regional Office is 25 business days, although in a real-world example provided in this presentation it took only 19 business days. Once PIRO receives an M&SI determination that would trigger a closure, it takes an additional 15-20 business days to promulgate the temporary rule for the closure. The FKWTRP regulations stipulate that the published closure date must be more than seven calendar days but less than 15 calendar days from the date on which the temporary rule is available for public inspection (which is usually the day before a regulation would publish in the Federal Register).

Considering all of these timelines, there is at least a month-and-a-half lag from when an observer is debriefed until the closure goes into effect. Additional time is added between when the take occurs and the observer is debriefed. It would be necessary to consider whether regulations would specify that whenever a take of a species subject to a cap is observed the vessel must immediately return to port; otherwise the time allotted to the balance of that fishing trip would be added to the time lag.

The PPA proposes M&SI hard caps for sea turtles in addition to marine mammals. The current NMFS M&SI determination policy only applies to marine mammals. Because currently there is no equivalent process for differentiating non-serious from serious injury for sea turtles one would have to be developed to implement the PPA. This should be considered when discussing implementation timelines.

Hard caps based on takes rather than M&SI would be easier to implement. Take is defined slightly differently in the ESA and MSA but, generally, any interaction between a protected species and fishing gear is considered a take. For this reason, determining when a take has occurred is relatively straightforward and could be made by an observer in the moment. If the intent of using

M&SI is to recognize that mortality (whether immediate or post release) is a much more consequential effect, hard caps could be formulated using mortality rate estimates so that estimated takes correspond to the desired mortality limit. However, for some species mortality rate estimates are based on small sample sizes and thus may not be accurate.

3.2.2 Expanding Observed Interactions (Takes or M&SI) to Estimated Total Interactions

Take caps under all the alternatives are specified as total takes or M&SI. If all interactions are not observed (either through 100% observer coverage or some combination of observer coverage and EM) observed interactions will have to be expanded to total interactions based on the observer coverage rate. Observer coverage rates vary between and within fishing seasons. This makes it somewhat difficult to determine the actual observer coverage rate at the moment an interaction occurs, because current effort is determined based on the vessel operator contacting the observer contractor once he returns to port. These estimates may be imprecise if the contractor is not contacted after every trip. The observer program currently estimates an observer coverage rate for the season by reconciling the contractor information with other data sources such as logbooks. (Logbook data have a longer time lag, because there is a 30-day grace period for submitting them after trips are completed.) Complete reconciliation occurs after the fishing season ends.

The SEZ trigger, discussed in the false killer whale example above, is specified in terms of observed takes (with an assumed percentage of observer coverage), which can be more directly determined in near real time.[2] However, a conversion from actual M&SI to the observed M&SI trigger is still necessary, because a goal of the FKWTRP is to reduce total fishery M&SI below PBR. To compute the observed M&SI trigger an observer rate of 20% is applied.

Using such a generalized observer coverage rate in the DGN fishery is more problematic for a number of reasons. In general, observer coverage is more constant in the Hawaii deep-set longline fishery (the fishery subject to the SEZ closure) compared to the DGN fishery. Vessels generally fish fulltime in the longline fishery while DGN vessels move in and out of other fisheries such as albacore troll, seabass, and Dungeness crab. If fishing is good in one of those fisheries effort may decline in the DGN fishery, potentially increasing the observer coverage rate. Changing environmental conditions have a similar effect on participation so that the resulting observer coverage rate can change substantially during a fishing season. Finally, in recent years fishing effort has been relatively low in the DGN fishery compared to historic levels. This means a small change in observed fishing effort has a potentially big effect on the observer coverage rate if unobserved effort does not change commensurately. For example, in the 2014/15 season an increase or decrease of just four observed sets would have changed the coverage rate by one percent.

With partial monitoring, in most cases the one-year hard caps under consideration would result in a fishery closure if one take/M&SI is observed, particularly given the practice of rounding up to

[2] The FKWTRP proposed rule notice (76 FR 42082) notes "Using observed incidental M&SI would allow for realtime management of the SEZ to prevent incidental M&SI from exceeding PBR, rather than waiting until the end of the year for extrapolated M&SI estimates, by which time PBR might be exceeded."

the next whole number when expanding observed takes/M&SI to estimated total takes/M&SI. This is illustrated in the table below. Under the PPA, except for short-fin pilot whale and common bottlenose dolphin, the hard caps are set at either two or three total takes. With observer coverage rates below 50% the fishery would close upon a single observed take/M&SI of species with a hard cap of three or less. For species with a hard cap of one, the fishery would close upon a single observed take/M&SI unless there is 100% monitoring.

Table 7. Estimated total take/M&SI from one observed take/M&SI at different observer coverage rates.

Observe Coverage Rate	Expanded Take/M&SI Estimate from One Observed Take/M&SI
20%	5
25%	4
34%	3
50%	2
100%	1

NMFS faced a similar problem in implementing the SEZ closure trigger in the FKWTRP. As noted in the final rule:

> We recognized that, given the PBR of 2.5, even a single observed mortality or serious injury in a year (which extrapolates to 5 M&SI at 20 percent observer coverage) would be double the PBR value. Therefore, we proposed to manage M&SI across a longer time frame. We calculated that allowable level of M&SI across five years (i.e., five times PBR), converted this number to allowable observed M&SI across five years (by multiplying by the observer coverage level), and rounded down to the nearest whole number. We proposed this value as an "initial" trigger, thereby "front-loading" five years' worth of M&SI into a single year. If the initial trigger was met within a given year, the SEZ would be closed for the remainder of the year. Then, if a single additional mortality or serious injury was observed in any of the following four years of that five-year timeframe, the 5-year PBR would be exceeded, so the SEZ would again be closed, until reopened by NMFS. (Federal Register Volume 77, No. 230, pages 71266-71267, November 29, 2012)

The Council may wish to consider a similar methodology for implementing one-year hard caps for the DGN fishery.[3]

3.2.3 Future Adjustment of Hard Caps

The numerical values upon which the proposed hard caps are based, ITS numbers or PBR, will change over time. A new ITS is developed when ESA Section 7 consultation is reinitiated for the fishery. Section XI in the May 2, 2013, DGN fishery Biological Opinion lists the standard set of circumstances that would trigger reinitiation. These are 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may affect listed species

[3] As discussed above, application of hard caps would be aligned with the fishing season (May 1-January 31)

or critical habitat in a manner or to an extent not considered in this Opinion; 3) the agency action is modified in a manner that causes an effect to listed species or critical habitat not considered in this Opinion; or 4) a new species is listed or critical habitat is designated that maybe affected by the action. Even the Council's current proposed action could trigger reinitiation based on criterion 3 above, which may change the ITS.

Marine mammal stock assessments are revised on a periodic basis. For example, the 2014 Draft Pacific Marine Mammal Stock Assessment Report contains revised assessments for 11 stocks.

The alternatives do not specify whether and how the hard cap values will be changed when a new ITS is issued or revised marine mammal stock assessments are published. The Council should confirm its intent that hard caps should be changed in step with changes in the underlying values.

For hard caps based on the ITS resulting changes in the hard caps could result in a perverse incentive. As has been noted in previous HMSMT reports, incidental take is not biologically based; it is simply an estimate of the number of anticipated takes that may occur in the fishery. The Biological Opinion then reports a determination of whether the estimated level of take jeopardizes the continued existence of the listed species. If takes decline in the DGN fishery because of the management measures the Council is considering, the hard cap values would decline as well. At the same time various factors beyond the control of DGN fishermen could conspire to make takes more likely. This could result if the overall population abundance or local abundance of a hard cap species increases. DGN fishermen would face being penalized even if they responded to hard caps by making operational changes that reduced target species CPUE and resulting revenues from the fishery. There would also be a perverse incentive for fishermen to achieve a minimal level of takes for species with ITS-based caps to avoid having the future level of the cap approaching an unattainable level due to a shrinking baseline.

3.3 Fishery Performance under the Alternatives

A bootstrap simulation methodology has been developed to analyze and compare the DGN hard caps alternatives under consideration by the Council. The objective is to use recent DGN effort, observer records of marine mammal and turtle bycatch, retained finfish catch, prices and costs data to simulate the operation of the DGN fishery under hard caps. The results allow comparison of conservation and economic risks under the various alternatives. A choice between alternatives will involve tradeoffs between potentially lower bycatch levels and a risk of lost production, revenues, and profitability. More restrictive caps may reduce conservation risk but may also increase economic risk, due to a heightened chance of triggering a cap early in the season, eliminating potential fishing effort.

Data sources used for the analysis include CDFW logbook data since 2001 to characterize the recent distribution of annual effort per vessel, set-level DGN observer retained finfish catch and bycatch M&SI counts since 2001 for simulation of set-level retained catch and bycatch counts, California Fisheries Information System landings database to estimate price per fish for retained market species catch, and SWFSC cost and earnings survey data to estimate average variable cost per set and average fixed cost per season.

The simulation results reported below were produced under the assumption that caps are limits on annual numbers of M&SI. Counts applied against the caps were based on an expansion estimator of bycatch assuming 30% of effort was observed, and that real-time status determination would enable the fishery to shut down at the point a bycatch cap was reached. Twenty active vessels were assumed to fish, representing actual recent levels of fishery participation. The results are summarized for 10,000 simulated seasons.

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 profits (Total Profits), average profit per vessel (Average Profits), and interaction 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 of simulation results (Q5, Q25, Q50, Q75 and Q95), followed by the mean and standard deviation (standard error) of simulation results.

Table 8 compares simulation results for the No Action alternative to the PPA, based on results for all observer data from the inception of the NMFS observer program in 1990 to the present. Using post-2000 data is arguably more appropriate to characterize recent operation of the fishery. However many of the species proposed for hard caps (e.g., green turtles) have no observed mortalities or serious injuries in the post-2000 data, which could either reflect a drop in bycatch rates or insufficient data to characterize long-term rates of interactions for rare event bycatch species. Due to a lack of conclusive evidence on this question, both sets of results are provided.

A small improvement in bycatch performance is seen between the No Action and Preliminary Preferred alternative, in the form of slightly lower bycatch M&SI rates for some species (e.g. leatherback turtle decline in mean from 0.24 to 0.20) and a decrease in the seventy-fifth percentile of M&SI for sperm whale, reflecting slightly lower sperm whale bycatch risk. However, none of the other bycatch percentiles showed any decrease; in particular, all of Q5, Q25 and Q50 were already at levels of zero without caps.

The major difference between the No Action Alternative and the PPA is a substantial decline in economic performance in terms of lower mean production (total revenues) and profitability (both total and average profits) accompanied by a large increase in risk (larger standard deviations of results). This decline in economic performance reflects the decrease in the mean number of sets that can be fished and the increase in the standard deviation of effort when the fishery is managed under one-year caps. Effort over the remainder of the season which would have been allowed after a bycatch incident under the No Action Alternative is generally disallowed under Alternative 4 due to reaching a one-year hard cap.

Table 9 provides comparable results for simulations with the observer data limited to the 2001-02 fishing season and later years. The results based on observer data for the 2001-02 fishing season and later years are less pessimistic in terms of economic and bycatch performance. Nonzero bycatch only appears in the simulation results for sperm whales, short-fin pilot whales, and bottlenose dolphin, as there were no mortalities or serious injuries in the observer data for 2001-

02 and later years for the other species. A slight decrease in mean sperm whale M&SI resulted due to applying 1-year hard caps under the PPA; other effects on bycatch results were negligible.

Results based on post-2000 observer data show a similar loss of total revenues, total profits, and average profits results due to moving from the No Action to the PPA as do the results based on all observer data. The effects are less pronounced due to higher average revenues per set based on post-2000 catch rates and a smaller risk of hitting a hard cap, because of the number of species with no post-2000 observed mortalities or serious injuries.

Additional analysis will compare the operation of Alternatives 1-3 with one-year and five-year hard caps, and will examine a range of scenarios for different levels of observer coverage and numbers of active vessels. These results will be provided in a Supplemental HMSMT Report.

Table 8. Bootstrap simulation results for No Action and Preliminary Preferred Alternative (Alternative 4) based on all observer data since the 1990-91 fishing season.

	No Action: No Caps						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	389	477	542	610	712	545	99
Total Revenues	$481,336	$595,802	$682,340	$771,174	$910,365	$687,173	$130,238
Total Profits	-$40,523	$17,654	$62,194	$109,897	$183,112	$65,629	$68,077
Average Profits	-$2,026	$883	$3,110	$5,495	$9,156	$3,281	$3,404
Leatherback Turtles	0	0	0	0	1	0.24	0.49
Loggerhead Turtles	0	0	0	1	1	0.32	0.57
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	1	0.08	0.29
Fin Whales	0	0	0	0	1	0.08	0.28
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	1	2	0.41	0.77
Short-fin Pilot Whales	0	0	0	1	2	0.41	0.64
Bottlenose Dolphins	0	0	0	0	1	0.08	0.29
	Alternative 4: 1-year Caps, 30% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	74	403	503	582	693	465	179
Total Revenues	$57,442	$498,213	$628,398	$734,583	$883,441	$577,177	$240,257
Total Profits	-$236,428	-$32,715	$35,441	$90,057	$168,176	$10,869	$120,264
Average Profits	-$11,821	-$1,636	$1,772	$4,503	$8,409	$543	$6,013
Leatherback Turtles	0	0	0	0	1	0.20	0.44
Loggerhead Turtles	0	0	0	1	1	0.30	0.53
Olive Ridley Turtles	0	0	0	0	0	0.00	0.00
Green Turtles	0	0	0	0	1	0.07	0.27
Fin Whales	0	0	0	0	1	0.06	0.25
Humpback Whales	0	0	0	0	0	0.00	0.00
Sperm Whales	0	0	0	0	2	0.32	0.67
Short-fin Pilot Whales	0	0	0	1	2	0.38	0.62
Bottlenose Dolphins	0	0	0	0	1	0.07	0.27

Table 9. Bootstrap simulation results for No Action and Preliminary Preferred Alternative (Alternative 4) based on observer data for 2001-02 and later fishing seasons.

	No Action: No Caps						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	389	477	542	610	712	545	99
Total Profits	$528,782	$653,450	$750,306	$848,369	$998,649	$755,073	$142,761
Total Revenues	$9,119	$77,655	$129,902	$185,352	$268,404	$133,529	$79,753
Average Profits	$456	$3,883	$6,495	$9,268	$13,420	$6,676	$3,988
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	0.43	0.93
Short-fin Pilot Whales	0	0	0	1	2	0.64	0.81
Bottlenose Dolphins	0	0	0	0	1	0.22	0.47
	Alternative 4: 1-year Caps, 30% Observed						
	Q5	Q25	Q50	Q75	Q95	Mean	StdDev
Sets	365	466	534	603	705	531	115
Total Profits	$491,804	$638,556	$738,601	$836,691	$987,937	$732,865	$167,997
Total Revenues	-$13,172	$68,596	$122,935	$178,544	$263,065	$120,999	$93,169
Average Profits	-$659	$3,430	$6,147	$8,927	$13,153	$6,050	$4,658
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	0.41	0.89
Short-fin Pilot Whales	0	0	0	1	2	0.64	0.80
Bottlenose Dolphins	0	0	0	0	1	0.22	0.47

4 Performance Objectives

4.1 Range of Alternatives for Performance Objectives

Performance objectives are not hard caps. The Council would review fishery performance in relation to the objectives after the end of each fishing season (January 31) and determine what, if any, additional management measures are needed. The alternatives are based on recommendations from the HMSMT and public comment, and Council action.

Bycatch is defined in the MSA as "fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards." In discussing bycatch it is important to distinguish between the common use of the term bycatch to mean fish which are not targeted in a fishery but may be retained and sold or kept, and the MSA definition, which, in practical terms, applies to fish that are discarded (usually at sea at the time of harvest).

4.1.1 No Action

Do not establish performance objectives for the DGN fishery.

4.1.2 Alternative 1

A performance objective for total finfish bycatch is calculated as landed catch during the baseline period divided by total catch (retained catch plus alive/dead/unknown discards) during the baseline period. Table 10, below, shows calculated values for the performance objective proposed under this alternative. Note that observer data reports number of animals, so the metric is based on this unit also.

4.1.3 Alternative 2

A performance objective for total finfish bycatch is calculated as landed catch during the baseline period divided by total catch mortality (retained catch plus dead/unknown discards) during the baseline period. Table 10, below, shows calculated values for the performance objective proposed under this alternative.

Table 10. Performance objectives for finfish bycatch 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.

4.1.4 Alternative 3

Performance objectives are established for selected bycatch species and/or set targets for groups of species as shown in Table 11. The performance objectives 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 objective values are taken from the August 8, 2014, public comment letter from Oceana, included in Agenda Item G.4.c, Public Comment, September 2014.

Table 11. Performance objectives based on Oceana public comment, September 2014 Council meeting.

Species/Species Group	Performance Objective	
	# 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

4.1.5 Alternative 4 (Preliminary Preferred Alternative)

Performance objectives for non-ESA-listed marine mammals are included in the PPA. The performance objective is defined as observed M&SI. These objectives are based on the 10-year maximum observed interactions (in any one season) over the 10 fishing seasons, 2004-05 through 2013-14. As discussed above with respect to hard caps, observed takes vary with respect to actual maximum takes in any one season because observer coverage has varied from one fishing season to the next. When observer coverage is relatively lower the actual take level could be higher and by the same token when the observer coverage rate is higher then the actual take level could be relatively lower. This means that the observed maximum take level during this period could have occurred in a different year than the true maximum take level. In

Table 12 below the HMSMT provides the expanded values based on observer coverage rates for each fishing season during the 10-year period. As discussed above, without 100% monitoring, these total take estimates would need to be converted back to an observed take level based on the observer coverage rate at the time that the take occurred.

These objectives could be lowered in future years (noting that objectives cannot be less than zero).

Table 12. Performance objectives under Alternative 4 (PPA).

Species	Annual performance objective based on maximum annual observed take	Annual performance objectives based on estimated total 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

The PPA does not include performance objectives for finfish but the Council may adopt such objectives when taking final action.

4.2 Impacts of the Performance Objective Alternatives

The effects of the performance objectives on the fishery cannot be determined, because the Council has not yet specified the consequences of one or more performance objectives being exceeded.

Most of the implementation issues discussed above for hard caps would need to be considered with respect to performance objectives.

Overall bycatch reduction, independent of the effect of fishing mortality on stock status, may be seen as a social objective to minimize waste. Protected species, to the degree that their existence alone has greater social value, may be similarly privileged beyond the effect of mortality on population status. However, if the primary objective of the proposed action is to balance the tradeoff between the economic benefits of the activity and its environmental impact, then fishing mortality relative to stock status is the more salient objective.

As with hard caps the issues of taking into account observer coverage levels both in determining performance objective values and determining fishery performance need to be considered. Since a performance objective is not tied to fishery closure, the need to compute bycatch rates or take levels in real time is less of an issue, however. The Council also needs to consider whether to adjust performance objective values in the future when new information becomes available. The same issue of a "shifting baseline" where bycatch reduction could lead to more stringent performance objectives would need to be considered.

In order to provide context for considering performance standards for finfish, Table 13 compares finfish retention rates for groundfish in groundfish fisheries to the DGN fishery as presented in Table 10. The retention rate is the ratio of retained or landed catch to total catch and is the inverse of the bycatch rate. It is the statistic proposed under Alternative 1. The table shows the minimum maximum, and median values for each species' retention rate. It also shows the average of the retention rates and the retention rate for total catch. The groundfish data are reported by weight while, as noted, DGN observer data reports number of animals. This difference has less effect when considering retention rates for individual species but could have a greater effect on the total rate depending on the range of sizes of individual animals among the species caught in each fishery. There is also a big difference in the total volume of discards between the two fisheries. For groundfish total discards averaged 8,473 mt per year, 2002-2012. The DGN fishery discarded an average of 11,934 individual animals per year, according to Table 10, which is a considerably smaller value if expressed in weight. In absolute terms this represents a smaller impact.

Table 13. Comparison of finfish retention rates in groundfish fisheries* compared to the DGN fishery. (Sources: groundfish – West Coast Groundfish Observer Program Multi-Year Data Product, 2002-2012; DGN - Table 10.)

Statistic	Groundfish (n = 109)†	DGN (n = 17)
Min	0.0%	0.0%
Max	100.0%	97.1%
Median	72.2%	51.0%
Average of rates	58.9%	51.8%
Total rate	96.3%	36.3%

*Nearshore fixed gear, non-nearshore fixed gear, nontribal at-sea hake, shoreside hake, tribal at-sea hake, tribal shoreside, limited entry trawl permit - trawl gear, limited entry trawl permit - fixed gear.

†n – number of species for which retention rates are computed.

5 Fishery Monitoring

5.1 Range of Alternatives for Fishery Monitoring

The Council adopted the range of alternatives, including a PPA, in September 2014 and narrowed the range in November 2014.

Under all these alternatives, prior to each fishing year, NMFS would inform the Council of the level of observer coverage and/or electronic monitoring (EM) that NMFS would be able to fund. The balance of the costs associated with observer coverage/EM requirements would be non-government funded.

5.1.1 No Action

Maintain the current 30% target observer coverage level.

5.1.2 Alternative 1

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

5.1.3 Alternative 2

Maintain a minimum of 50% observer coverage level, remove the unobservable vessel exemption, and allow individual vessels the flexibility to contract with an approved observer provider company.

5.1.4 Alternative 3 (Preliminary Preferred Alternative)

Maintain the 30% target observer coverage level and/or require EM (for the purpose of catch and bycatch accounting) but remove the unobservable vessel exemption. Achieve 100% monitoring by 2018.

5.2 Impacts of the Fishery Monitoring Alternatives

Observer funding is allocated to the West Coast Regional Office (WCRO) who manages observers for west coast fisheries through the NMFS National Observer Program (NOP). NOP funds have been fully earmarked in 2015 to meet the objective of maintaining 30% coverage in the DGN fishery, as well as 100% coverage for one longline vessel operating outside the West Coast EEZ. Future funding levels are uncertain. In circumstances where federal resources are insufficient to meet fishery monitoring needs the shortfall can be made up through private resources. Private fishery monitoring providers can be contracted to provide observers trained by NMFS, but with the costs paid by fishers, NGOs, or other stakeholders. There are multiple private companies who have provided observers to NMFS in the past. The costs of their observers are variable, ranging from approximately $500/day and upwards. This is comparable to costs for US west coast groundfish shorebased IFQ fishery, which pays for 100% private observer coverage at approximately $500/day. The WCRO indicates that seven days of DGN fishing would likely require 10 days of observer time to account for fishing time as well as travel between ports and fishing grounds and other fishing trip related demands. Commercial fishers experienced in the west coast swordfish fishery have projected the need for a minimum of $1000/day gross revenue to cover the typical fixed (crew, permits, etc.) and variable costs (fuel, maintenance, etc.) of fishing operations, without paying observers. Fishers would need to increase their revenue to cover any additional monitoring costs.

If observer coverage requirements increase above the current 30% rate in the DGN fishery, there are options for how administration of this could be shared between NMFS and private sources. For simplicity, an example will be used where coverage requirements are raised to 100% in the DGN fishery. On any given trip the cost of the observer could either be covered entirely by NMFS or private sources, in which case observer coverage on approximately one-third of trips would be paid by NMFS and private funding would be required for approximately two-thirds of the trips. Alternatively, a co-pay arrangement could be reached where NMFS and operators divide the observer costs of each observed DGN trip, with 30% of the cost being covered by NMFS and 70% by the operator. It is worth noting that the cost of fishery monitoring includes the cost of the observer’s time as well as the overhead of running the observer program, which includes training, data entry, and other administrative functions. Another cost sharing arrangement could be for NMFS to cover the cost of overhead, while the operators pay for the actual time of the observers.

In the future, electronic monitoring (EM) could supplement or even replace human observers. However, EM is still in the experimental stage where performance testing of different systems is needed. NMFS is looking into funding sources for testing EM in 2016 and 2017, with academia, NGO’s and industry also currently pursuing EM trials.

The HMSMT discussed the potential impact of requiring industry to pay for observer costs at their February 4-6, 2015 meeting. An analysis based on retained market species catch counts in post-

2001 DGN observer data was used in combination with recent average prices paid per fish in CDFW landings data to produce an estimate of $1,400 in revenue per set of DGN fishing effort. Results of a recent cost and earnings survey of the DGN fleet showed average costs per set of about $700, implying average variable profits of about $700 per set under status quo management. Based on the assumptions of estimated observer costs of $500 per day and ten required observer days per seven days of fishing[4], average observer costs per set of fishing would be slightly higher than $700. Hence a move to 100% observer coverage with all (70%) of additional costs borne by industry would reduce variable profits per set by about 50% to $350.

Electronic monitoring (EM) may be deployed if proven successful in the DGN fleet. NMFS plans to test DGN EM in 2016 and 2017, dependent on available funding. Costs of potential future EM implementation are unknown at this time. It is also unclear who would pay for EM in the DGN fleet. As part of its Electronic Technologies Initiative, NMFS is working to develop further information on how EM costs will be shared between NMFS and industry.

6 A comparison of bycatch and economic metrics across U.S. fisheries targeting or retaining swordfish

At its February 4-6 meeting in La Jolla, California, the HMSMT heard a presentation from Dr. Heidi Dewar on the results of a study comparing bycatch metrics for a U.S. fisheries catching swordfish. The study authors are Heidi Gjertsen (SWFSC contractor), Stephen Stohs (SWFSC), Heidi Dewar (SWFSC), Craig Heberer (NMFS WCR), Chugey Sepulveda (PIER) and Scott Aalbers (PIER). The authors intend to publish the results in a peer reviewed journal in the near future. Dr. Dewar's presentation updated preliminary results of this study presented to the HMSMT in May 2013 and summarized in an appendix to Agenda Item E.2.b, Supplemental HMSMT Report, June 2014.

Four metrics were developed to compare these fisheries in terms of protected species bycatch, economic performance, and catch volume. Metrics were computed for the eight fisheries shown in Table 14. Table 15 shows a summary comparison of the fisheries the four metrics presented in the study. Reading columns from left to right the metrics are: the ratio of landings to high priority protected species takes, the ratio of landings to total protected species take, the ratio of dollar profits to landings, and average landings per vessel. To make interpretation of the results easier, the cells within each column are shaded from green to red to provide a visual scale of more versus less desirable results.

[4] Lyle Enriquez, personal communication

Table 14. Fisheries evaluated in the study showing the years for which data were obtained, the primary target species (S-swordfish, T-tuna), and fleet size.

Fishery	Years	Target	Fleet size
California Drift Gillnet (CA DGN)*	2001-2012	S	17-68
California deep-set longline (CA DSLL)	2005-2011	T	1
California harpoon (CA HPN)*	1995-2011	S	9-40
Hawaii shallow-set longline (HI SSLL)*	2005-2012	S	18-35
Hawaii deep-set longline (HI DSLL)	2005-2012	T	122-129
Atlantic pelagic longline ATL LL	2005-2012	S / T	106-120
Atlantic buoy gear (ATL BG)*	2007-2012	S	42-57
Historic California shallow-set longline (CA SSLL)†	2001-2004	S	23-40

*Landings in these fisheries show a declining trend over the sample years.
†This fishery was closed in 2004. When operational it did not use circle hooks and mackerel type bait as is the practice in the Hawaii shallow-set longline and Atlantic pelagic longline fisheries today.

Developing a bycatch metric that results in a reasonable comparison across fisheries is challenging, because of difference between how and where these fisheries operate. The mix of target and incidental finfish species and protected species vulnerable to being caught differs across these fisheries. The authors have not yet identified a metric for finfish bycatch but were able to develop a metric for protected species bycatch.

To assess protected species bycatch the authors decided to use a metric that aggregates protected species takes and ratios this against total landings. Because observer coverage varies across these fisheries, observed takes were expanded to estimated total, or expected takes. The protected species component is denominated in number of animals while landings are denominated in weight (metric tons). The ratio is thus total landings in metric tons divided by estimated total protected species takes in number of animals. Results are reported for both "high priority" protected species ESA-listed species or MMPA strategic stocks) and all protected species (which includes high priority species as well as all other marine mammals and sea birds). Because the metric places protected species in the denominator of the ratio, the results should be interpreted as metric tons of landings per protected species take (animal). Thus a higher value reflects greater benefits (landings) per protected species take.

The California deep-set longline fishery shows the best performance with 337 mt of landings per either high priority or total protected species take. (A single vessel comprises this fishery and only one protected species take has been documented.) At the other end of the scale, the Atlantic pelagic longline fishery has much lower landings per protected species take than the other fisheries. The California DGN fishery is intermediate in terms of performance; for example it has a more favorable ratio for high priority protected species takes compared to the Hawaii shallow-set longline fishery (130 versus 82) but does not perform as well when total protected species takes are compared (4.6 versus 16).

The economic metric is the ratio of profits in dollars to the weight (mt) of total landings. Profit estimates rely on cost-earnings surveys and other data. The California harpoon fishery shows negative profits, or economic loss. Obviously, a fisherman would not continue to operate beyond the short term under such conditions. This result may be at least partially explained by the limited data available for this fishery. Cost-earnings data were obtained during a period when swordfish were particularly unavailable to the fishery.[5] Atlantic buoy gear performs best under this metric while DGN ranks fourth out of the eight fisheries in the study.

Fishery volume is assessed by computing total landings per vessel. Higher volume may be considered a benefit in the sense that fewer vessels are needed to supply product to the market. The two segments of the Hawaii pelagic longline fishery perform best under this metric while California harpoon and Atlantic buoy gear are low volume fisheries. The DGN fishery is relatively low volume; it performs significantly better than harpoon and buoy gear but well below the pelagic longline fisheries.

Table 15. Comparison of swordfish fisheries across performance metrics.

Fishery	Mt_{total} / $take_{hp}$	Mt_{total} / $take_{total}$	Profits / mt_{total}	Mt_{total} / vessel
CA DGN	129.5	4.6	2.3	13
CA DSLL	337	337	0.6	48.1
CA HPN	N/A	N/A	-31.5	2.3
HI SSLL	81.9	16.1	1.7	54.9
HI DSLL	147.1	29.7	2.8	67.7
ATL LL	5.4	4.3	2.6	44.6
ATL BG	N/A	N/A	2.9	1.9
CA SSLL[#]	7.2	2.9	2	47.9

[#]Fishery closed in 2004.

These metrics should prove useful in developing its DGN monitoring and management plan, because one element of the plan is to explore alternative gear types for a west coast swordfish fishery. First, this study contextualizes the DGN fishery with regard to other swordfish target fisheries in U.S. waters. A crude way of assessing the relative benefits of the different fisheries is simply to rank them based on the sum of the metric values. From this perspective, DGN ranks fourth out of the eight fisheries. It is also intermediate in terms of the constituent metrics. Buoy gear performs well on all metrics except for production volume. This suggests that this gear type could be a good addition to a portfolio of gear types in the west coast swordfish fishery but a large number of vessels would be needed to deliver sufficient product to west coast markets to replace the volume landed by the DGN fishery. Pelagic longline gear preforms quite well; using the simple ranking technique described above, California deep-set longline fishery (currently just one vessel) the Hawaii deep-set longline fishery, and the Hawaii shallow-set longline fishery rank first, second, and third respectively. However, the Atlantic pelagic longline fishery (targeting both swordfish and tuna) fairs poorly, likely because of comparatively poor protected species bycatch

[5]The fishery relies on finding swordfish when they are basking at the surface during the daytime and in relative calm conditions. This behavior was not evident in recent years in the Southern California Bight.

performance. It should be noted that the Atlantic populations of these sea turtle species are less depleted than the corresponding Pacific populations. For that reason, a higher level of take is permitted under the ESA Section 7 process for the Atlantic pelagic longline fishery compared to west coast swordfish fisheries. This highlights an important caveat for comparing across fisheries in different regions: population status, and thus conservation concern, is likely to be different for the protected species encountered by a fishery.

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