A Review of the California Drift Gillnet Fishery

Prepared for the

By

SOUTHWICK ASSOCIATES

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Executive Summary

Drift gillnets (DGN) are often deployed in marine waters off the U.S. West Coast, primarily in federal waters adjacent to California, to harvest swordfish and other high-value food fish. This paper examines the economic characteristics and trends associated with the West coast DGN fishery and compares these trends and economic characteristics to other methods frequently used to harvest swordfish.

Several major points are seen:

1. Approximately 26 percent of Pacific swordfish are landed by DGN, with longlines accounting for the majority of west coast landings and deep-set buoy gear (DSBG) and harpoon accounting for 6 percent and 4 percent, respectively.
2. The revenue from DGN landings in 2017 was only 8 percent of the 1990 DGN landings.
3. Since 1990, the real, inflation-adjusted value of west coast swordfish landings in the DGN fishery has declined by more than ninety percent.
4. Of all methods used to harvest swordfish, drift gillnets have the highest rates of discarded bycatch. Over a period of approximately ten years, the DGN fishery average 64 % discarded bycatch.
    a. Deep-set buoy gear and harpoon have the lowest rates of discarded bycatch at 2 percent and 0 percent, respectively, while pelagic longlines have a 44 percent rate.
    b. The National Marine Fisheries Service (NMFS) estimates the DGN fishery's unintentional bycatch of ESA-listed and non-listed marine mammals and turtles, and in 2017, bycatch exceeded limits placed on the unintentional take of northern elephant seals, gray whales and hammerhead sharks.
5. Swordfish sold by the DGN fleet on average earned harvesters $3.37 per pound, while swordfish caught using deep-set buoy gear earned harvesters $6.65 per pound due to the ability of these fishermen to deliver a fresher, higher-quality product. If DGN fish were landed using deep-set buoy gear instead, the swordfish fishery's economic contributions to California would increase 18-19 percent, providing 42 additional jobs and $341,000 in additional state and local tax revenues.

These results are provided to help federal and state lawmakers better understand the impacts and alternatives associated with the drift gillnet fishery. All data and claims in this report are fully sourced and are available for review. The rest of this report describes the methods, data sources and results in greater detail.

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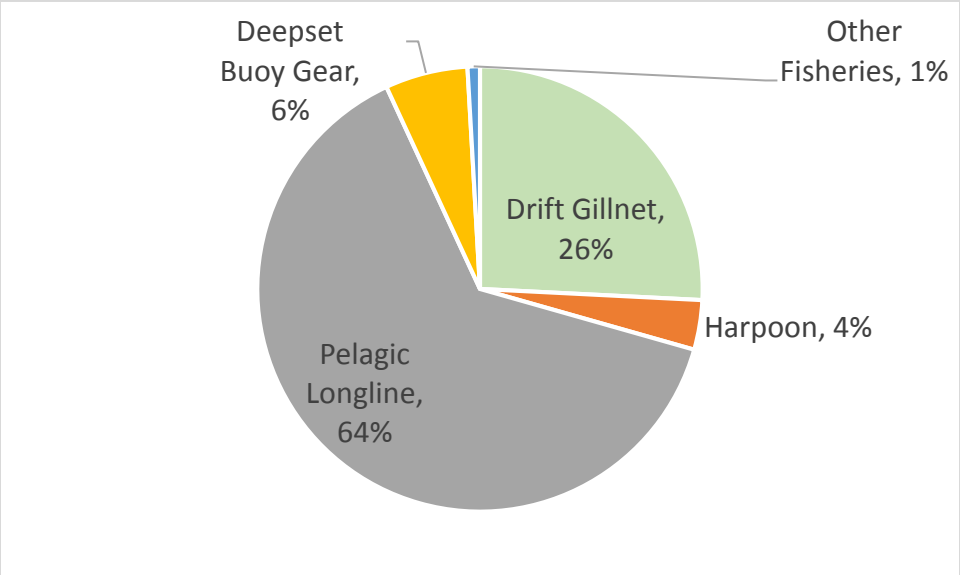
Background

Drift gillnets (DGN) emerged in California's swordfish fishery in the 1980's. Originally deployed as a means of catching large volumes of thresher sharks in the late 1970's, the rising market prices for swordfish resulted in a shift toward swordfish as the primary target species, hitting a high of 2,198 metric tons of swordfish landed by 228 DGN vessels in 1985. That same year, thresher shark landings were 1,000 metric tons. By 2017, DGN landings of both species had declined substantially with only 17 vessels landing 176 metric tons of swordfish and 39 metric tons of thresher sharks.[i]

Until 1990, the DGN fishery accounted for a majority of U. S. Pacific swordfish landings. Since then, longline fishing by Hawaii-based vessels has been the largest source of west coast U.S. swordfish landings. In 2017, the DGN fleet accounted for approximately one-quarter of swordfish vessels and landed approximately the same proportions in landed weight and ex-vessel value (Table 1). By weight, other swordfish fisheries include harpoon (4 percent), pelagic longlines (64 percent), deep-set buoy gear (6 percent) and other gear (1 percent).

Table 1. Share of Pacific swordfish landings, 2017.



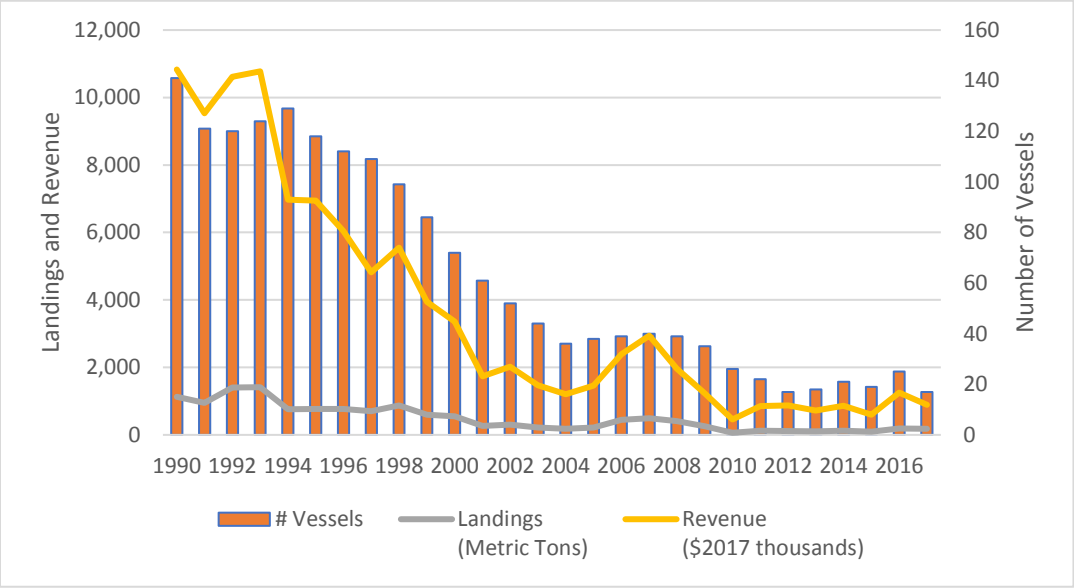
By 1990, when the National Marine Fisheries Service (NMFS) first placed observers on DGN vessels, the number of vessels dropped to 141 vessels, then down to a current low of 17 vessels in 2017 (Table 2). The DGN fleet effort in annual total vessel days has consistently declined from the all-time high of about 5,400 vessel days at sea per year in 1993 to about 510 days by 2015. The volume of west coast swordfish landings has similarly declined from a high of 1,413 metric tons in 1994 to an all-time low of 62 metric tons in 2010.

Since 2010, the landings have rebounded somewhat to 176 metric tons in 2017, though significant fluctuations occur from year to year. In inflation-adjusted terms ($2017), the value of the harvest peaked in 1990 at $10.8 million.

In 2017, the value of the harvest was $890,000[ii]. From 1993 to 2017, the average value earned per day of effort has dropped about 40 percent.

By 2017, total West coast swordfish landing revenues were only 8 percent of their 1990 levels, in inflation adjusted terms. The 2014 stock assessment of Pacific swordfish concluded that the Western and Central North Pacific stock is not currently overfished and is not fully exploited. It should be noted that the stock assessment indicates that the Eastern Pacific stock may have been overfished in recent years and the recent average harvest is not likely to be sustainable in the long term[iii].

Table 2. Number of vessels, landings and revenue in the West Coast drift gillnet fishery.



Source: Pacific Fishery Management Council, Stock Assessment and Fishery Evaluation documents. Available at https://www.pcouncil.org/highly-migratory-species/stock-assessment-and-fishery-evaluation-safe-documents/current-hms-safe-document/pacfin-data/

I. Bycatch

As with most commercial fisheries, the harvest of swordfish results in bycatch – the unintended capture of other species of fish as well as marine mammals, seabirds, and sea turtles. The disposition of the bycatch varies depending on several factors. Some species, although not the primary target, have commercial value and are kept and landed. The remaining bycatch is returned to the sea either dead or alive. Fish and other bycatch species returned alive may or may not survive depending on condition and species.

It is estimated that marine mammals and sea turtles unintentionally caught by the DGN fishery from 1990-2013 included: 4,110 dolphins; 2,138 seals and sea lions; 500 whales; and 306 sea turtles[iv]. In 2015, the Pacific Fishery Management Council (PFMC) set annual benchmarks for the DGN fishery for specified marine mammals that are not listed under the Endangered Species Act but have been observed entangled in the DGN fishery[v].

These limits are not part of the hard cap rule that was unanimously approved by the PFMC in September 2015, but withdrawn by NMFS.[vi] Currently, exceeding these limits does not trigger any specified management action. In the 2017/18 season, the DGN fishery exceeded the limits for several species of marine mammals[vii]:

- Northern elephant seals: limit = six versus estimated catch of 16.3
- Gray whales: limit = five versus estimated catch of 5.4
- Hammerhead sharks: limit = four versus estimated catch of 21.7

In response to the high rates of bycatch in the DGN fishery, managers have undertaken significant efforts to mitigate the problem through such means as: implementing time and area closures; requiring fishermen to attach acoustic pingers to their nets and lower their nets 36 feet below the surface; and requiring enhanced monitoring and other accountability measures.

As a result, bycatch has been reduced, however, still remains high in the DGN fishery relative to other commercial fisheries. In the 2017/18 DGN swordfish season, two-thirds of the more than 6,000 fish harvested by DGN vessels targeting swordfish were species other than swordfish (i.e., bycatch) (Table 3).

Over the past decade, the bycatch rate has been even higher. Please note that numerous species impacted as bycatch are important recreational species, frequently targeted by California recreational anglers (*marked in Table 3 with **).

Table 3. Bycatch in the swordfish DGN fishery, 2017/2018 season.

Species	Total Caught	Number Kept	Number Returned			Number Damaged
			Alive	Dead	Unknown	
Swordfish*	2,098	2,098	0	0	0	33
Striped Marlin*	11	0	0	11	0	0
Blue Marlin*	5	0	0	5	0	0
Bluefin Tuna*	352	98	0	255	0	0
Yellowfin Tuna*	27	27	0	0	0	0
Skipjack Tuna*	293	239	0	54	0	0
Pacific Bonito*	266	195	0	70	0	11
Common Thresher Shark	434	434	0	0	0	0
Bigeye Thresher Shark	27	5	0	22	0	0
Shortfin Mako Shark	222	211	0	11	0	0
Blue Shark	651	38	282	282	49	0
Salmon Shark	5	0	0	5	0	0
Smooth Hammerhead Shark	22	5	0	16	0	0
Unidentified Shark	5	0	0	0	5	0
Bat Ray	27	0	27	0	0	0
Pelagic Stingray	98	0	92	0	5	0
Louvar	5	5	0	0	0	0
Escolar	5	5	0	0	0	0
Pacific Hake	5	5	0	0	0	0
Pacific Mackerel*	5	0	0	5	0	0
Common Mola	1,095	0	1,068	22	5	0
Slender Mola	5	0	5	0	0	0
Opah	331	331	0	0	0	5
California Sea Lion	5	0	0	5	0	0
Northern Right Whale Dolphin	5	0	0	5	0	0
Short Beaked Common Dolphin	54	0	0	54	0	0
Northern Elephant Seal	16	0	0	11	5	0
Gray Whale	5	0	0	5	0	0
Total DGN Catch	**6,082**					
Bycatch	**3,984**	**1,599**	**1,475**	**840**	**70**	**16**
Bycatch rate	**66%**					

Source: Season total estimated from NMFS West Coast Region Observer Program Observed Catch - 2017/2018 Drift Gillnet Fishing Season May 1, 2017 through January 31, 2018[viii]. Observations represented 114 sets compared to total of 618 sets for the entire season.
**Represents fish species targeted by recreational anglers.*

Of the total bycatch, 40 percent was kept and landed and the remaining 60 percent were returned. Retention rates vary depending on regulations and landed value. The results in Table 3 also show the high variation in survivability across species. All Striped Marlin caught, a prohibited species, were

returned dead. Nearly 75 percent of the Bluefin Tuna, an important recreational species, was returned to the sea and all of those returned were dead. Less than 6% of Blue Sharks caught were kept and over 50% of returned Blue Sharks were dead.

Ideally, commercial harvesters would be able to deploy gear that effectively targets a specific species, causes little damage to fish that are caught, and has a very limited incidence of bycatch. Unfortunately, such gear does not exist for large-scale harvests and bycatch is a problem with all indiscriminate, large-scale gear types. Drift gillnets, however, typically have the highest rates of bycatch and discards of all gear types. Oceana has examined NOAA observer reports from roughly 2004 to 2014 to estimate overall bycatch rates for different gear types.

Over the period from 2004-2014, Oceana reports only 13 percent of the DGN catch was swordfish. The shallow-set longline gear performed better, with swordfish comprising 35 percent of the total catch from 2007 to 2013. Deep-set buoy gear (DSBG) trials in California resulted in a catch composition of 63 percent swordfish, and the commercially successful Atlantic buoy gear fishery has a catch rate of 90 percent swordfish. Notably, 98-100 percent of the harpoon catch is swordfish (Table 4). Over three years from 2015-2017, west coast trials of DSBG yielded an 86 percent swordfish catch rate, reaching a 93 percent catch rate in 2017[ix].

Table 4. Catch rates for swordfish and bycatch for different gear types in the swordfish fishery.

	Drift Gillnets	Pelagic Longlines	Deep-Set Buoy Gear	Harpoons
Swordfish	13%	35%	81%	100%
Retained bycatch	36%	56%	98%	100%
Discarded bycatch	64%	44%	2%	0%

Sources: Oceana, “Ensuring A Sustainable U.S. West Coast Swordfish Fishery: Benefits of Deep-Set Buoy Gear”, March 2017.

II. Alternative Harvest Methods Provide Greater Economic Returns

The drift gillnet (DGN) fishery has the highest discard rate of any of the commercial fisheries assessed. During a ten-year period from 2004 to 2014, the DGN fishery discarded 64 percent of its catch. Data show that commercial longline fisheries also have high discard rates, ranging from 44 percent to 51 percent. The California deep-set longline fishery's catch was comprised of 76 percent non-marketable species. The California DSBG trials revealed that only 6 percent of the catch was of non-marketable species and the harpoon fisheries are estimated to have a discard rate of zero[x]. After three years of trials, the DSBG fishery had reduced the non-marketable catch to two percent.

In addition to high discard rates, DGN typically result in lower quality, lower value swordfish than other harvest methods. By reducing the amount of time fish remain trapped within DGN before being properly handled and iced, other harvest methods such as DSBG provide better quality fish and, therefore, higher prices to fishermen using these alternative methods.

In 2017, swordfish harvested with DGN brought a landed price of $3.37 per pound while swordfish caught with DSBG brought a landed price of $6.65 per pound[xi]. The price differential is due mainly to the higher quality of fish caught with the DSBG because those fish are not weakened and degraded from being trapped at depth for extended periods of time as they are in gillnets.

With the 80 percent price premium for swordfish caught with DSBG, a shift in harvest would provide higher total value of the swordfish harvest. Assuming all DGN-caught swordfish were caught instead by DSBG, the total value of the 680.5 metric tons of fish landed in 2017 would increase from $3.9 million to $4.6 million (Table 5).

Table 5. Effect of shifting Drift Gillnet (DGN) harvests to Deep-set Buoy Gear (DSBG)

Fishery Type	$/lb	Ex-vessel Revenue	Ex-vessel Revenue After Reallocating DGN fish to DSBG
Drift Gillnet	3.37	$890,443	$-
Harpoon	7.78	$265,990	$265,990
Pelagic Longline	2.59	$2,271,864	$2,271,864
Deepset Buoy Gear	6.06	$408,874	$2,010,086
Other fisheries	5.79	$50,280	$50,280
Grand Total		**$3,887,451**	**$4,598,220**

In addition to increasing the revenue to harvesters, the higher value would translate into greater economic value for the entire seafood industry and the California economy. Table 6 shows the estimated economic contributions to the entire seafood industry from all swordfish harvest in 2017

compared to the expected economic contributions if all swordfish caught with DGN gear were instead caught with DSBG gear.

Due to the higher value of DSBG swordfish, the California economy would see an 18-19 percent increase in jobs, output, income, value-added and taxes from the swordfish fishery. Higher economic value in other fisheries currently caught as bycatch in DGN gear could also be derived based on the reduced levels of bycatch associated with transitioning swordfish effort away from DGN gear.

Table 6. Economic effect of shifting Drift Gillnet (DGN) landings of swordfish to Deep-set Buoy Gear (DSBG) landings

	Current Fleet	Without DGN	Increase	% Increase
Jobs	226	268	42	19%
Sales	$8,507,418	$10,071,216	$1,563,798	18%
Income	$12,295,387	$14,554,129	$2,258,742	18%
Value Added	$19,086,474	$22,581,804	$3,495,330	18%
State/Local Taxes	$1,852,577	$2,193,290	$340,713	18%
Federal Taxes	$1,887,992	$2,234,818	$346,826	18%

Footnotes & Citations

[i] NMFS Report on Highly Migratory Species (HMS) Activities, March 2018, available at: https://www.pcouncil.org/wp-content/uploads/2018/03/I1a_Sup_NMFS_Rpt3_Draft_Increased_Monitoring_Analysis_031218_Mar2018BB.pdf.

[ii] http://www.pcouncil.org/wp-content/uploads/HMS-SAFE-Table-12.htm

[iii] North Pacific Swordfish (Xipiaus gladius) Stock Assessment in 2014, Report of the Billfish Working Group. Western and Central Pacific Fisheries Commission, 2014. WCPFC-SC10-2014/ SA-WP-13.

[iv] Enticknap, Ben. "U.S. West Coast Swordfish Fishery Management How to Achieve Environmental Sustainability and Economic Profitability." November 2015. Available at http://www.pcouncil.org/wp-content/uploads/2015/11/G2b_Sup_Public_Comment3_ELECTRONIC_ONLY_Nov2015BB.pdf

[v] Pacific Fishery Management Council. "Highly Migratory Species Management Team Report On Performance Metrics For The 2017/2018 California/Oregon Large-Mesh Drift Gillnet Fishery. June 2018. Available at https://www.pcouncil.org/wp-content/uploads/2018/05/G3a_HMSMT_Rpt1-DGN_Performance_Metrics_JUN2018BB.pdf

[vi] Available from: https://www.federalregister.gov/documents/2017/06/12/2017-12070/fisheries-off-west-coast-states-highly-migratory-fisheries-california-drift-gillnet-fishery

[vii] NMFS Report On Highly Migratory Species (HMS) Activities, March 2018, available at https://www.pcouncil.org/wp-content/uploads/2018/03/I1a_Sup_NMFS_Rpt3_Draft_Increased_Monitoring_Analysis_031218_Mar2018BB.pdf.

[viii] Available from: http://www.westcoast.fisheries.noaa.gov/publications/fishery_management/swr_observer_program/drift_gillnet_catch_summaries/observeddgncatch2017-2018.pdf

[ix] Sepulveda, Chugey and Scott Aalbers. 2015-2017 PIER Deep-Set Buoy Gear EFP Summary-June, 2018, 2015-2017 EFP findings Ongoing and proposed research. Available at https://www.pcouncil.org/wp-content/uploads/2018/06/G4b_Supp_PublicPresentation1_Sepulveda-_HMS_JUNE2018BB..pdf

[x] For the experimental fisheries (deep-set longlines and deep-set buoy gear) nonmarketable species have been used as a proxy for discards because non-marketable species have no economic value and are likely to be discarded.

[xi] Pacific Fishery Management Council, Landings of swordfish by fishery, 2008-2017, June 2018. Available at https://www.pcouncil.org/wp-content/uploads/2018/05/G7_Att2_Landings_of_swordfish_2008-2017_Jun2018BB.pdf