



ENSURING A SUSTAINABLE U.S. WEST COAST SWORDFISH FISHERY:

Benefits of Deep-Set Buoy Gear

Buoy Gear Design

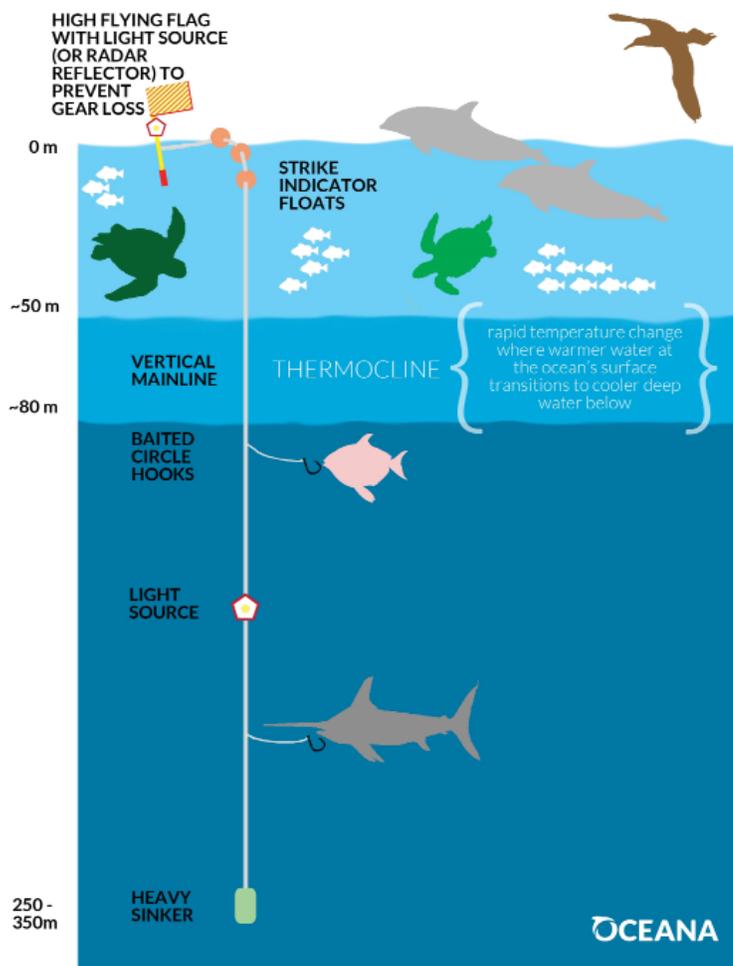


Figure 1: Deep-set buoy gear targets swordfish and secondary species like opah, thresher sharks, and mako sharks below the thermocline during the daytime, depths that greatly reduce interactions with marine mammals and sea turtles.

Over the last several decades, the majority of swordfish commercially caught off California has been in drift gillnets. Spanning up to a mile in length, and positioned 200 feet below the ocean surface, these nets hang like invisible curtains overnight. In addition to swordfish, these nets also entangle marine mammals, sea turtles, and sharks, which die when they are unable to surface for air or pass water over their gills (in the case of fish). Fortunately, there is a cleaner method that successfully catches swordfish while avoiding harm to other sea creatures.

A Clean Alternative to Catch Swordfish

Deep-set buoy gear is a type of fishing gear consisting of a floating buoy supporting a single vertical line to which one to three baited hooks are attached. This type of fishing gear is currently used to target swordfish in the Atlantic and is now being used commercially off California on a limited basis. This deep-set buoy gear targets swordfish during the day because they feed at a different depth than most other species. Hooks are deployed below the thermocline between 250 meters and 350 meters deep (820 feet-1148 feet). Buoy gear is more effective at catching its target species relative to drift gillnets or pelagic longlines—indiscriminate gears—that are set at night near the surface where many other ocean wildlife species congregate. A typical buoy gear deployment has up to ten individual buoys that are actively tended by fishermen. The buoys indicate when a fish has been caught, so fishermen can retrieve their catch within minutes of it being hooked.

Deep-Set Buoy Gear Holds the Potential for the Economic Advancement of the Fishery

Swordfish caught by deep-set buoy gear is a higher value product pound for pound than drift gillnet or pelagic longline-caught swordfish (imported and domestic), due to greater freshness, quality, and market demand for sustainable seafood. Current prices and initial market research in California indicate that buoy gear caught swordfish is likely to garner a market price approximately twice that of drift gillnet swordfish. Deep-set buoys may provide fishermen with additional opportunities to fish in locations that are off limits to drift gillnets per existing regulations and where pelagic longlines are banned due to pervasive and harmful bycatch interactions. A high market value for deep-set buoy gear caught swordfish and continued improvements in catch efficiency indicate the potential for a profitable fishery with increased total catch as fishermen develop expertise using this new gear type.

Deep-set Buoy Gear is Highly Selective in Targeting Swordfish with Minimal Bycatch

In experimental and commercial deep-set buoy gear trials to date, the primary catch has been swordfish (approximately 81 percent), followed by bigeye thresher shark (15 percent), and the remainder has been mostly opah and other shark species. Non-marketable fish catch (i.e. blue shark) has been low and all non-marketable species have been released alive.

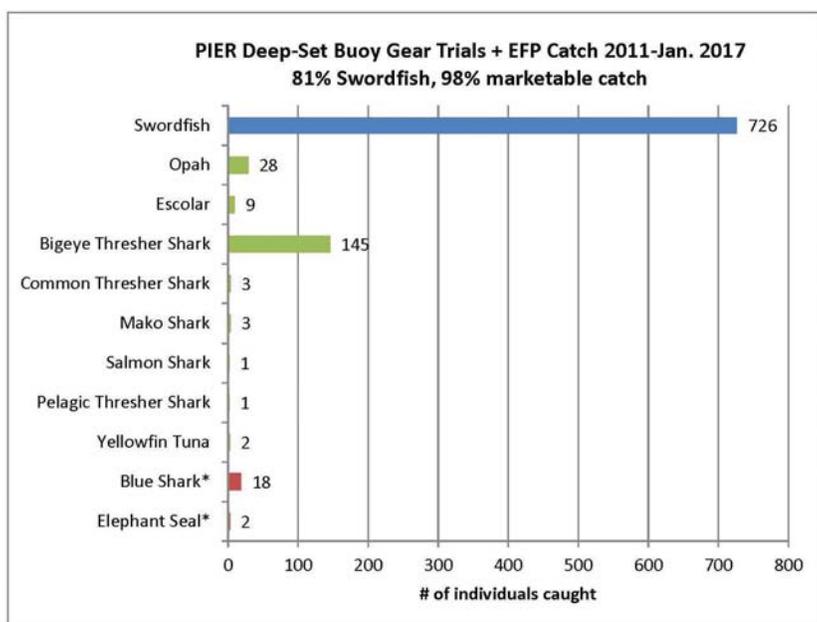


Figure 2: Collective catch from all deep-set buoy gear experiments to date. Data is from 529 eight-hour fishing days from 2011 to early 2017 in which a full 10-buoy set was made. Of the hundreds of deep-set buoy gear sets, two interactions with a protected species were observed. Two elephant seals were caught and both were reported to be released alive in good condition.



Benefits of Deep-Set Buoy Gear

Experimental and commercial deep-set buoy gear trials off California—led by the Pflieger Institute of Environmental Research (PIER) between 2011 and early 2017—have confirmed that:

- Swordfish can be selectively targeted at depth during the day.
- Non-target catch rates (e.g. sharks) are significantly lower than with drift gillnets or pelagic longlines.
- There were few discards, no sea turtle takes, and only two marine mammal interactions.
- There were no interactions with species of concern like whales, dolphins, or sea turtles.
- The gear is actively tended—strikes are detected immediately— and all catch is retrieved in a matter of minutes. This allows a quick release of non-marketable species, avoiding long-term or serious injury, and allows the marketable product to arrive at the dock more quickly in a fresher, high quality condition.
- 98 percent of fish caught off California with buoy gear from 2011- January 2017 were marketable species.

Targeting Swordfish with Deep-set Buoy Gear is Good for the Environment

According to PIER, based on trip expenses calculated in 2014, swordfish fishermen using a two-person operation (captain and one crew member) had average trip expenses around \$500/day. With the capture and sale of one average sized swordfish (200-pound dressed weight) at the average market price of \$8.75/ pound, the 2-person operation could result in a net gain of \$1,250/day. Given that catch rates ranged from 1.3 to 2.9 swordfish/day in 2016, these results show that deep-set buoy gear can be profitable.

In 2015 and 2016 the National Marine Fisheries Service approved additional commercial use of deep-set buoy gear through Exempted Fishing Permits, and is now considering authorizing the gear more widely in 2017.

| | Deep-Set Buoy Gear | Harpoons | Drift Gillnets | Pelagic longlines |
|--------------------------------------|--------------------|----------|----------------|-------------------|
| Swordfish Catch | 81% | 100% | 12.8% | 35% |
| Retained, Marketable catch | 98% | 100% | 36% | 56% |
| Discards | 2% | 0% * | 64% | 44% |
| Endangered species injured or killed | no | no | yes | yes |

Figure 3: Comparison of marketable catch and bycatch among deep-set buoy gear trials, swordfish harpoon fishery, swordfish drift gillnet fishery, and shallow-set pelagic longlines. Sources: NOAA CA Swordfish Drift Gillnet observer program 2004-2014; NOAA shallow set longline observer program, 2007-2014; NOAA Hawaii shallow-set longline Observer Program Data, 2007-2013.* Note, some swordfish strikes with harpoons may injure the swordfish yet do not result in a successful catch, however, we are not counting that as "bycatch" here.

Sources:

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Monterey
99 Pacific St., Ste. 155-C | Monterey, CA 93940
831.643.9267

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