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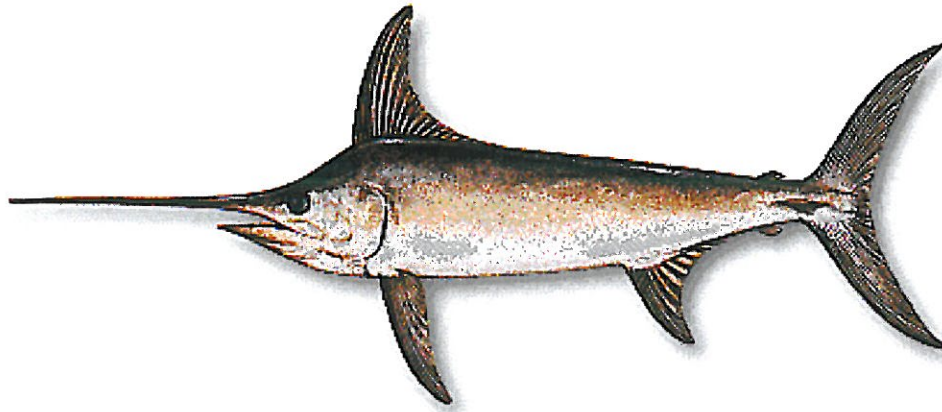
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OBSERVED SWORDFISH CATCH
IN THE CALIFORNIA
DRIFT NET FISHERY

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Introduction

The drift net fishery for thresher shark (*Alopias vulpinus*) began in California in 1977. By 1980 swordfish (*Xiphias gladius*) had become the primary target species. Thresher shark landings peaked in 1982 at 900 mt with swordfish landings peaking in 1984 and 1985 at 1500 mt. Legislation enacted in 1985 limited further entry into the fishery, set several time-area closures, mandated a State-funded observer program, and required vessel captains to complete bridge logs to document their catch. These regulatory measures effectively reduced overall fishing effort over the next decade. These time-area closures are in effect today and define the fishing season, which is open within 75nm of the coastline only from August to January of the following year. Since fishing is restricted to outside 75 nautical miles from May 1 - August 14, and outside 200 nm from February 1 - April 30.

In 1990 the National Marine Fisheries Service (NMFS) began placing biological technicians (observers) on swordfish/shark driftnet vessels. Although the observers primary duty is to monitor fishery interactions with marine mammals and endangered species, there are opportunities for additional data collection. At the observer programs inception, the Pelagic Division of the Southwest Fishery Science Center (SWFSC) designed a protocol for collection of life history and distribution data on pelagic sharks, billfish and swordfish. The Observer Management Branch (Southwest Region Office) approved this protocol and has worked cooperatively to provide all requested material and data. Their efforts have provided a tremendous source of fishery and species life history information otherwise not available.

The observed distribution of swordfish catch and effort from 1990 to 1998 extends from the Mexican border to the Columbia River. Drift net vessels ply the coastal and offshore waters searching for swordfish, the primary target in more than 95% of the observed sets. Effort is initially concentrated in the southern portion of the fishing grounds, expanding to its full range by October before retreating back to the south to avoid the harsh northern storms. The highest catch of swordfish occurs 15 to 150 km off the California coast. Fishing effort within 15 km of the coast or near the Channel Islands usually target pelagic sharks. In higher latitudes swordfish catch and effort tend to be further offshore.

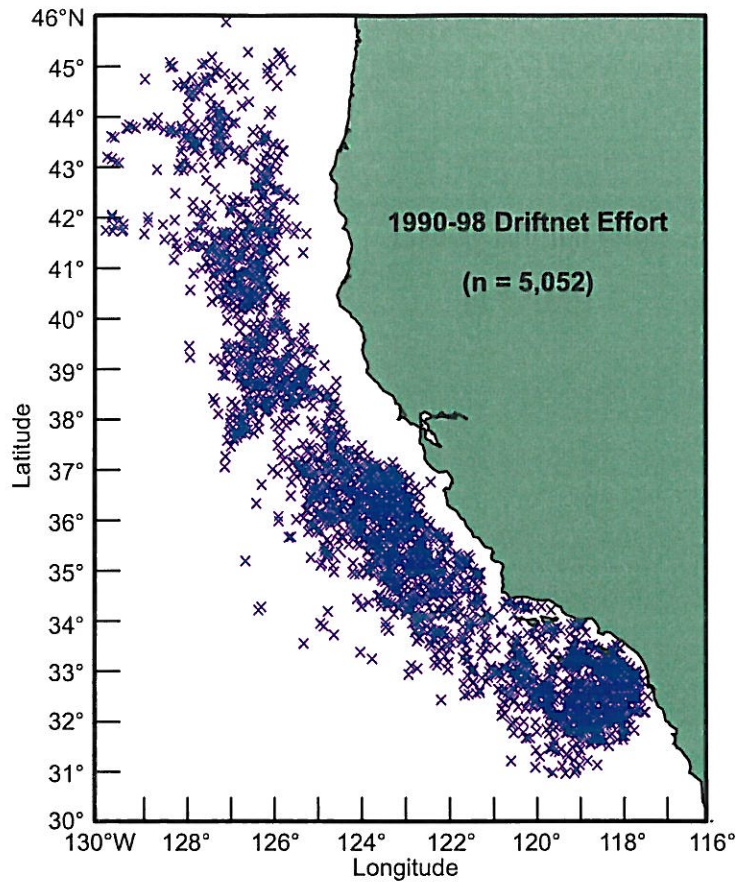


Fig 1 : 5,052 drift net sets, 14% of the estimated total, have been observed from 1990-1998.

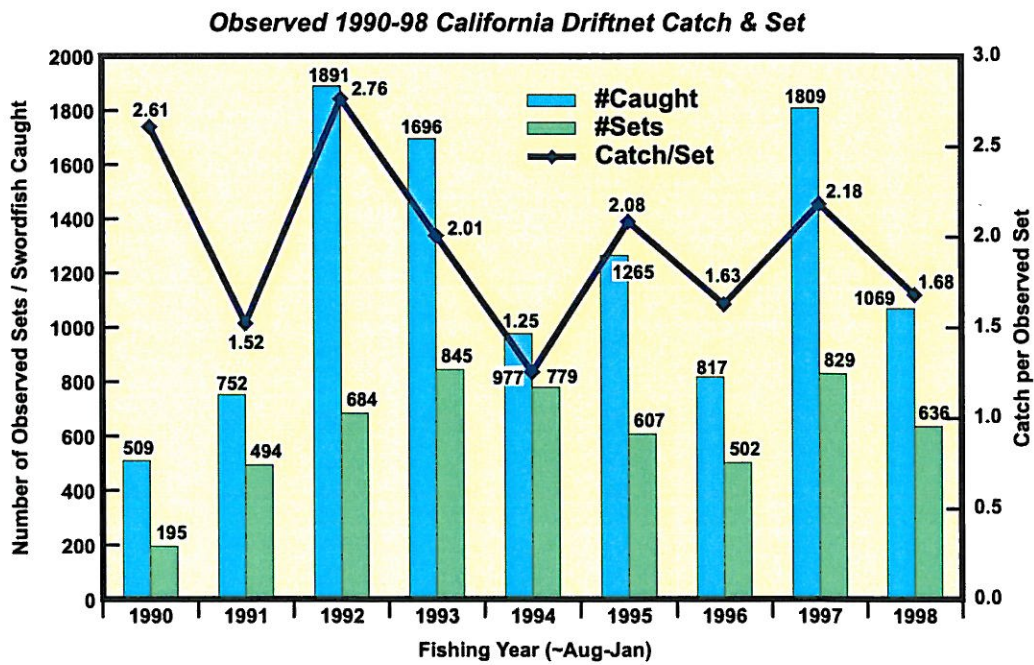


Fig. 2: The observed, non-adjusted CPUE, in swordfish per fishing set, ranged from 1.25 to 2.75 and does not indicate any particular trend. Catch rates were greatest during the warm water years (1992 and 1997) with the last four years indicating a more stable catch rate.

California Driftnet Swordfish Life History Data

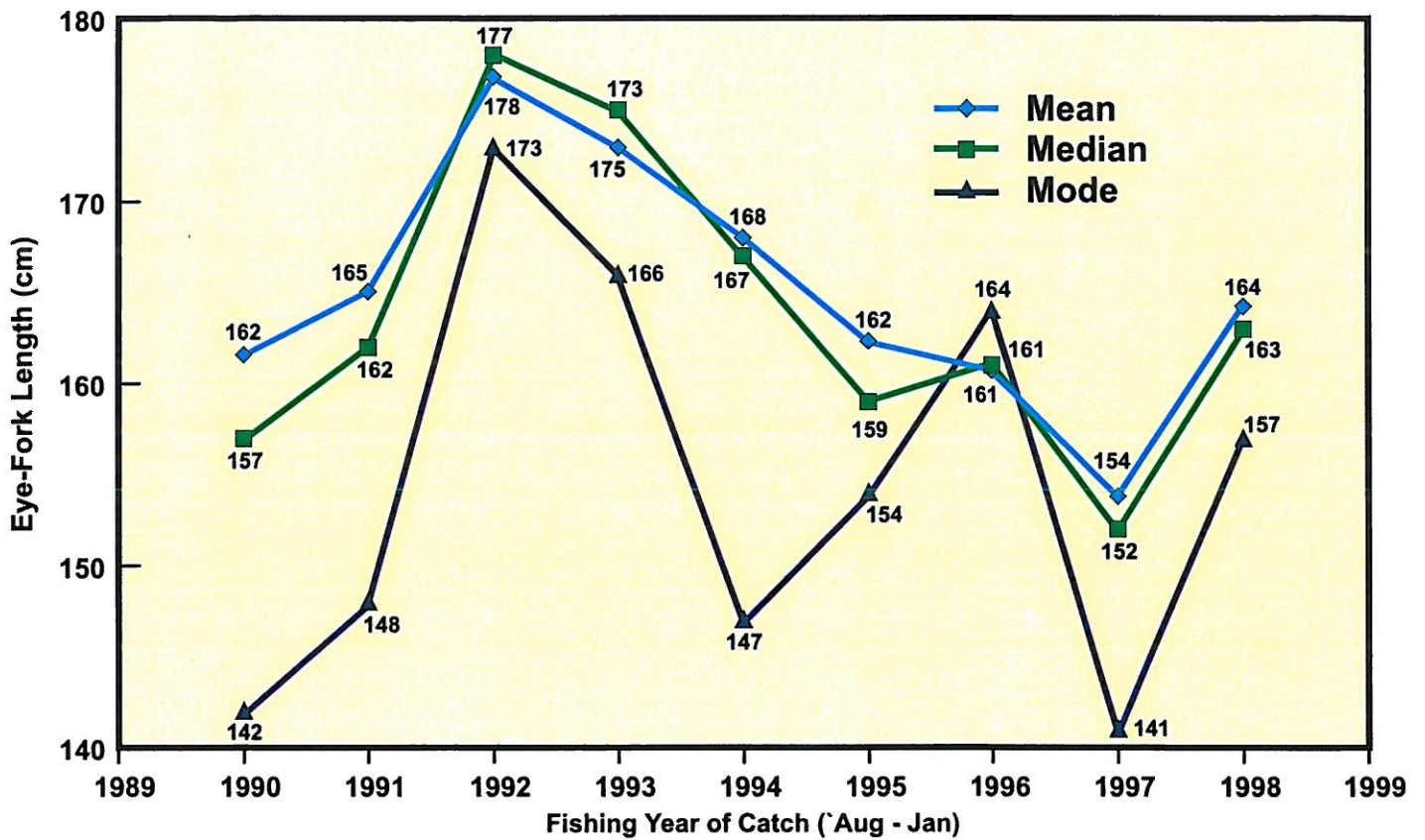


Fig 3: The apparent downward trend of mean EF between 1993 and 1997 was not confirmed in 1998. The modal tendency for most seasons indicate smaller swordfish were sampled more frequently from the catch.

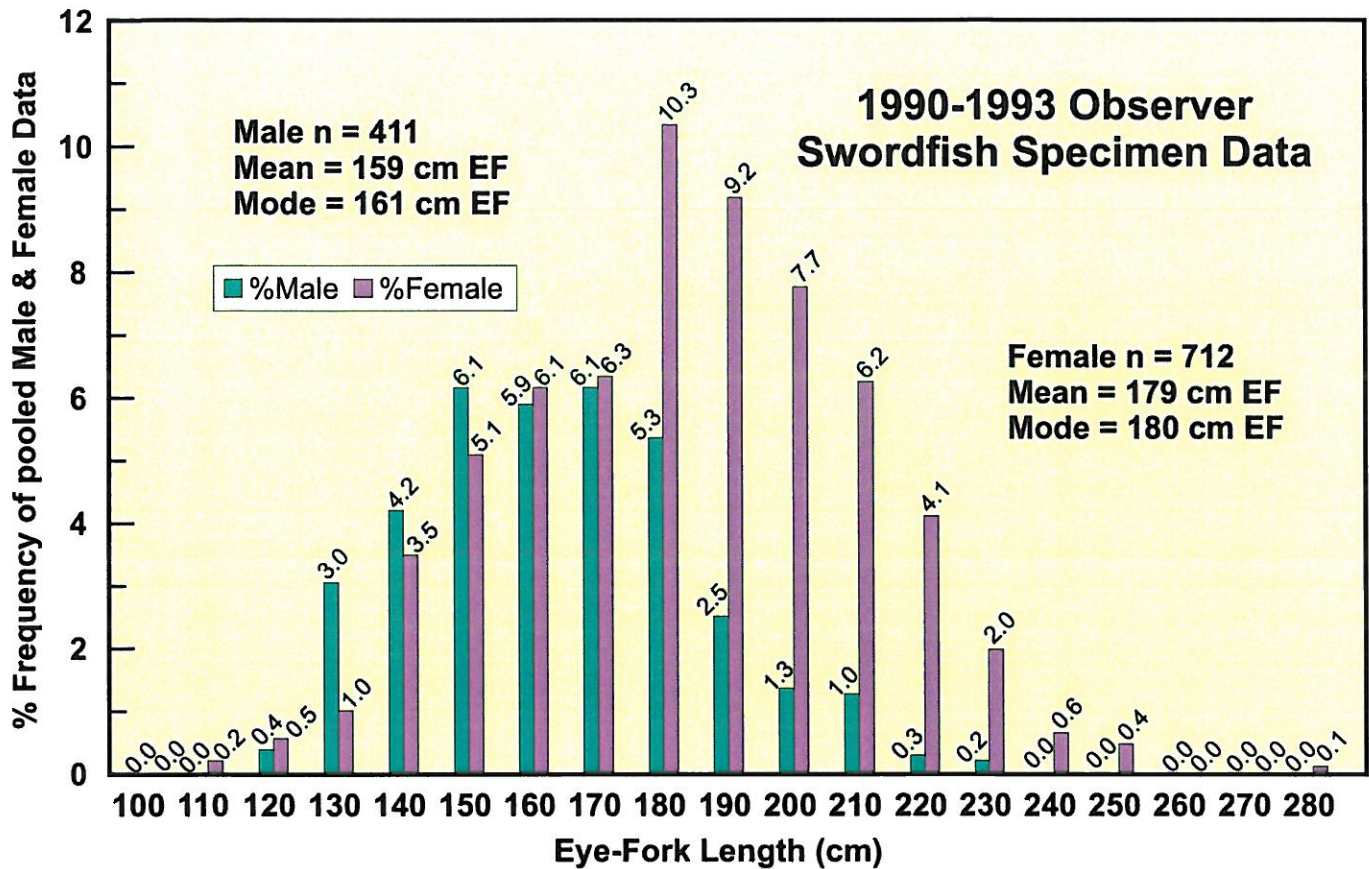


Fig 6.: From 1990 to 1993 observers collected swordfish gonads to determine maturity and spawning condition. A histogram of male/female EF lengths shows that females grow larger than males, averaging 179 cm EF to 159 cm EF for males. Females mature at 180 cm and males mature at 150 cm. The majority of both males (79%) and females (64%) sampled were mature. None of the 712 female ovaries examined however were in spawning condition.

Total 1990-1998 California Drift Gillnet Catch

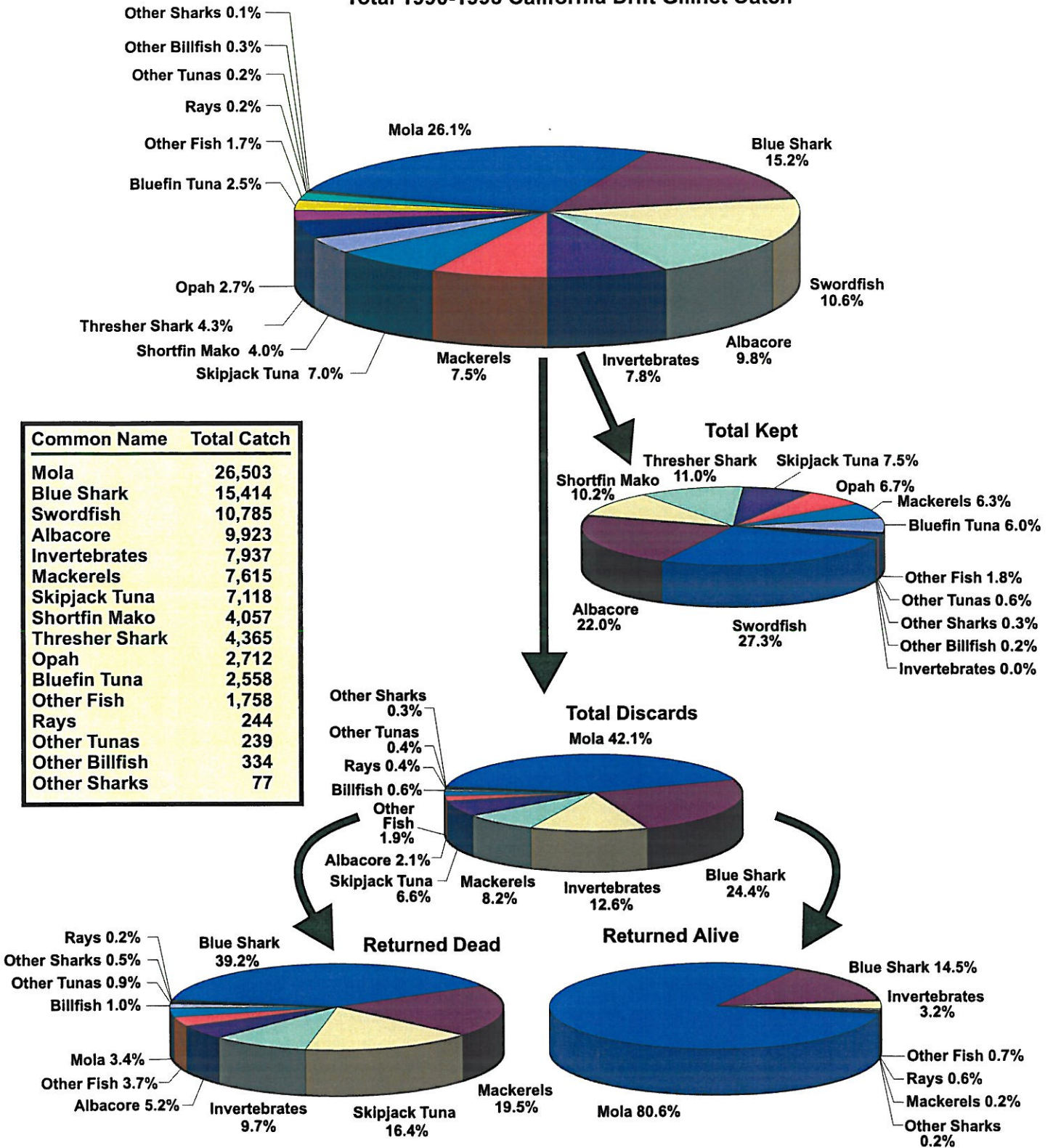


Fig 5: Percent of catch, catch kept and catch discarded for both target and nontarget species, 1990 to 1998. By catch of nontarget fishes include many marketable species including albacore, skipjack, bluefin tuna, pelagic sharks and opah. Discarded bycatch include mola, blue sharks, mackerels and invertebrates. The most frequently caught fish, the common mola, are not kept and more than 80% of them are returned to the sea alive. Others, such as the blue shark are often dead by the time they are removed from the net.

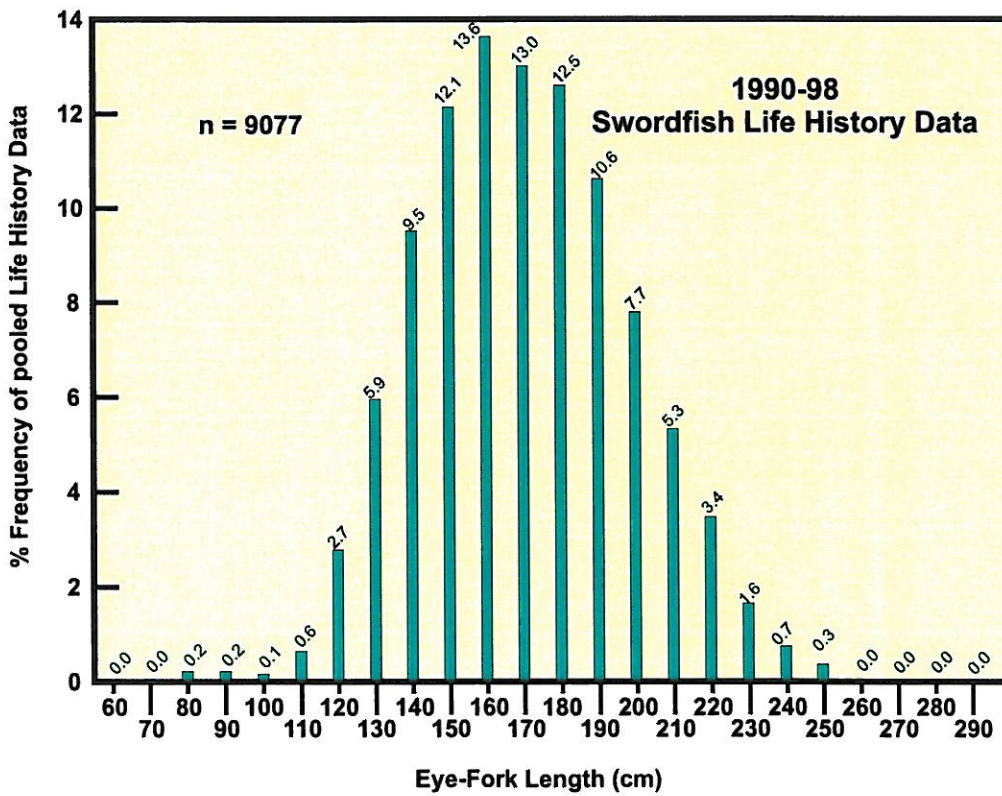


Fig 4: Observers routinely collect 3 length measurements, with the eye to fork length (EF) easily available and the most reliable. The EF length of all measured catch averaged 166 cm, and ranged from 67 cm to 277 cm EF.

California Drift Gillnet Sets with Swordfish Catch

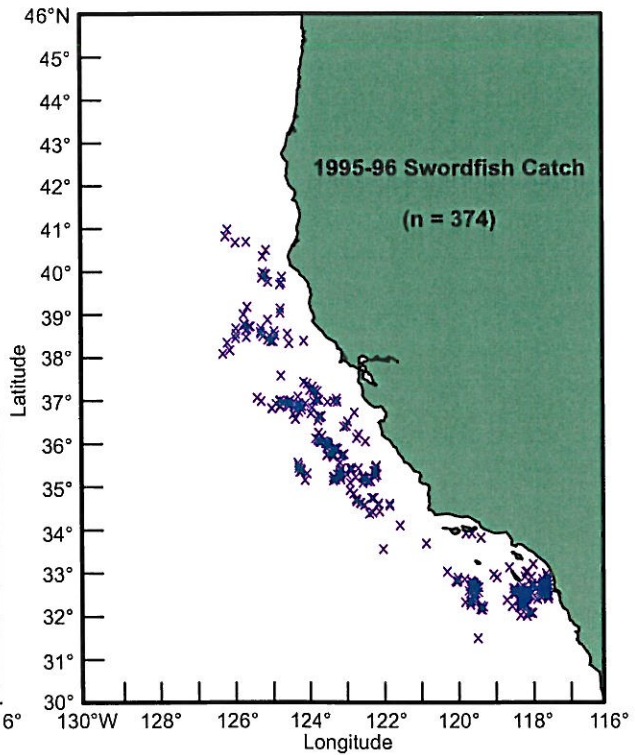
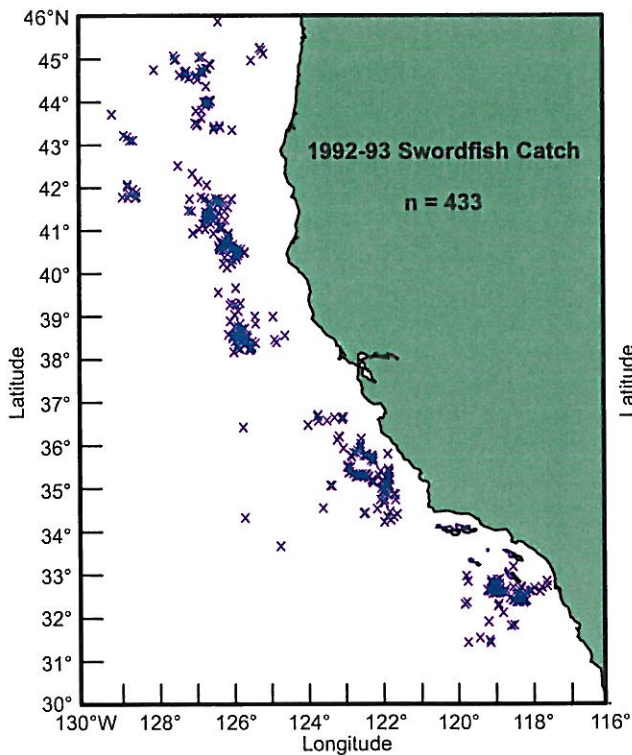
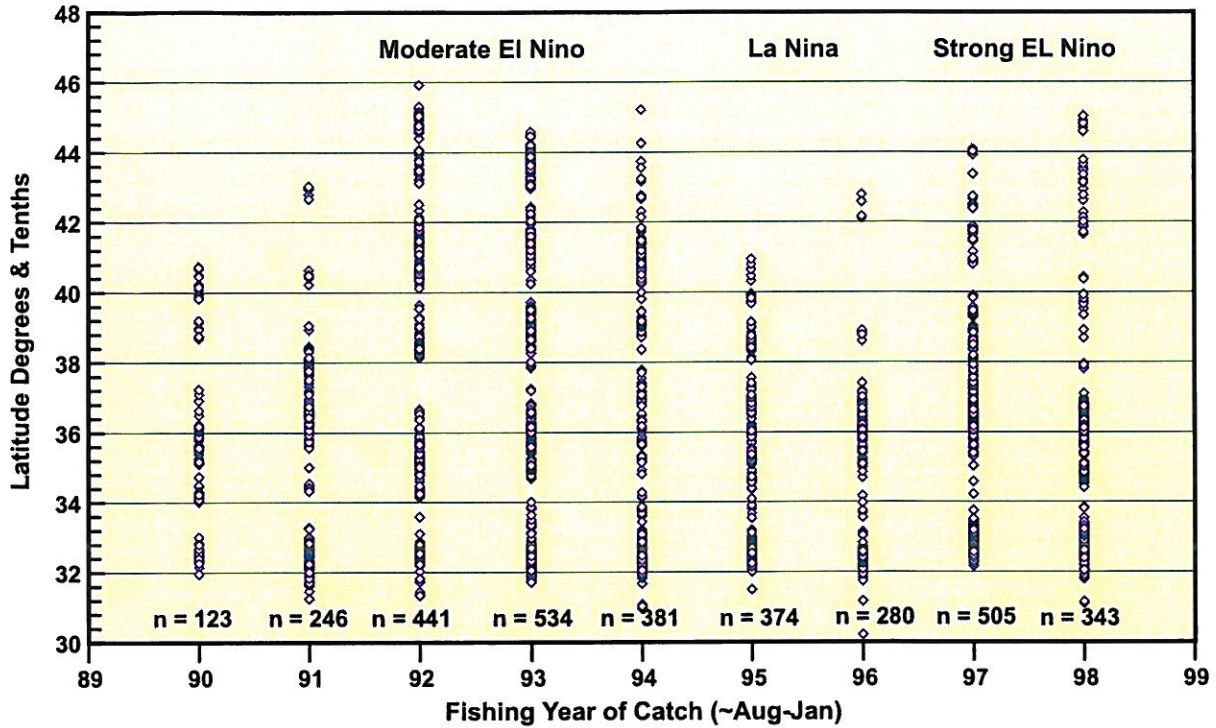


Fig 9, 10 & 11: The effects of cyclic warming and cooling periods have an important effect on swordfish catch distribution. During El Niño periods swordfish are captured further north than during colder La Niña periods. For example, during the 1995 La Niña no catches of swordfish were observed north of Cape Mendocino at 41°N. The moderately strong El Niño of 1992 resulted in catches as far north as 46°N.

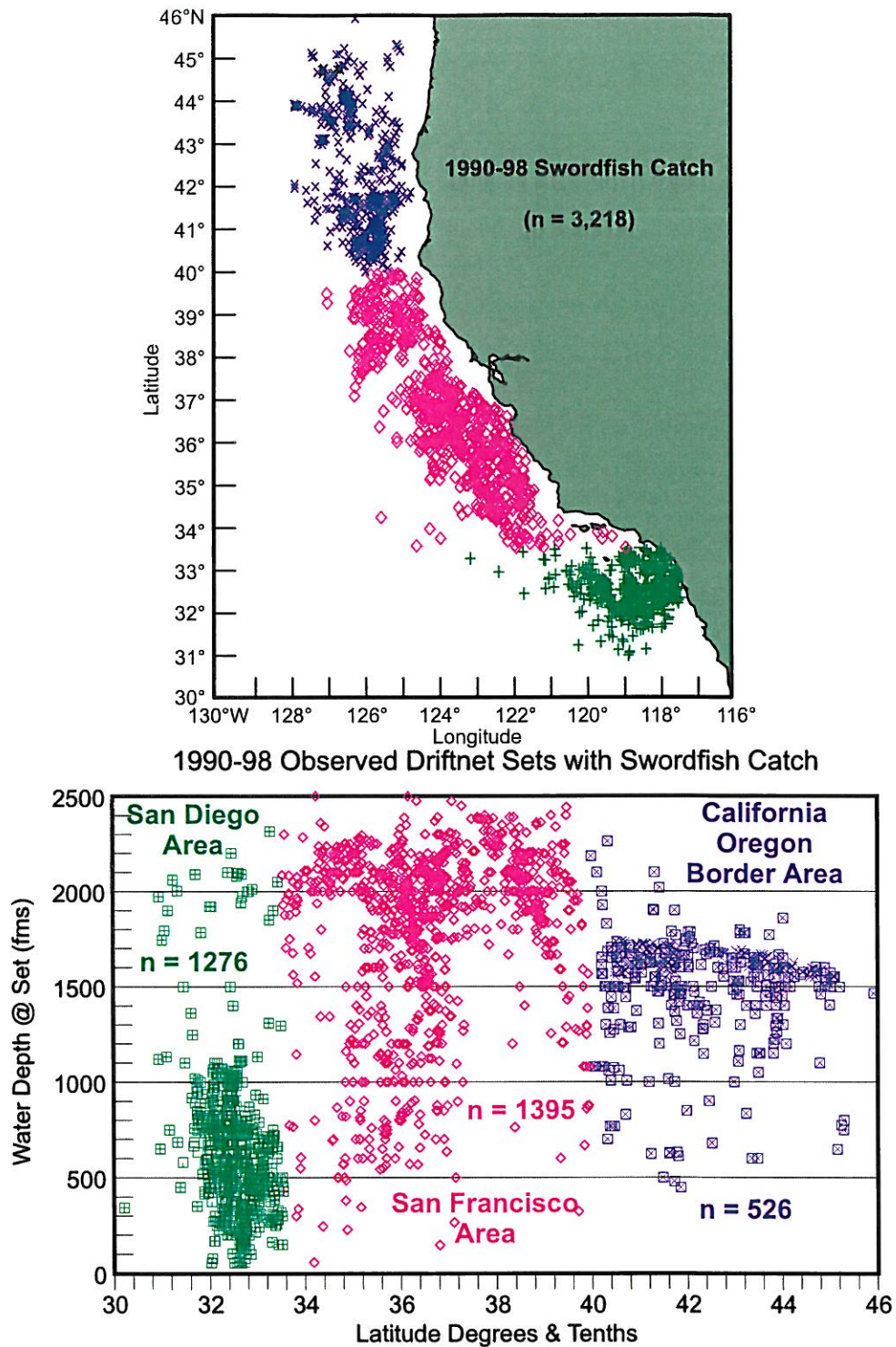
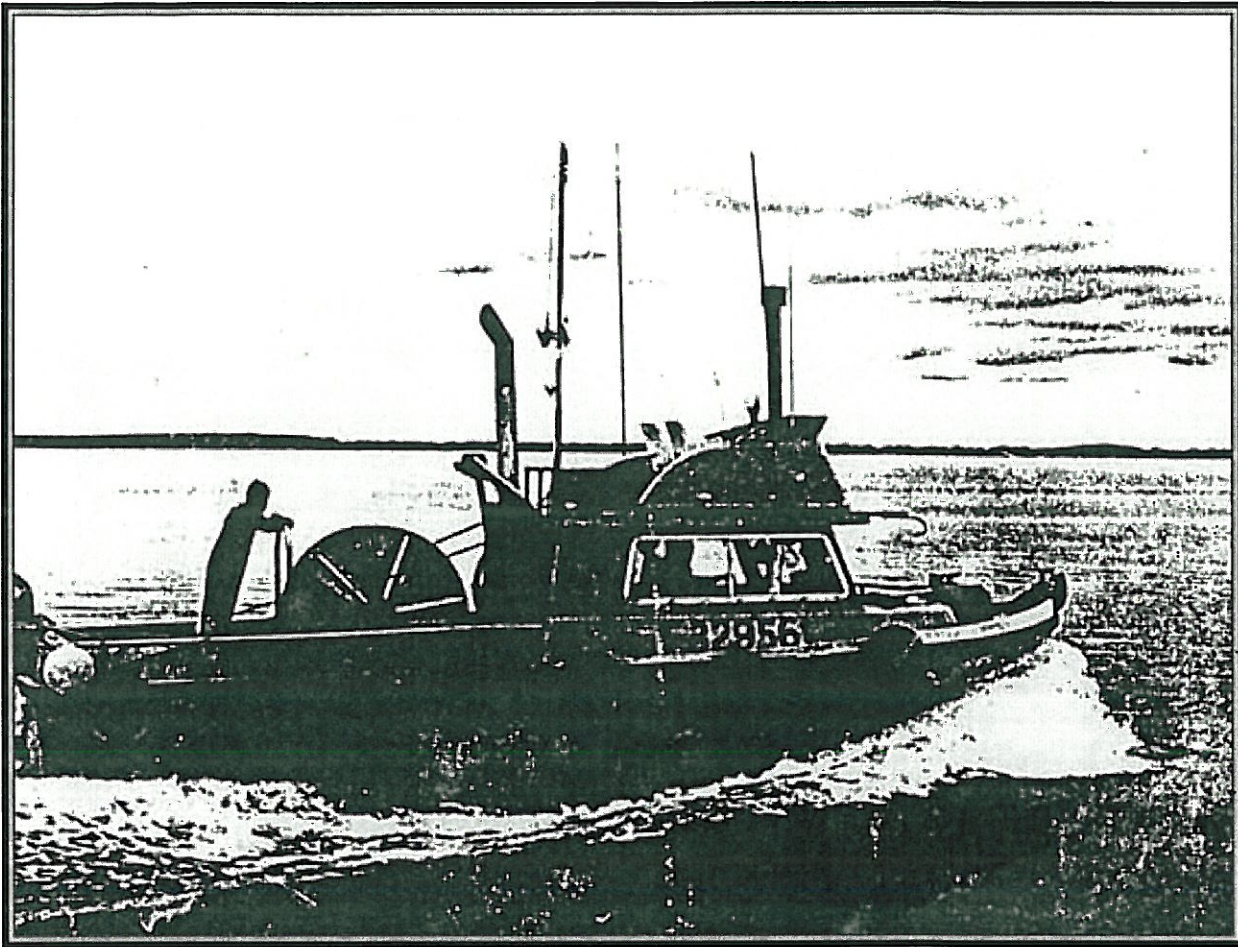


Fig 7 & 8: Three general fishing areas for swordfish are identified along the California coast. They are segregated by latitude and occupy areas of similar bottom depths. The southern area is centered off San Diego and is characterized by relatively shallow water in depths of less than 1000 fathoms. This area is within the southern California bight and fairly close to the coast. The central area off San Francisco is in deep waters in depths of 1500 to 2000 fathoms, with the northern area off the California/Oregon border in moderate depths of 1600 fathoms.



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Breaching swordfish picture: Murray Archives.