White Seabass Fishery Management Plan
2022-2023 Annual Review

White Seabass, *Atractoscion nobilis*.
(Photo Credit: Scott Aalbers, Pfleger Institute of Environmental Research (PIER)).

Prepared by

California Department of Fish and Wildlife
Marine Region
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Executive Summary

The California Fish and Game Commission (Commission) adopted the White Seabass Fishery Management Plan (WSFMP) in June 2002. The WSFMP includes a provision for annual monitoring and assessment of the white seabass fisheries. The White Seabass Scientific and Constituent Advisory Panel (WSSCAP) was established to assist the California Department of Fish and Wildlife (Department) and the Commission with the review of the fishery assessments, management proposals, and plan amendments. Although the WSFMP designates the WSSCAP as having seven members representing the scientific community, recreational and commercial fishing industries, and environmental groups, the WSFMP does not identify specific members for the WSSCAP. Therefore, the Department invites stakeholders interested in white seabass management to participate in the annual review. The annual review includes fishery-dependent data (e.g., commercial and recreational landings and length frequencies), and fishery-independent data (e.g., recruitment information) if available, as well as documented changes within the social and economic structure of the recreational and commercial industries that utilize the white seabass resource within California. The review also includes information on the harvest of white seabass from Mexican waters and other relevant data. Based on the results of the annual review, in cooperation with the WSSCAP, the Department will provide management recommendations, if needed, to the Commission.

To assist the Commission in determining if management measures need to be modified or added, the WSFMP framework includes, and the Commission adopted, points of concern criteria to help determine when management measures are needed to address resource issues. The points of concern are:

1. Catch is expected to exceed the current harvest guideline or quota.

2. Any adverse or significant change in the biological characteristics of white seabass (age composition, size composition, age at maturity or recruitment) is discovered.

3. An overfishing condition exists or is imminent.

4. Any adverse or significant change in the availability of white seabass forage or in the status of a dependent species is discovered.

5. New information on the status of white seabass is discovered.

6. An error in data or stock assessment is detected that significantly changes estimates of impacts due to current management.

The Department and WSSCAP met on October 28, 2024, to review the 2022-2023 fishery season (September 1 to August 31). Recognizing that it has been over 20 years since the WSBFMP was adopted and there are new tools and data available, the Department is beginning discussions with the WSSCAP and other interested parties to discuss potential changes to the management framework for white seabass.

Background

The Department and the WSSCAP annually review current information to evaluate the status of the white seabass resource based on six points of concern adopted to implement the WSFMP and to consider whether current management measures provide adequate protection for the resource. The annual review process is intended to foster a continuous review of white seabass stocks and fisheries to prevent overfishing or other resource damage. If a resource conservation issue is found, the WSSCAP will provide its recommendation, rationale, and analysis to the Department. The Department will evaluate the recommendation from the WSSCAP and all available information and will recommend to the Commission management measure(s) to address the issue(s).

Analysis and Results

Analysis and results of the WSFMP six points of concern reviewed for the 2022-2023 fishery season are described below, including an overall summary (Table 1), and section on each point of concern. Two criteria were met in 2022-2023.

Table 1. Overall summary of the WSFMP six points of concern for the 2022-2023 fishing season.

Criteria	**Analysis**	**Result**
Catch is expected to exceed the current harvest guideline or quota.	Total catch for 2022-2023 = 234,003 pounds. Optimum Yield = 1.2 million pounds. Total catch is below Optimum Yield.	Criterion not met
Any adverse or significant change in the biological characteristics of white seabass (age composition, size composition, age at maturity or recruitment) is discovered.	Recreational and commercial fishery length frequencies showed no significant change that would indicate a problem in the fishery. The Department completed a length at maturity analyses. Results indicate white seabass mature at a larger size than previously understood, reaching 50% maturity at 34.8 inches (884.3 millimeters (mm)).	Criterion met
An overfishing condition exists or is imminent.	No overall overfishing condition noted. See analysis in Table 2.	Criterion not met
Any adverse or significant change in the availability of white seabass forage or in the status of a dependent species is discovered.	Of the five fisheries analyzed, landings increased for two fisheries while landings declined slightly for two fisheries, and one fishery remained closed in the 2022-23 season. Biomass estimates for Pacific mackerel increased and Pacific sardine remained the same. White seabass, however, are opportunistic feeders and are known to feed on a variety of pelagic fish and invertebrate species when available.	Criterion not met
New information on the status of white seabass is discovered.	The Department completed a length at maturity analyses. Results indicate white seabass mature at a larger size than previously understood, reaching 50% maturity at 34.8 inches (884.3 mm).	Criterion met
An error in data or stock assessment is detected that significantly changes estimates of impacts due to current management.	A stock assessment, which was completed in May 2016, determined that the stock was not overfished or depressed, but the current optimum yield may be too high.	Criterion not met

1. Catch is expected to exceed the current harvest guideline or quota.

The Commission established a fishing season of September 1 through August 31 of the following year. The Commission also adopted an optimum yield (OY) that serves as the harvest guideline or quota. The OY is based on a maximum sustainable yield proxy of the unfished biomass and is currently set at 1.2 million pounds. In the 2022-2023 season, the total recreational and commercial harvest was 234,003 pounds, 20 percent of the allowable catch; thus, the criterion for this point of concern was not met (Appendix A, Table 1).

2. Any adverse or significant change in the biological characteristics of white seabass (age composition, size composition, age at maturity or recruitment) is discovered.

The criterion for this point of concern was met. Although no significant changes were found in the length composition of sampled white seabass, the Department, in collaboration with the Pflieger Institute of Environmental Research (PIER), completed a study that indicates that white seabass mature at a larger size than previously understood; therefore, there may be a need to consider changes in management measures in the fishery.

Length frequency data collected by the Department from the commercial fish markets in California for the past six seasons are presented in Appendix A, Figure 1. In the 2022-2023 season, Department staff measured a total of 211 fish for length. Most samples were taken from gill net landings. The commercial fishery continues to harvest white seabass across a wide size range. In 2022-23, all fish sampled were larger than the minimum size limit of 28 inches (711.2 mm) and 69 percent of the fish sampled were larger than 45 inches (1,143 mm). Based on previous age-at-length information from reading otoliths and from a previously calculated weight/length relationship, those fish larger than 45 inches are likely more than 11 years old and weigh more than 30 pounds.

Recreational anglers tend to land smaller fish than those from the commercial fishery; this is in part due to the selectivity of commercial gill nets which tend to capture larger fish because of the mesh size. Length frequency data for the recreational fishery for the past six seasons are presented in Appendix A, Figure 2. In the 2022-2023 season, Department staff measured a total of 78 fish for length; 32 percent sampled were from private/rental boats, 44 percent from Commercial Passenger Fishing Vessels (CPFV), and two percent from man-made/jetty. Of the 78 fish measured, 10 were less than the minimum size limit of 28 inches (711.2 mm). The remaining 68 fish measured were legal sized with 24 percent larger than 40 inches (1,016.0 mm) total length (TL). Based on previous age-at-length information from reading otoliths and from a previously calculated weight/length relationship, those fish larger than 40 inches are likely more than nine years old and weigh more than 24 pounds.

The current minimum size limit of 28 inches (711.2 mm) for the commercial and recreational fishery for white seabass was established in 1931 based on a single maturity study (Clark 1930) with limited data from 25 immature and 8 maturing females

from southern California. Knowing that it has been almost 100 years since this original assessment, all the samples were from just one region of coast, and the very low sample size, the Department prioritized a study to update this essential fishery information.

The Department collaborated with the PIER to examine white seabass gonads statewide, with a focus on increasing sample size and utilizing the best available science (histology) for maturity assessments. Between 2017-2023, Department and PIER staff collected and analyzed a total of 676 white seabass (393 females, 283 males), ranging in size from approximately 12 to 62 inches TL (305-1,575 mm). White seabass were measured and weighed prior to removing gonads for macroscopic and histological assessments of maturity. In addition to gonadosomatic indices (GSI) generated from white seabass collected during the spawning season, histological assessments of fixed gonad cross sections from 243 white seabass sampled off southern California and 282 individuals collected in the San Francisco Bay area were conducted to assign females to a specific reproductive phase: immature, early developing, late developing, spawning imminent, spawning active, spawned, regressing, or regenerating. Histological assignments were used to generate multiple maturity curves, with the best fit model including females that were in the late developing and spawning phases as well as those regenerating with residual spawning attributes (Appendix A, Figure 3).

Histological evidence used to develop the functional maturity ogive suggests that 50 percent of female white seabass reach maturity around 34.8 inches (884.3 mm) TL, with 95 percent of examined individuals becoming mature by 38.4 inches (975.4 mm). Additionally, a one-inch difference in size at maturity was found geographically with females from northern California reaching 50 percent maturity at 35.6 inches (903.9 mm) and southern California females at 34.6 inches (878.7 mm). Reduced mean GSI values for female white seabass less than 884.3 mm (0.91 ± 0.54) also suggest minimal reproductive output prior to reaching the identified 50 percent size of maturity. Findings from GSI and histological classification both suggest that white seabass begin contributing to the population at a larger size than previously estimated; therefore the existing minimum size limit (28 inch TL) may not allow for all females to spawn at least once before being taken by the fisheries, which was identified as an objective in the WSFMP. Current data aligns with the modified maturity curve presented in the 2016 white seabass stock assessment (Valero and Waterhouse, 2016) as well as with recommendations from Clark (1930), who concluded that fish smaller than 100 cm (39.4 inch TL) should be protected to assure all white seabass are provided at least one unmolested spawning season.

3. An overfishing condition exists or is imminent.

Three criteria (summarized in Table 2), all of which must be met to establish the point of concern, determine if an overfishing condition exists or is imminent. Meeting the criteria in one sector may mean overfishing is occurring in that sector and further investigation may be warranted. The criteria for this point of concern were not met.

Table 2. Analysis to determine if the white seabass resource is overfished (Criteria taken from Section 51.01 (b), Title 14, California Code of Regulations).

Criteria	**Analysis**	**Result**
A 20 percent decline in the total annual commercial landings of white seabass for the past two consecutive seasons compared to the prior 5-season running average of landings, based on landing receipt data.	2022-2023: 175,659 pounds = 5% increase; 5-season average = 167,180 pounds. 2021-2022: 139,664 pounds = 24% decrease; 5-season average = 182,830 pounds.	Criterion not met
A 20 percent decline in both the number of fish and the average weight of white seabass caught in the recreational fishery for the same two consecutive seasons, as determined by the best available data.	2022-2023: 3,474 fish = 43% decrease; 17.8 pound average = 36% decrease. 2021-2022: 6,080 fish = 38% decrease; 27.8 pound average = 48% increase.	Criterion not met
A 30 percent decline in recruitment indices for juvenile white seabass compared to prior 5-season running average of recruitment, as determined by the best available data.	2022-2023: No white seabass recruitment surveys have occurred since the 2018/19 season; thus this criterion cannot be analyzed.	N/A

Following are the results for each of the three overfishing sub-criteria.

A. *A 20 percent decline in the total annual commercial landings of white seabass for the past 2 consecutive seasons, compared to the prior 5-season average of landings, based on fish landing receipt data.*

The WSSCAP and the Department agreed that the overfishing criterion for the commercial fishery was not met because the commercial landings of white seabass did not decrease by 20 percent when compared to the prior 5-season average for the past two consecutive seasons (Appendix A, Table 2). In the 2022-2023 season, commercial landings totaled 175,659 pounds, which is a 5 percent increase compared to the prior 5-season running average of 167,180 pounds. During the previous 2021-2022 season, commercial landings totaled 139,664 pounds, which was a 24 percent decrease compared to the prior 5-season running average of 182,830 pounds.

The set and drift gill net fisheries have consistently landed most of the white seabass each season (Appendix A, Table 2). The trawl fishery and other incidental gears continue to be minor components of the commercial fishery. In the 2022-2023 season, landings increased in the gill net and trawl fisheries but decreased in the hook-and-line fishery.

B. A 20 percent decline in both the number of fish and average weight of white seabass caught in the recreational fishery for the same 2 consecutive seasons as determined based on the best available data.

The WSSCAP and the Department agreed that the overfishing criterion for the recreational fishery was not met because both the number of fish and average weight did not show a 20 percent decline for two consecutive seasons (Appendix A, Table 3). In the recreational fishery, both the number and average weight of fish caught in the 2022-2023 season decreased by 43 percent and 36 percent, respectively. However, the overfishing criterion was not met because the average weight of fish caught during the previous season increased by 48 percent.

C. A 30 percent decline in recruitment indices for juvenile white seabass compared to the prior 5-season average of recruitment, as determined by the best available data.

The Ocean Resources Enhancement and Hatchery Program (OREHP) previously conducted standardized field studies four times a year (August, October, April, and June) for juvenile recruitment. However, reductions in funding curtailed survey effort, and the Ocean Enhancement Stamp fund was insufficient to cover all the OREHP activities as well as the recruitment surveys. Consequently, there was no sampling between 2009 and 2011. In October 2012, sampling, similar to previous surveys, was reinstated by the OREHP Advisory Panel. The objective of the sampling design resumed the prior sampling plan but included more embayment sites and less coastal sites than previously sampled. Recruitment sampling continued through the 2018-2019 season, but because of administrative and funding priority changes within the OREHP, no white seabass recruitment surveys have occurred since the 2018-2019 season. Thus, this criterion could not be addressed in this report.

Based on the analysis of all three overfishing criteria, the WSSCAP and the Department agreed that the overfishing point of concern for the fishery was not met. However, the Department and the WSSCAP have concerns regarding these analyses and will look to re-evaluate the criteria outlined in the WSFMP.

4. Any adverse or significant change in the availability of white seabass forage or in the status of a dependent species is discovered.

White seabass are known to be opportunistic feeders on a variety of pelagic fish and invertebrate species. Certain prey species [northern anchovy (*Engraulis mordax*), jack mackerel (*Trachurus symmetricus*), market squid (*Doryteuthis opalescens*), Pacific mackerel (*Scomber japonicus),* and Pacific sardine (*Sardinops sagax*)] are highly

mobile, and their distributions are affected by oceanographic conditions. A review of these white seabass forage species (Appendix A, Figures 4, 5, 6, 7, and 8) revealed some changes in availability.

A formal stock assessment was conducted for northern anchovy in 2021, and while landings have varied over the last five years, the stock assessment indicated that the biomass has increased over the same time period. The assessment focused on the central subpopulation of northern anchovy, which ranges from roughly northern California, USA to central Baja California, Mexico. In 2018, there was a substantial increase in northern anchovy landings, but then landings declined from 2019 to 2022. In 2023, landings increased by 48 percent. (Appendix A, Figure 4).

Jack mackerel have not been significantly targeted off California, and most landings are caught incidentally to other fisheries. Therefore, regular stock assessments or efforts to collect biological information on jack mackerel have not been a priority. In 2016, jack mackerel landings were high but then decreased each consecutive year from 2016 through 2019. Between 2020 - 2022, jack mackerel landings remained low, but in 2023, landings increased significantly from 32 metric tons (mt) to 121 mt. (Appendix A, Figure 5).

There are currently no estimates of population abundance in California for market squid, but recruitment varies substantially from year to year in response to environmental factors, causing natural fluctuations in abundance. As squid availability fluctuates throughout the season, many vessels target other fisheries (e.g., northern anchovy, Pacific mackerel, or tuna). When squid are readily available, market conditions can drive fishing effort. During the 2018-2019 season, market squid landings decreased from the previous season and continued to decline until the 2020-2021 season when landings increased once again (Appendix A, Figure 6).

Both Pacific mackerel and Pacific sardine landings have remained low over the past eight seasons. Since the 2015-2016 season, Pacific mackerel landings have not exceeded 5,000 mt per season (Appendix A, Figure 7), and Pacific sardine landings have not exceeded 4,000 mt (Appendix A, Figure 8). Additionally, the directed fishery for Pacific sardine has been closed since the end of the 2014-2015 season.

Pacific mackerel and Pacific sardine have stock assessments conducted by the National Marine Fisheries Service and these stock assessments include biomass estimates. Since 2008, Pacific mackerel biomass estimates have been conducted every two years (Appendix A, Figure 9). Pacific sardine biomass estimates are conducted every year (Appendix A, Figure 10). The biomass estimates for both Pacific mackerel and Pacific Sardine have remained at approximately the same level for the past four seasons.

Although this criterion relates to a single forage species, it is more appropriate to consider in aggregate all five of the primary forage species for white seabass. However, it is not a simple matter of summing up annual catch or biomass estimates in determining if there is a problem with overall prey availability. Prey species are highly

mobile, and their distributions are also affected by oceanographic conditions. Additionally, many of the same fishing vessels fish for all five species depending on market factors and availability. Based on the analysis of all the prey species, the WSSCAP and the Department agreed that this point of concern was not met; however, there is concern about what appears to be an overall reduced prey availability, and the Department will continue to monitor these species.

5. New information on the status of white seabass

The Department, in collaboration with the PIER, completed analysis of gonad histology slides. Results indicate white seabass mature at a larger size than previously understood, reaching 50 percent maturity at 34.8 inches (884.3 mm) (See Criterion 2).

6. An error in data or stock assessment is detected that significantly changes estimates of impacts due to current management.

No errors in the current stock assessment have been found.

Additional Information

The Department has used two basic socioeconomic information indicators to characterize the commercial fishery and has provided those summaries to the WSSCAP (Appendix A, Table 4). As a social information indicator, the number of commercial vessels landing white seabass has been tracked over time. In the 2022-2023 season, the number of vessels fishing for white seabass decreased by 15 percent (20 vessels). This decrease in the number of vessels mostly occurred in the hook-and-line fishery. As an economic information indicator, the most frequent ex-vessel price per pound has also been tracked over time. The most common ex-vessel price per pound for the 2022-2023 season was at $5.00 per pound for all gears combined, a decrease of $1.00 from the previous season. No similar social or economic data are available for the recreational fleet.

Information about the take of white seabass in Mexican waters was considered by the WSSCAP. California commercial fishermen are prohibited by Mexican law to fish in the territorial seas of Mexico, and no landings of white seabass from Mexico by California commercial fishermen were reported in 2022-2023. Recreational anglers may fish in Mexico under the authority of a Mexican sport fishing license. During the 2022-2023 season, Commercial Passenger Fishing Vessel logbook data reported 55 white seabass taken in Mexico and landed in California, a decrease of 26 fish from the 81 reported taken during the prior season. No additional information about either the recreational or commercial catch of white seabass in Mexico is available.

Conclusion

Since the WSBFMP was adopted by the Commission more than 20 years ago, the Department has developed new tools and collected additional information to improve management of the white seabass fishery. The results from the maturity study indicate that the current minimum size limit (28 inch TL) may not be allowing all females the

opportunity to reproduce at least once before being available to the fishery. It is timely to consider potential changes to the management framework within the WSBFMP, which could include an evaluation of the minimum size limit, incorporation of the stock assessment into calculating maximum sustainable yield and optimum yield, assessing the potential impacts of bycatch, and re-evaluation of the trigger mechanisms that are outlined in the WSBFMP. The Department looks forward to opening those discussions with fishery participants, California Tribes and other interested stakeholders around future management measure for the white seabass fishery.

Appendix A – Data Analyses

Table 1. Total catch (pounds) of white seabass, 2013-2014 to 2022-2023. Source: Department's Marine Landings Database System (MLDS) and California Recreational Fisheries Survey (CRFS) data extracted from the Recreational Fisheries Information Network (RecFIN) database at http://www.recfin.org. In 2020, COVID-19 pandemic health safety guidelines prevented CRFS sampling from April - June and restricted observing and collecting biological data on anglers' catch from July - August.

Season	Recreational	Commercial	Total
2013/14	219,116	262,441	481,557
2014/15	63,125	196,521	259,646
2015/16	100,406	247,195	347,601
2016/17	177,582	217,915	395,497
2017/18	129,195	220,687	349,882
2018/19	93,747	168,077	261,824
2019/20	73,408	138,537	211,945
2020/21	198,482	168,934	367,657
2021/22	127,271	139,664	266,935
2022/23	58,344	175,659	234,003

Table 2. Commercial white seabass landings (pounds) by gear type, 2013-2014 to 2022-2023. Source: Department's MLDS.

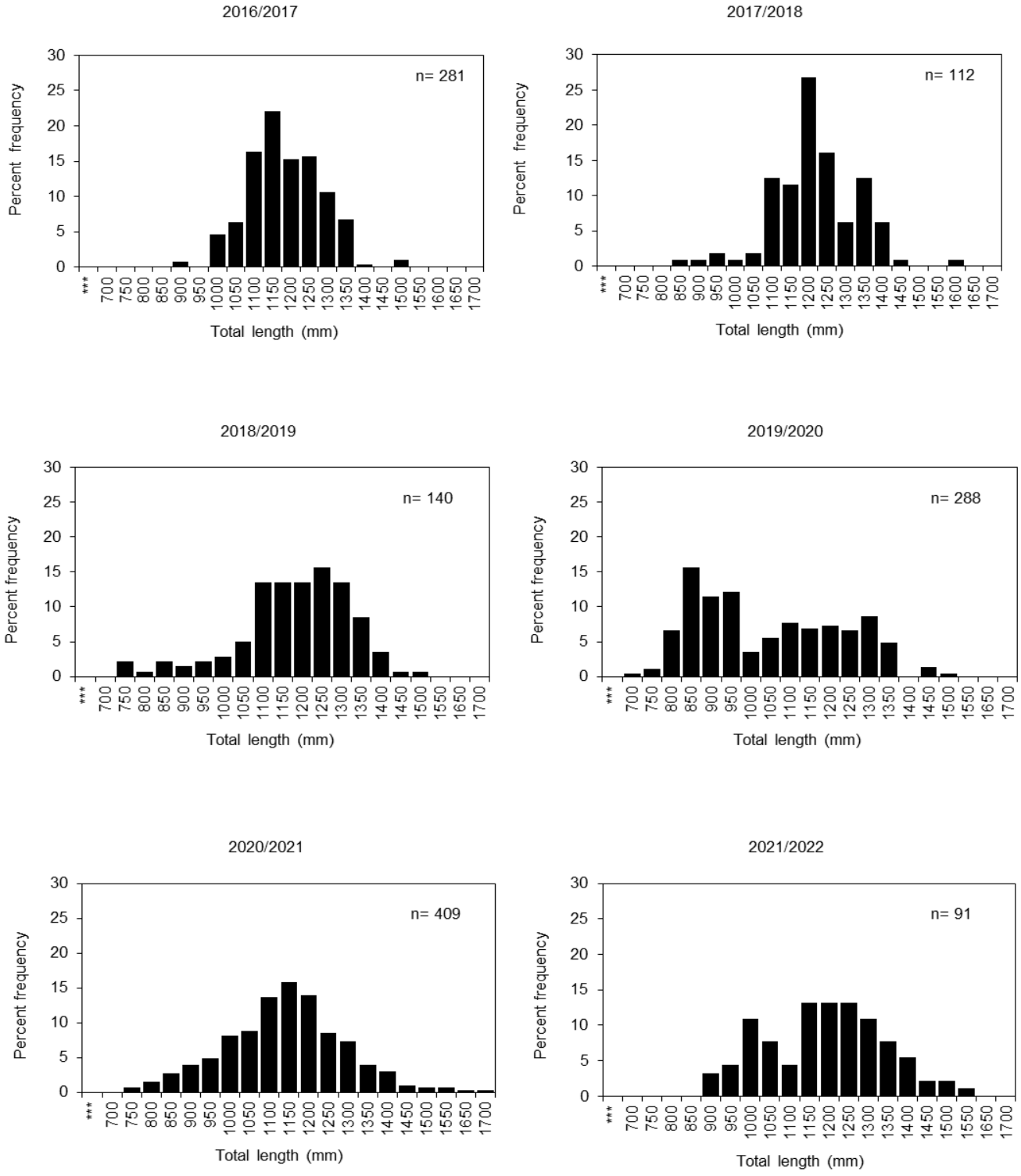
Season	Gill Net	Hook-and-line	Trawl	Other Gears	All Gears Combined	Prior 5-season Average	Percent Change from Previous 5-season Average
2013/14	183,575	76,373	2,237	256	262,441	431,873	-39
2014/15	153,001	38,508	4,909	103	196,521	401,469	-51
2015/16	202,946	36,182	7,404	662	247,195	340,369	-27
2016/17	195,642	19,143	2,924	205	217,915	285,687	-24
2017/18	183,900	32,371	2,535	1,880	220,687	247,921	-11
2018/19	112,840	48,995	5,852	389	168,077	229,196	-27
2019/20	99,255	34,108	1,926	3,248	138,537	210,079	-34
2020/21	120,089	42,590	5,022	1,234	168,934	198,482	-15
2021/22	104,597	30,033	4,310	724	139,664	182,830	-24
2022/23	146,928	21,851	6,851	29	175,659	167,180	5

Table 3. Recreational white seabass catch and estimated average weight (pounds) for recreational caught white seabass, 2013-2014 to 2022-2023. Source: CRFS data extracted from the RecFIN database at http://www.recfin.org. In 2020, COVID-19 pandemic health safety guidelines prevented CRFS sampling from April - June and restricted observing and collecting biological data on anglers' catch from July - August.

Season	Total number of fish caught	Percent change in number of fish from prior season	Average weight in pounds	Percent in weight from prior season
2013/14	9,567	-10	22.4	16
2014/15	3,136	-67	18.9	-15
2015/16	3,793	21	23.1	22
2016/17	5,675	50	22.9	-1
2017/18	4,874	-14	23.0	0
2018/19	6,349	30	20.1	-13
2019/20	4,898	-23	19.0	-5
2020/21	9,761	99	18.8	-1
2021/22	6,080	-38	27.8	48
2022/23	3,474	-43	17.8	-36

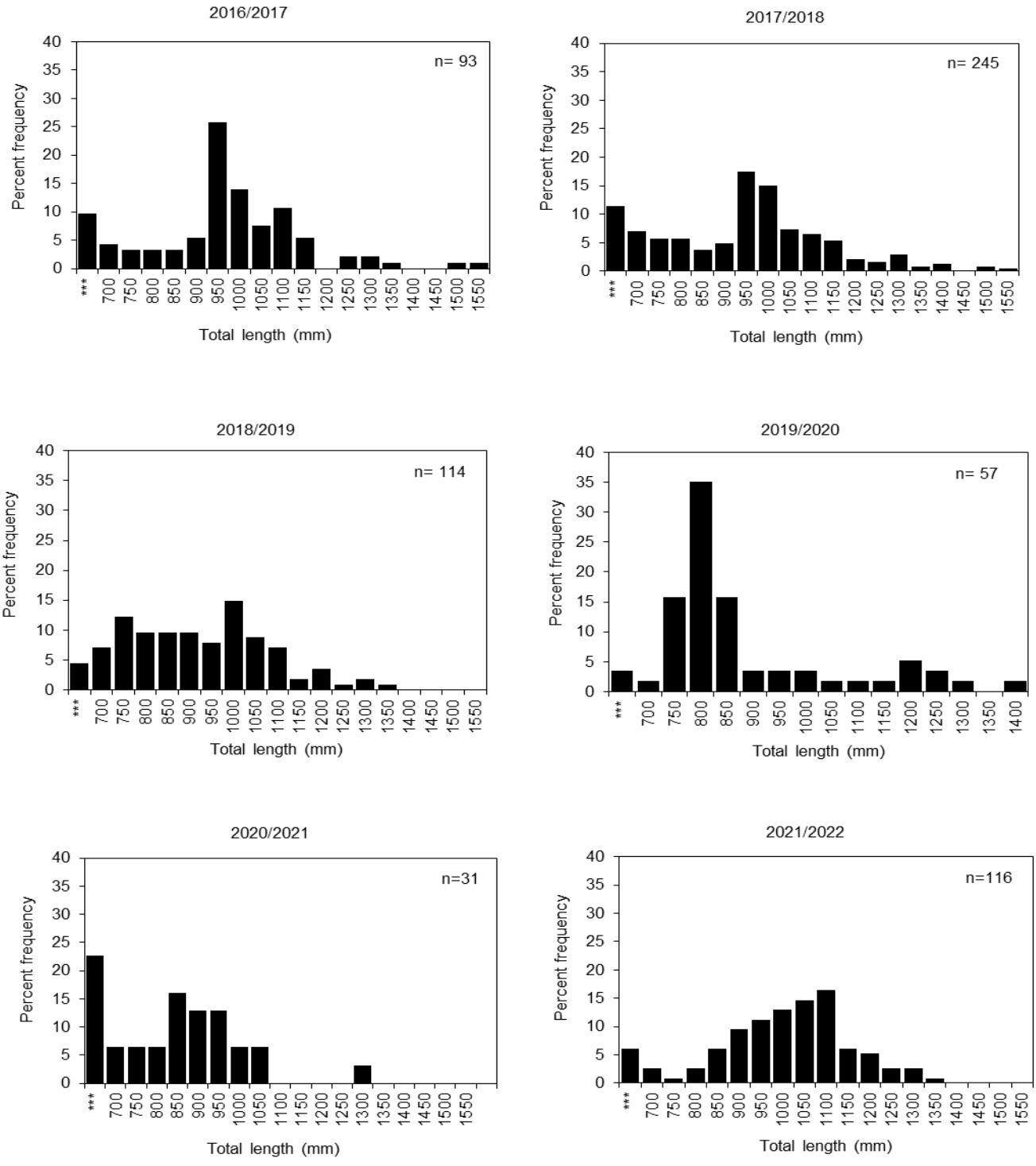
Table 4. Number of commercial vessels landing white seabass by principal gear and most common ex-vessel price per pound paid for white seabass, 2013-2014 to 2022-2023. Source: Department's MLDS.

Season	Gill net	Hook-and-line	Trawl	Other gears	Total number of vessels	Most common ex-vessel price
2013/14	26	181	9	6	222	$4.50
2014/15	29	164	8	17	218	$6.00
2015/16	28	135	10	8	181	$6.00
2016/17	28	92	10	5	135	$4.00
2017/18	33	135	9	8	185	$6.00
2018/19	28	140	11	4	183	$5.00
2019/20	31	130	9	2	172	$6.00
2020/21	32	141	11	2	186	$4.00
2021/22	30	89	9	4	132	$6.00
2022/23	28	74	9	0	111	$5.00



***all sub-legal fish are grouped together

Figure 1. Commercial white seabass sampled length frequencies, 2017-2018 to 2022 2023. Source: California Department of Fish and Wildlife



***all sub-legal fish are grouped together

Figure 2. Recreational white seabass sampled length frequencies, 2017-2018 to 2022-2023. Source: California Department of Fish and Wildlife and CRFS data extracted from the RecFIN database at http://www.recfin.org.

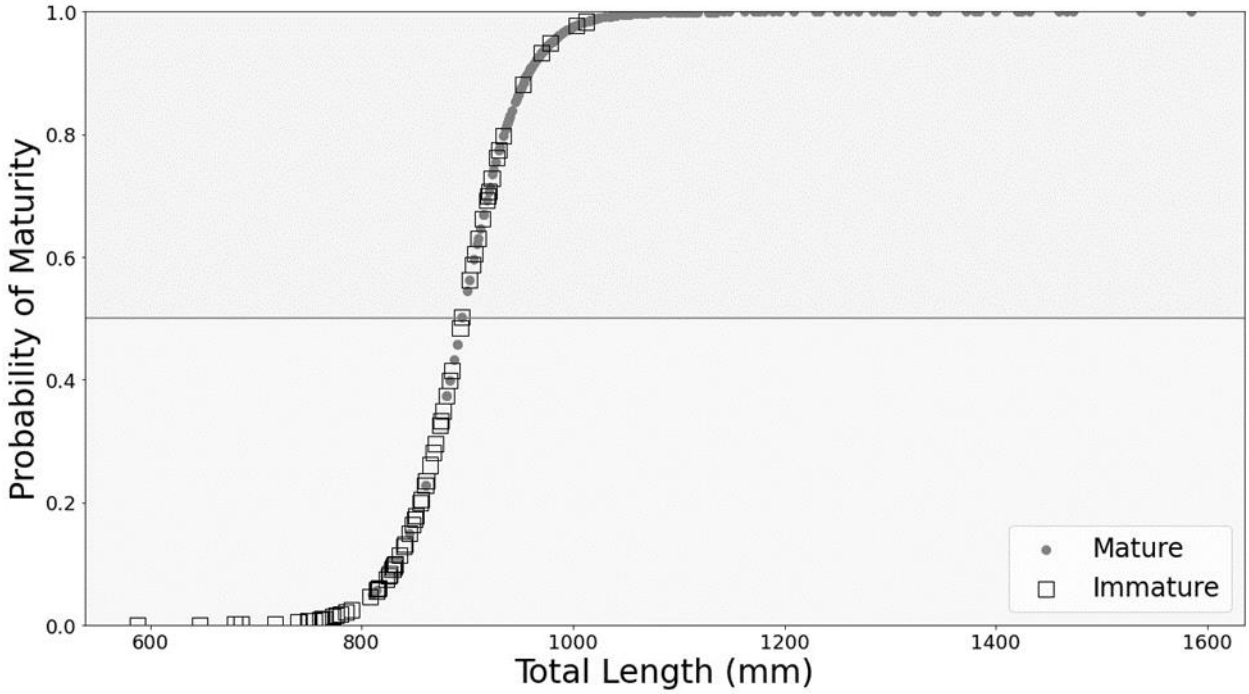


Figure 3. Logistic regression curve showing the probability of maturity for female white seabass based on total length. Females with histological maturity indicators were considered mature. The horizontal line indicates 50% maturity. Squares and dots represent actual data points and their respective maturity assignment.

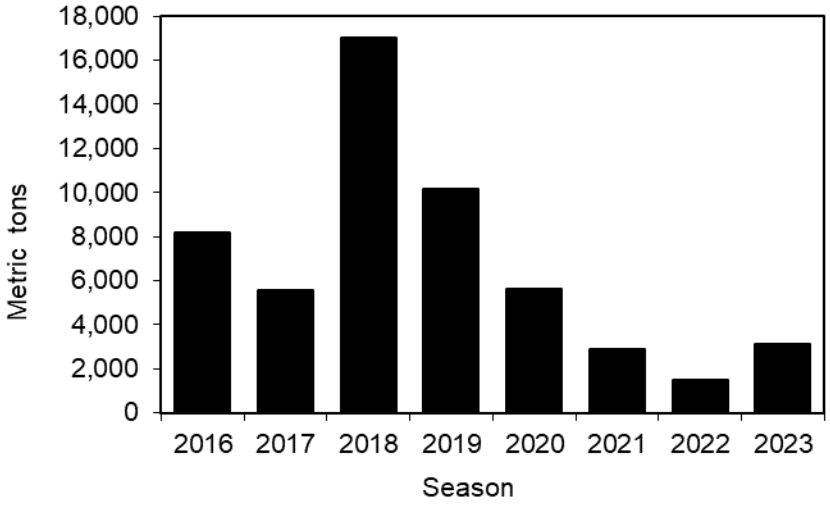


Figure 4. Commercial catch of northern anchovy, 2016 to 2023. Northern anchovy season is January 1 through December 31. Source: Department's MLDS.

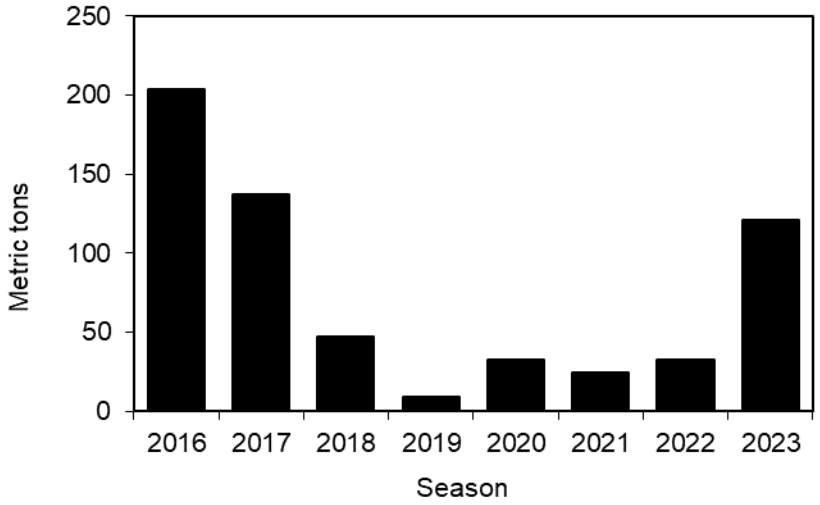


Figure 5. Commercial catch of jack mackerel, 2016 to 2023. Jack mackerel season is January 1 through December 31. Source: Department's MLDS.

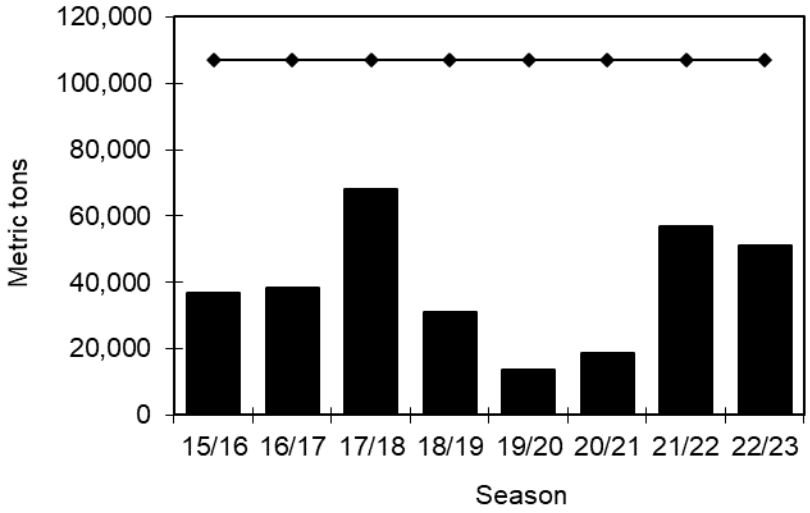


Figure 6. Commercial catch (bars) and harvest guideline (line) of market squid, 2015-2016 to 2022-2023. Market squid season is April 1 through March 31 of the following year. Source: Department's MLDS.

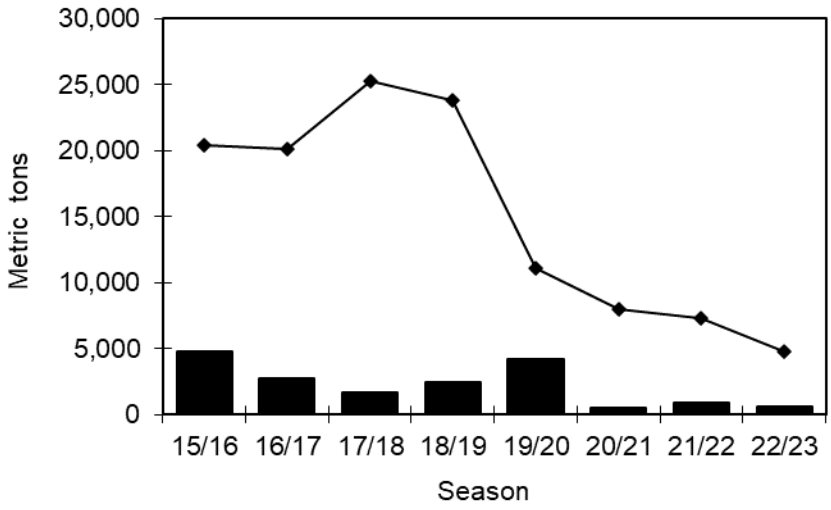


Figure 7. Commercial catch (bars) and harvest guidelines (line) of Pacific mackerel, 2015-2016 to 2022-2023. Pacific mackerel season is July 1 through June 30 of the following year. Source: Department's MLDS.

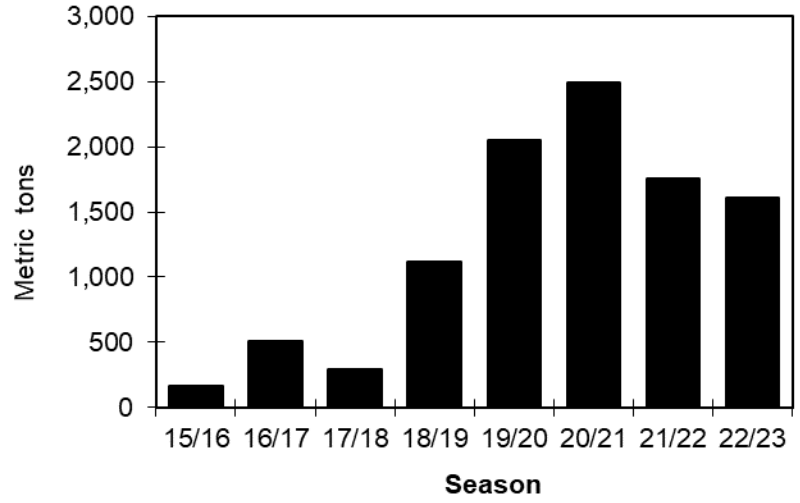


Figure 8. Commercial catch of Pacific sardine, 2015-2016 to 2022-2023. The harvest guideline has been set at 0 mt since the 2015-2016 season. Pacific sardine season is July 1 through June 30 of the following year. Source: Department's MLDS.

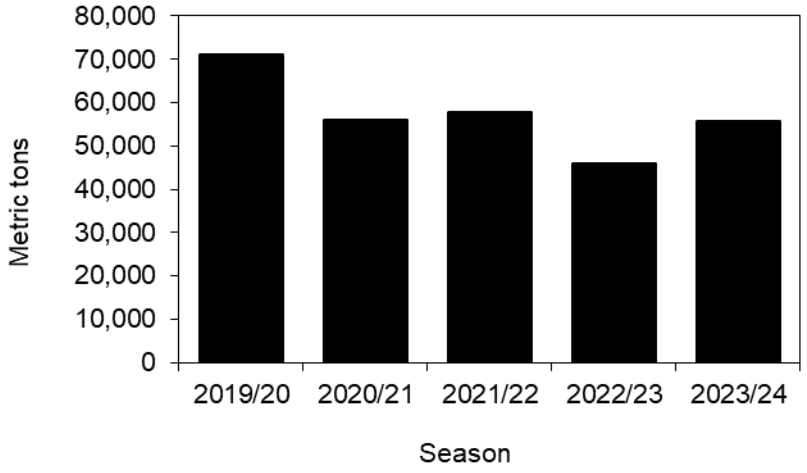


Figure 9. Biomass estimates for Pacific mackerel in metric tons, 2019-2020 to 2023-2024 seasons. Source: Pacific Fishery Management Council (PFMC) CPS SAFE documents and PFMC proceedings.

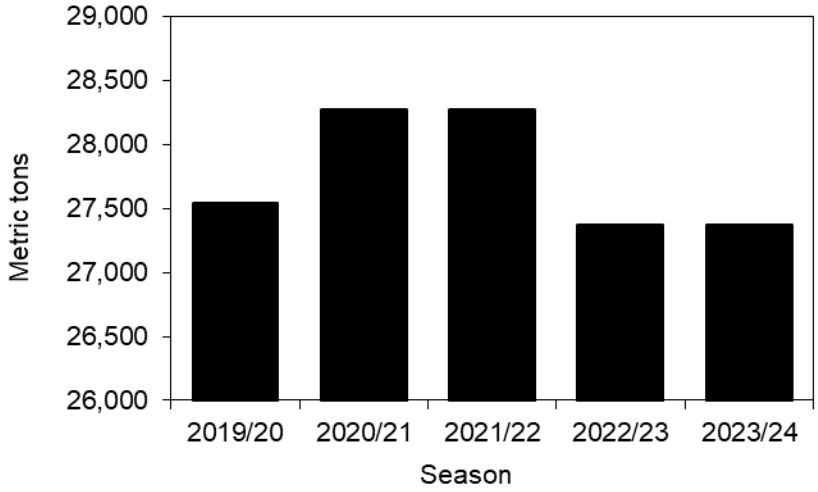


Figure 10. Biomass estimates for Pacific sardine in metric tons, 2019-2020 to 2023-2024 seasons. Source: Pacific Fishery Management Council (PFMC) CPS SAFE documents and PFMC proceedings.