

White Seabass Fishery Management Plan 2023-2024 Annual Review



White Seabass, *Atractoscion nobilis*.

(Photo Credit: Scott Aalbers, Pflieger Institute of Environmental Research (PIER)).

Prepared by

California Department of Fish and Wildlife
Marine Region
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White Seabass Fishery Management Plan 2023-2024 Annual Review

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 and tribal members 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 did not meet this year to review the 2023-2024 fishery season (September 1 to August 31). However, this document was sent to the WSSCAP before the October 2025 Commission meeting, providing the opportunity for the WSSCAP to review and comment on the document through the Commission's public participation process for meetings. The Department is also beginning discussions with the WSSCAP and other interested parties to discuss potential changes to the management framework for white seabass since it has been over 20 years since the WSFMP was adopted and there are new tools and data available.

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 2023-2024 fishery season are described below, including an overall summary (Table 1), and section on each point of concern. Two criteria were met in 2023-2024.

Table 1. Overall summary of the WSFMP six points of concern for the 2023-2024 fishing season.

Criteria	Analysis	Result
Catch is expected to exceed the current harvest guideline or quota.	<p>Total catch for 2023-2024 = 220,936 pounds.</p> <p>Optimum Yield = 1.2 million pounds.</p> <p>Total catch is below Optimum Yield.</p>	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.	<p>Recreational and commercial fishery length frequencies showed no significant change that would indicate a problem in the fishery.</p> <p>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)).</p>	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.	<p>Of the five fisheries analyzed, landings increased for three fisheries but declined for two of the fisheries; one fishery remained closed in the 2023-24 season.</p> <p>Biomass estimates increased for both Pacific mackerel and Pacific sardine. White seabass, however, are opportunistic feeders and are known to feed on a variety of pelagic fish and invertebrate species when available.</p>	Criterion not met
New information on the status of white seabass is discovered.	The Department completed a length at age 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 2023-2024 season, the total recreational and commercial harvest was 220,936 pounds, 19 percent of the harvest guideline; 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 documents 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 2023-2024 season, Department staff measured a total of 231 fish for length. Most samples were taken from gill net landings. The commercial fishery continues to harvest white seabass across a wide range of sizes. In 2023-24, all fish sampled were larger than the minimum size limit of 28 inches (711.2 mm) and 81 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 2023-2024 season, Department staff measured a total of 71 fish for length; 56 percent sampled were from private/rental boats, 12 percent from Commercial Passenger Fishing Vessels (CPFV), and three percent from man-made/jetty. Of the 71 fish measured, 12 were less than the minimum size limit of 28 inches (711.2 mm); however, nine of the 12 undersized fish were released. The remaining 59 fish were legal size with 51 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. Since it had been almost 100 years since this original assessment, the Department, in collaboration with PIER, prioritized a study to update this essential fishery information.

The study estimated the length at 50 percent maturity for both male and female white seabass sampled from California waters. 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) (Appendix A, Figure 3). 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 Gonadosomatic Index (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.	2023-2024: 138,129 pounds = 13% decrease; 5-season average = 158,174 pounds. 2022-2023: 175,659 pounds = 5% increase; 5-season average = 167,180 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.	2023-2024: 4,411 fish = 27% increase; 27.2 pound average = 53% increase. 2022-2023: 3,474 fish = 43% decrease; 17.8 pound average = 36% decrease.	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.	2023-2024: 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 Department determined 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 2023-2024 season, commercial landings totaled 138,129 pounds, which is a 13 percent decrease compared to the prior 5-season running average of 158,174 pounds. During the previous 2022-2023 season, commercial landings totaled 175,659 pounds, which was a 5 percent increase compared to the prior 5-season running average of 167,180 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 2023-2024 season, landings decreased for all commercial gears.

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 Department determined 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 the average weight of fish caught in the 2023-2024 season increased by 27 percent and 53 percent, respectively.

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 cannot be addressed in this report.

Based on the analysis of all three overfishing criteria, the Department determined that the overfishing point of concern for the fishery was not met. However, the Department has 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 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 and continued to increase in 2024. (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 2017, jack mackerel landings were high but then decreased during the next two years. Between 2020 - 2022, jack mackerel landings remained low, but in 2023, landings increased significantly from 32 metric tons (mt) to 121 mt. In 2024, landings decreased by 50 percent to 60 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 2020-2021 season, market squid landings increased from the previous three seasons but then began to decline once again over the next two seasons. (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), while Pacific sardine biomass estimates are conducted every year (Appendix A, Figure 10). For the 2024-2025 season, both biomass estimates for Pacific mackerel and Pacific sardine increased after having remained at approximately the same level over the past four years.

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 Department determined this point of concern was not met; however, because stock

availability of prey species tend to fluctuate due to environmental factors and biological characteristics, 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 (Appendix A, Table 4). As a social information indicator, the number of commercial vessels landing white seabass has been tracked over time. In the 2023-2024 season, the number of vessels fishing for white seabass increased slightly from 111 to 116 vessels. This slight increase in the number of vessels occurred in the hook-and-line and trawl fisheries. 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 2023-2024 season was at \$6.00 per pound for all gears combined, an increase of \$1.00 from the previous season. No similar social or economic data is available for the recreational fleet.

Information about the take of white seabass in Mexican waters was considered by the Department. 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 2023-2024. Recreational anglers may fish in Mexico under the authority of a Mexican sport fishing license. During the 2023-2024 season, Commercial Passenger Fishing Vessel logbook data reported 709 white seabass taken in Mexico and landed in California, an increase of 654 fish from the 55 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 WSFMP. The Department looks forward to opening those discussions with fishery participants, California Tribes and other interested stakeholders around future management measures for the white seabass fishery.

Appendix A – Data Analyses

Table 1. Total catch (pounds) of white seabass, 2014-2015 to 2023-2024. 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
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
2023/24	82,807	138,129	220,936

Table 2. Commercial white seabass landings (pounds) by gear type, 2014-2015 to 2023-2024. Source: MLDS.

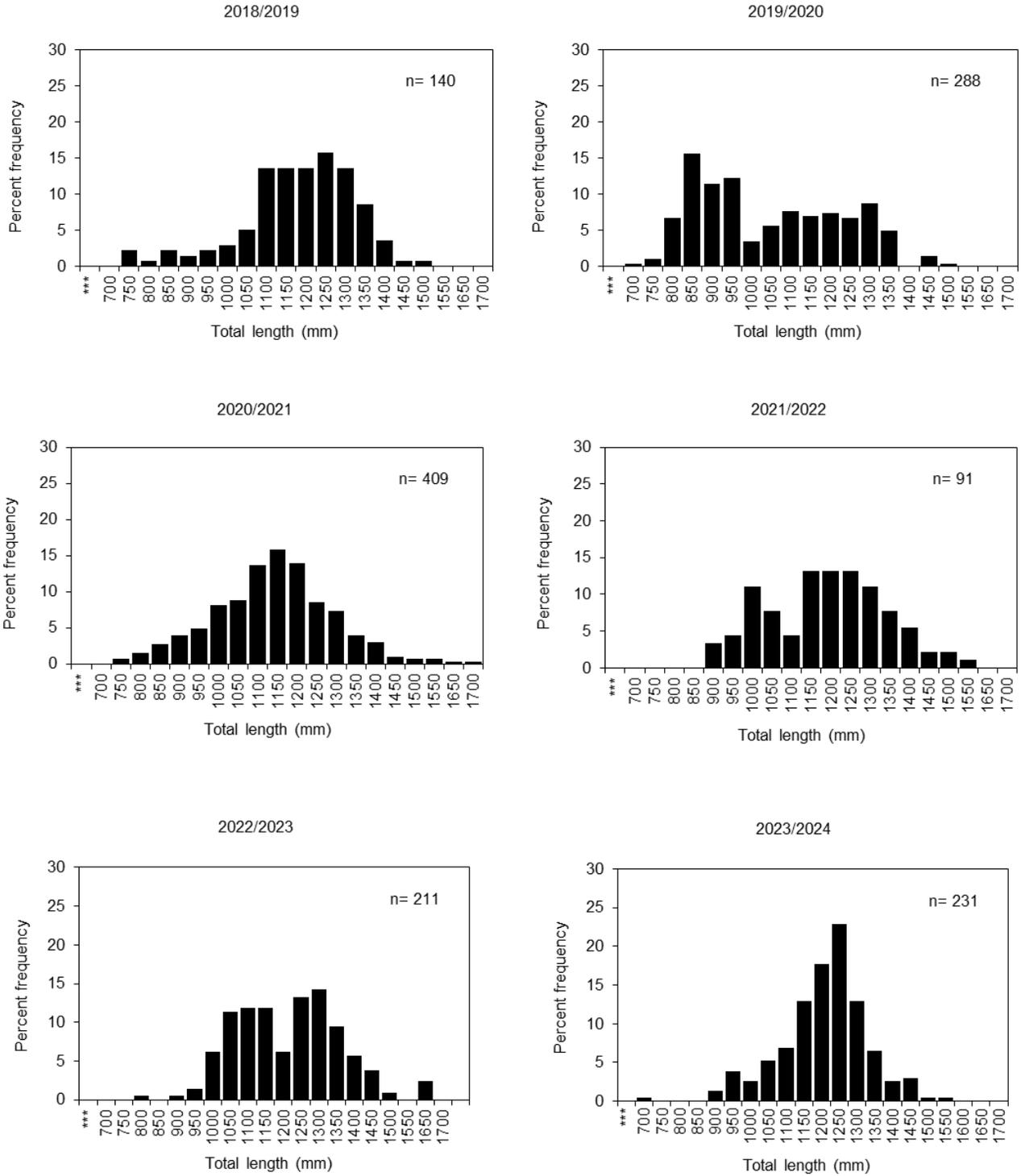
Season	Gill Net	Hook-and-line	Trawl	Other Gears	All Gears Combined	Prior 5-season Average	Percent Change from Previous 5-season Average
2014/15	153,001	38,508	4,909	103	196,521	401,469	-51
2015/16	202,946	36,182	7,404	662	247,195	340,369	-27
2016/17	195,642	19,143	2,924	205	217,915	285,687	-24
2017/18	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
2023/24	116,940	19,108	2,080	0	138,129	158,174	-13

Table 3. Recreational white seabass catch and estimated average weight (pounds) for recreational caught white seabass, 2014-2015 to 2023-2024. 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
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
2023/24	4,411	27	27.2	53

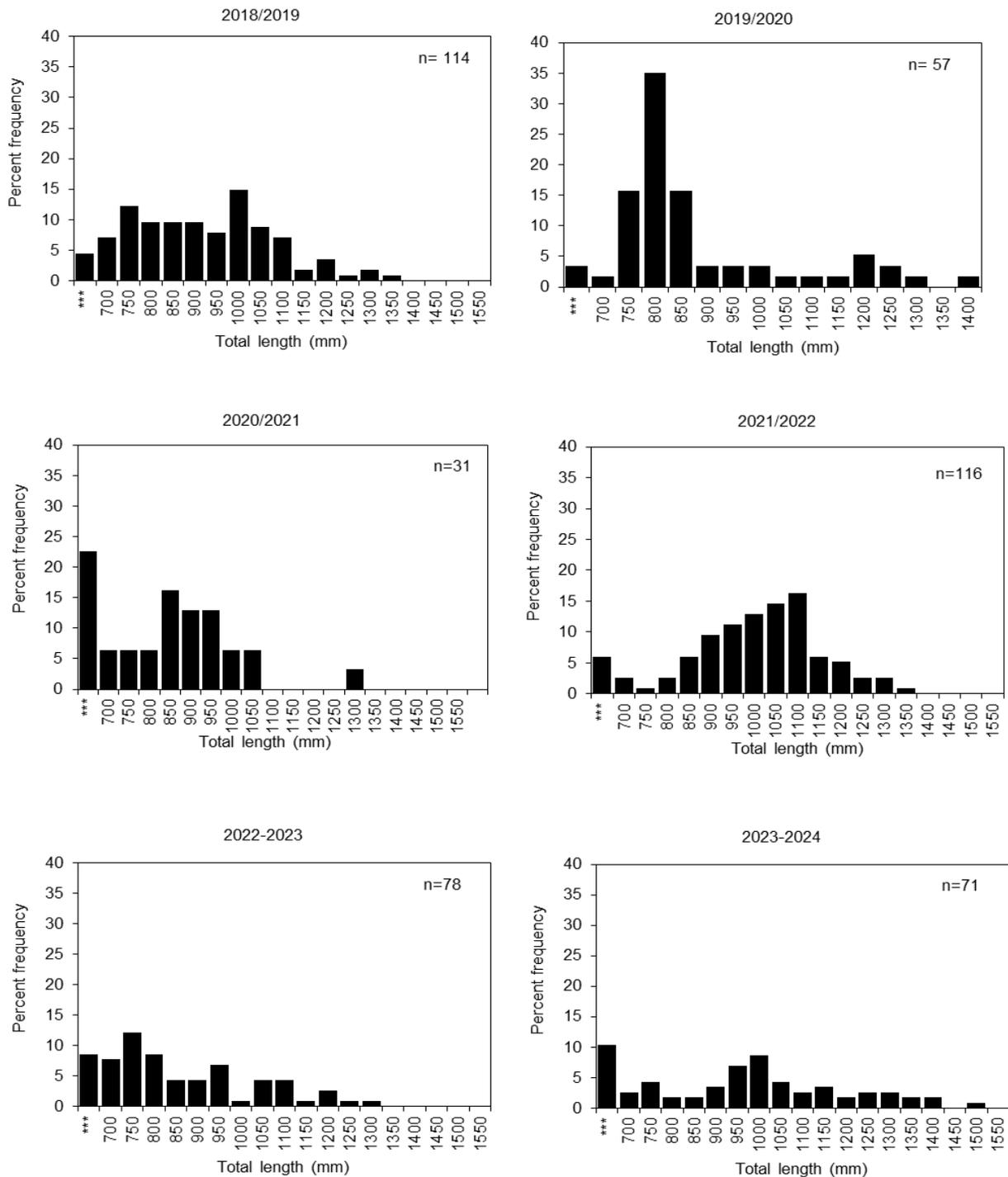
Table 4. Number of commercial vessels landing white seabass by principal gear and most common ex-vessel price per pound paid for white seabass, 2014-2015 to 2023-2024. Source: MLDS.

Season	Gill net	Hook-and-line	Trawl	Other gears	Total number of vessels	Most common ex-vessel price
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
2023/24	25	81	10	0	116	\$6.00



***all sub-legal fish are grouped together

Figure 1. Commercial white seabass sampled length frequencies, 2018-2019 to 2023-2024. Source: California Department of Fish and Wildlife



***all sub-legal fish are grouped together

Figure 2. Recreational white seabass sampled length frequencies, 2018-2019 to 2023-2024. Source: California Department of Fish and Wildlife and CRFS data extracted from the RecFIN database at <http://www.recfin.org>.

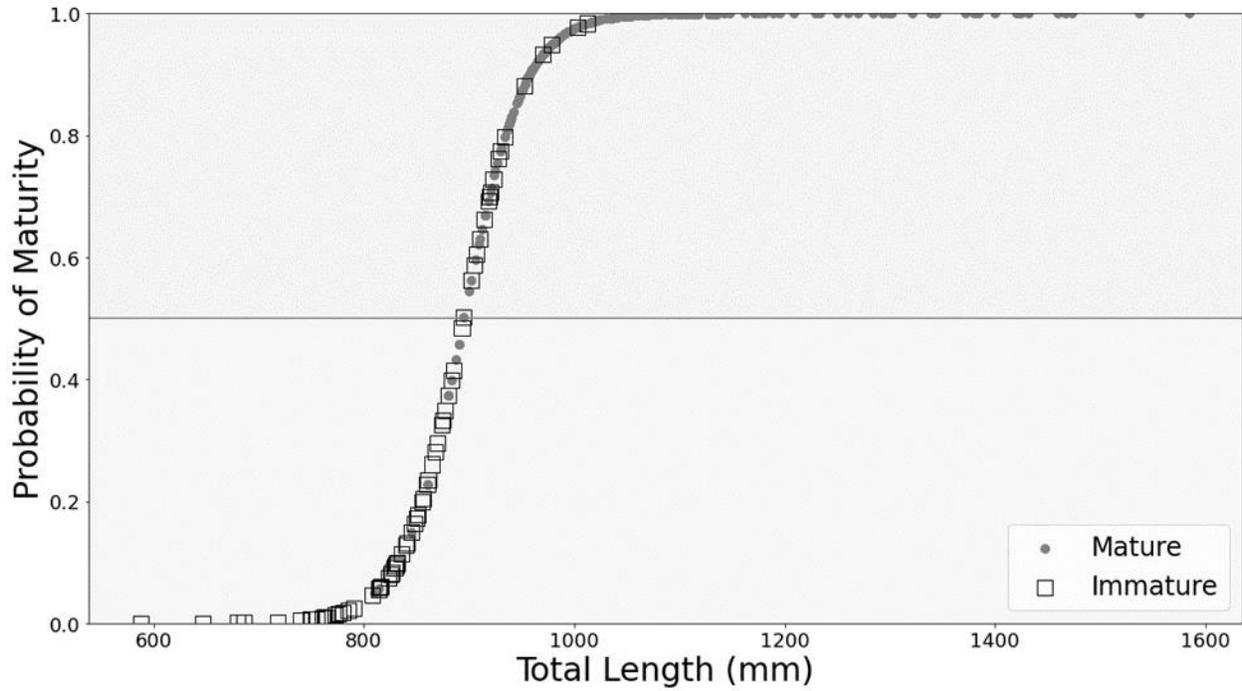


Figure 3. Logistic regression curve showing the probability of maturity for female white seabass based on total length. Females with histological maturity indicators were considered mature. The horizontal line indicates 50% maturity. Squares and dots represent actual data points and their respective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

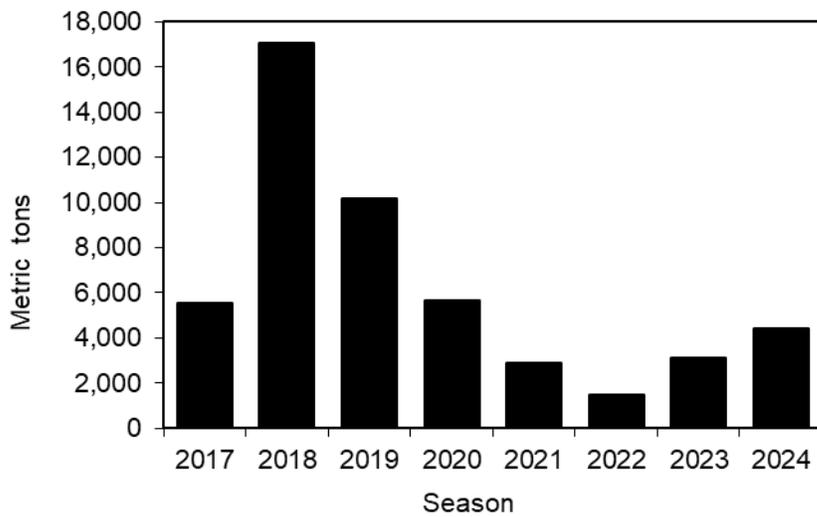


Figure 4. Commercial catch of northern anchovy, 2017 to 2024. Northern anchovy season is January 1 through December 31. Source: MLDS.

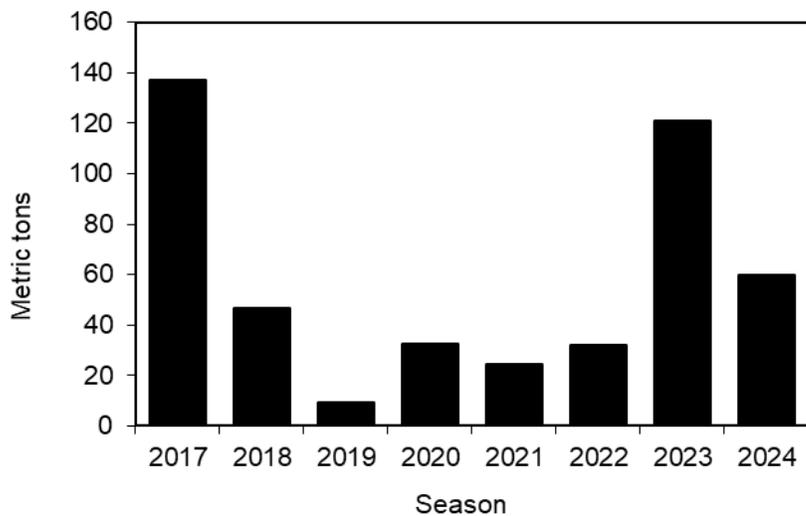


Figure 5. Commercial catch of jack mackerel, 2017 to 2024. Jack mackerel season is January 1 through December 31. Source: MLDS.

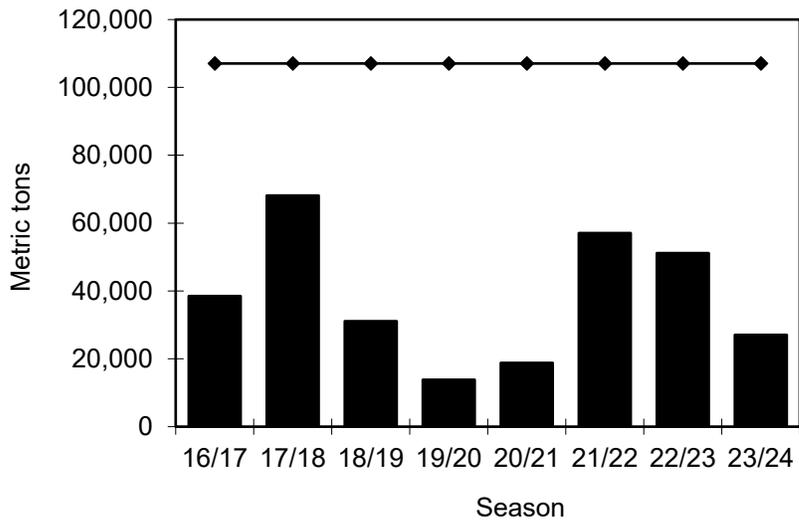


Figure 6. Commercial catch (bars) and harvest guideline (line) of market squid, 2016-2017 to 2023-2024. Market squid season is April 1 through March 31 of the following year. Source: MLDS.

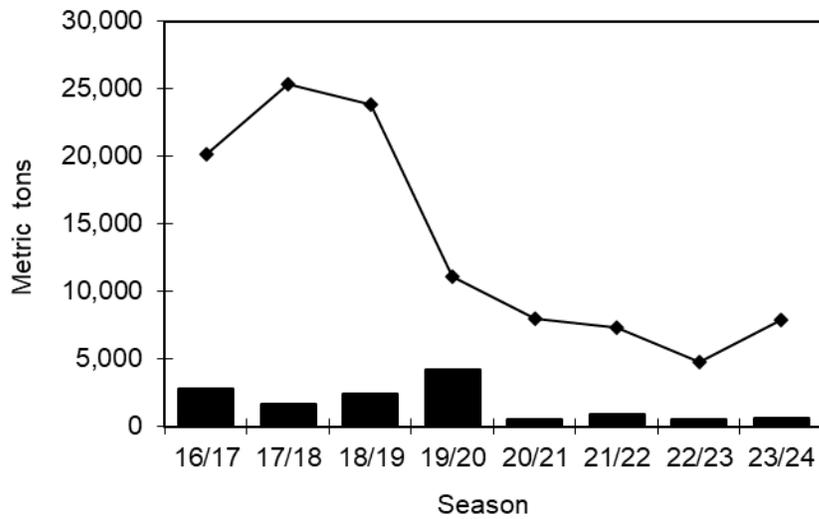


Figure 7. Commercial catch (bars) and harvest guidelines (line) of Pacific mackerel, 2016-2017 to 2023-2024. Pacific mackerel season is July 1 through June 30 of the following year. Source: MLDS.

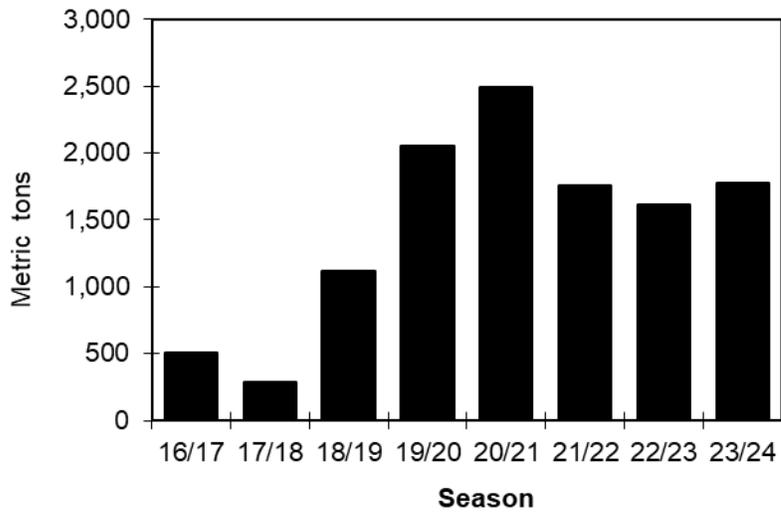


Figure 8. Commercial catch of Pacific sardine, 2016-2017 to 2023-2024. The harvest guideline has been set at 0 mt since the 2015-2016 season. Pacific sardine season is July 1 through June 30 of the following year. Source: MLDS.

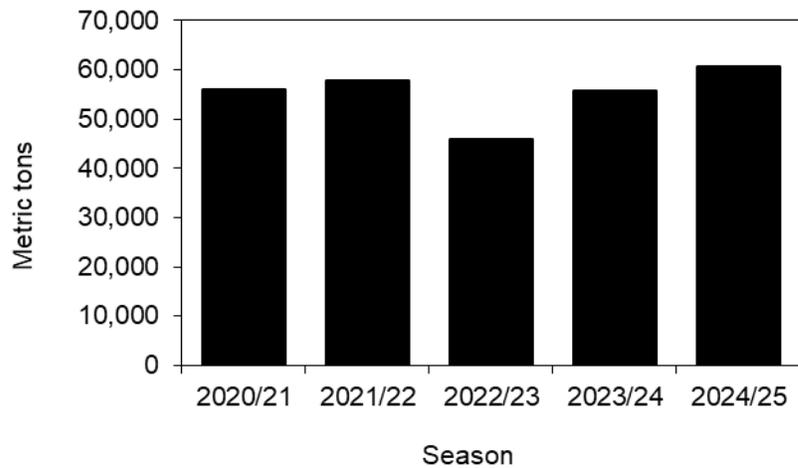


Figure 9. Biomass estimates for Pacific mackerel in metric tons, 2020-2021 to 2024-2025 seasons. Source: Pacific Fishery Management Council (PFMC) CPS SAFE documents and PFMC proceedings.

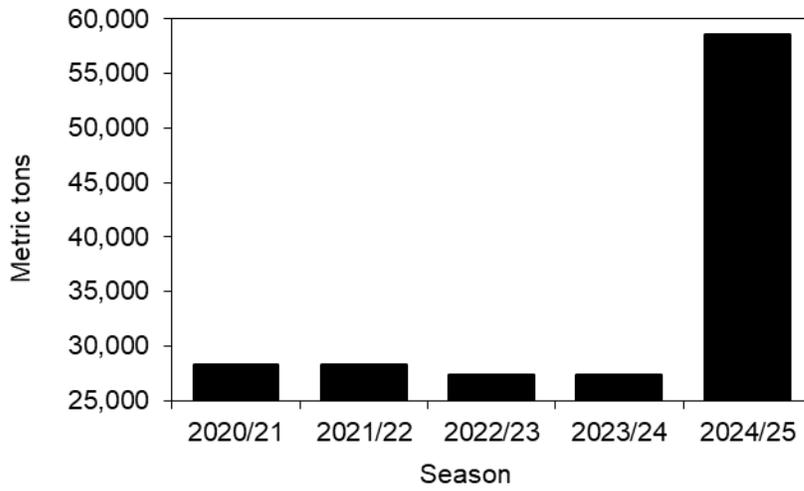


Figure 10. Biomass estimates for Pacific sardine in metric tons, 2020-2021 to 2024-2025 seasons. Source: Pacific Fishery Management Council (PFMC) CPS SAFE documents and PFMC proceedings.