



AGENDA ITEM SUMMARY

BACKGROUND

State rules governing fisheries for Coastal Pelagic Species (CPS), including Pacific sardine, Pacific mackerel, jack mackerel, northern anchovy, market squid, and krill, are based on federal regulations. The Oregon Fish and Wildlife Commission (Commission) typically adopts these federal rules by reference. This agenda item presents one issue for consideration: adoption of updated federal harvest specifications and management measures for the Pacific sardine fishery, from July 2021 through June 2022. These measures continue a closure of the primary directed fishery and provide for very low harvest allowances in other sectors across the West Coast, due to the depressed stock status. Acronyms used in this document, with links to additional information, are listed in Appendix 1.

The Pacific sardine stock status is assessed annually by the National Marine Fisheries Service (NMFS). The Pacific Fishery Management Council (Council) reviews the assessment and the best available science as recommended by the Council's Scientific and Statistical Committee (SSC), the harvest specifications framework and harvest control rule specified in the Council's fishery management plan (FMP), advice from technical and industry advisors, and public input when determining federal harvest limits and management measures. ODFW participates via a voting seat on the Council and representatives on the CPS Management Team and SSC.

The Council adopted sardine harvest specifications and management measures for the 2021-22 season in April 2021 (Attachment 4). The FMP and harvest specifications framework recognize the forage value of sardines, and account for uncertainty in assessment of the stock and management/monitoring of the fishery. The specifications adopted for 2021-22 use a significantly increased buffer for uncertainty in the biomass estimate, resulting in more conservative catch limits (described in the Analysis). The Council transmitted its recommendations to the National Marine Fisheries Service (NMFS), which will publish them in the Federal Register prior to July 1.

Pacific Sardine Biology and Ecosystem Role

Pacific sardines (*Sardinops sagax*) are small schooling fish. When their abundance is high, they can be found from the tip of Baja California to southeastern Alaska, with the bulk of the population off central and southern California. Fisheries in waters off Oregon encounter sardines in only a small portion of this range.

Pacific sardines commonly live for about six years, although they can reach 14 years. Most sardines landed in fisheries are three to six years old. Most adults measure 12 inches long or less, but sardines up to 16 inches long have been found. Pacific sardines reproduce beginning at age one or two and spawn multiple times per season. Spawning occurs in schools in the upper 50 meters of the water column; eggs are fertilized externally and hatch in about 3 days.

Pacific sardines feed on plankton. They are prey for many other fish, marine mammals, and seabirds, and are an important component of the forage base in the California Current Ecosystem (CCE). At times of high abundance, Pacific sardine can compose a substantial portion of biomass in the CCE. The CCE forage base consists of many species of fish and invertebrates, and the composition shifts on various time scales, likely related to environmental influences on the abundance of each of these species.

The estimated biomass of CPS finfish stocks in the CCE between 2008 and 2019 is illustrated in Figure 1, from the *Ecosystem Status Report of the California Current for 2019-20: A Summary of Ecosystem Indicators Compiled by the California Current Integrated Ecosystem Assessment Team*. The predominant stock most recently has been northern anchovy (central subpopulation).

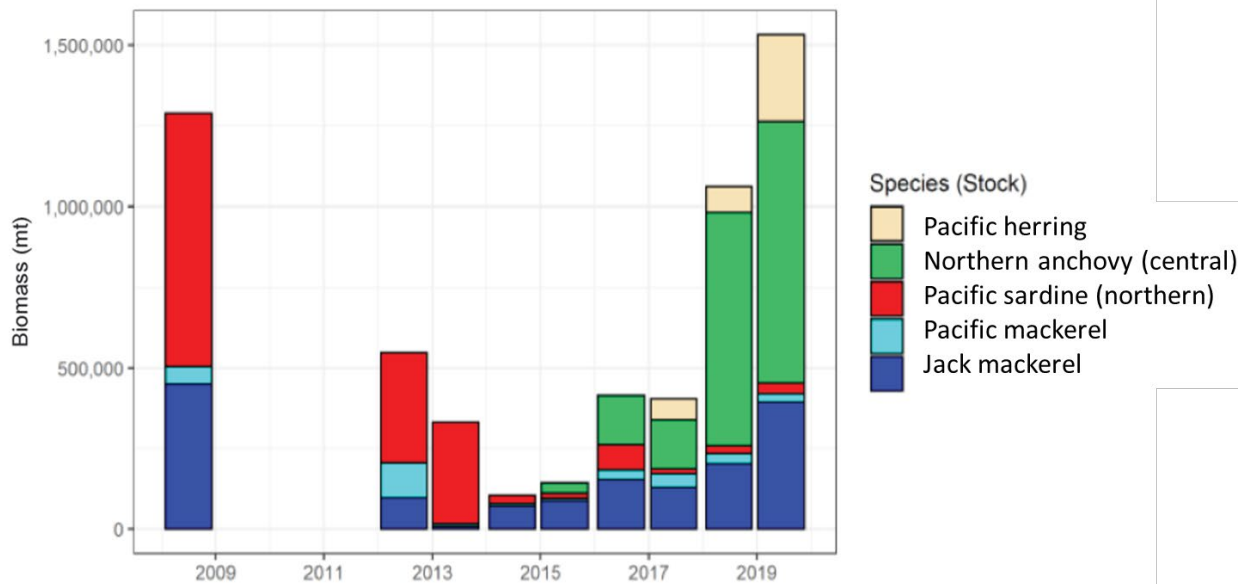


Figure 1. Cumulative biomass (mt) of the five most abundant CPS stocks in the CCE, 2008 and 2012-2019 (surveys not conducted in 2009-2011). Biomasses of N. anchovy prior to 2015 and P. herring prior to 2017 not reported. Figure reproduced from [NOAA Technical Memorandum NMFS-NWFSC-160, October 2020](#).

Sardine population size is primarily driven by environmental conditions and varies naturally. Periods of low recruitment can lead to low population abundance over extended periods. An analysis of fish scale deposits in deep ocean sediments off southern California found layers of sardine and anchovy scales, with scale deposition rates indicating a series of major population spikes and declines over a 1700-year period (A.D. 270 to 1970). This illustrates the cyclical boom and bust nature of sardines and anchovies. Biomass estimates of Pacific sardine between Baja California, Mexico and Monterey, California from this study are shown in Figure 2.

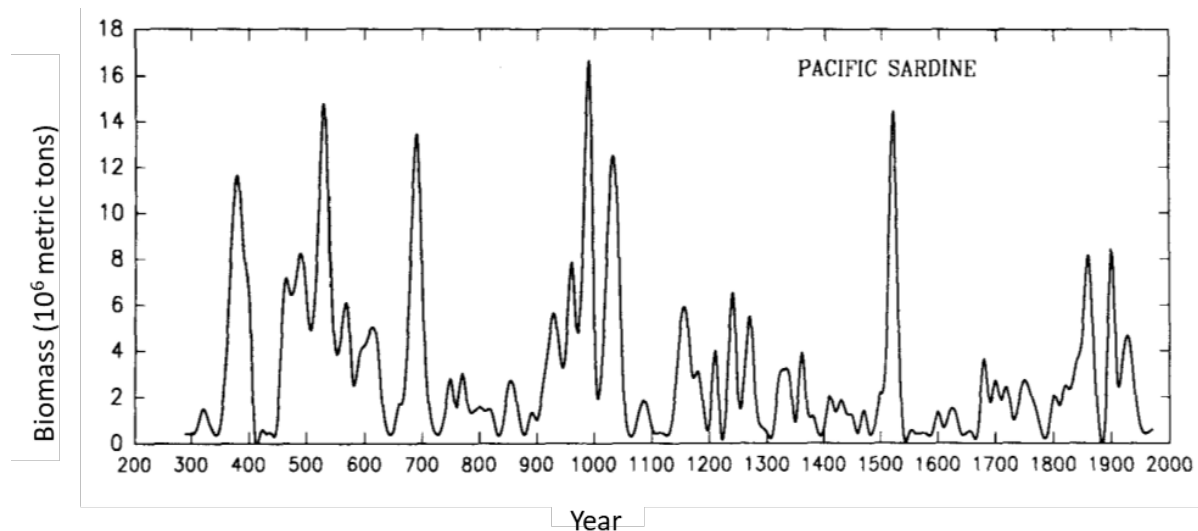


Figure 2. 1700-year hindcast series of Pacific sardine biomass off California and Baja California ([Baumgartener, 1992](#)).

Fluctuating oceanographic conditions can have significant effects on the abundance and distribution of CPS stocks. The El Niño/Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO) are important climate drivers, and alterations in their patterns of temperature, upwelling, and other oceanographic features impact CPS stocks directly and indirectly. Based on past data, sardines appear to become abundant during warm PDO periods, and anchovy during cool PDO periods. However, the mechanisms involved are uncertain, and whether the past correlations will persist into the future, with changing ocean conditions, is uncertain.

The Council adopted a [Fishery Ecosystem Plan](#) (FEP) in 2013 to enhance species-specific management with more ecosystem science, broader ecosystem considerations, and policies that coordinate management across the Council’s FMPs and the CCE. One outcome of the FEP is an annual report by NMFS’ California Current Integrated Ecosystem Assessment (CCIEA) program, which provides biophysical and socioeconomic information on climate conditions, climate change, habitat conditions, and ecosystem interactions. The [March 2021 CCIEA report](#) suggests a return to average or above-average productivity in the CCE compared to recent prior years, with signs of a healthy forage base, noting:

- Oceanographic signals show a transition from El Niño conditions and positive PDO signals to La Niña conditions and a negative PDO for the first time in many years. These conditions are generally associated with higher productivity in the CCE.
- Foraging conditions appeared to be above average, based on measures of the zooplankton community including a high abundance of nutritious northern copepods off Oregon, continued high abundance of anchovies and production of offspring at seabird and sea lion colonies.
- Signs of concern included widespread harmful algal blooms and biotoxin accumulation in clams, crabs and other harvested species, continued presence of species associated with warmer waters, and mixed outlooks for returns of Chinook salmon in 2021.

PUBLIC INVOLVEMENT

A significant public process was conducted by the Council in the development of the federal harvest regulations for commercial fisheries for Pacific sardine in 2021-2022. Twenty-two written and verbal comments were provided to the Council by individuals and groups representing commercial and recreational fisheries and conservation organizations. In addition, the Council received input from its Coastal Pelagic Species Advisory Subpanel (CPSAS), which represents the commercial and recreational fishing industry, tribes, the public, and conservation interests.

ISSUE 1

Harvest specifications and management measures for commercial sardine fisheries in 2021-2022.

ANALYSIS

This section provides information on Pacific sardine fisheries, the federal management process, and the federal harvest specifications and management measures for July 2021-June 2022 which staff recommend adopting by reference.

Pacific Sardine Fisheries – Harvest History

The Council produces an annual [CPS Stock Assessment and Fishery Evaluation](#) (SAFE) document which contains a detailed history of sardine fishing on the west coast, from which the information here is excerpted/summarized:

In the 1930s and 1940s, Pacific sardine supported the largest commercial fishery in the western hemisphere, accounting for nearly 25% of all the fish landed in the United States by weight. Peaking in 1936-37, landings from the west coast plus British Columbia reached a record 717,896 metric tons (mt). In the 1940s, the sardine fleet consisted of 376 vessels and more than 100 canneries and reduction plants, which employed thousands from San Francisco to San Diego, California. The fishery declined and collapsed in the late 1940s following extremely high catches and changes in environmental conditions and remained at low levels for nearly 40 years.

Sardines began to return to abundance in the late 1970s, when the PDO shifted to a warm cycle again. Fishery managers adopted a highly precautionary management approach as sardine fishing began again. The sardine resource grew substantially in the 1980s and early 1990s, with strong recruitment. In 1998, biomass was slightly more than 1 million mt. The sardine recovery appeared to level off during 1999-2002.

In 2007, California landings were the highest since the 1960's, at nearly 81,000 mt of the 152,564 mt harvest guideline (HG). The HG generally declined from 2008 through 2015, except for 2012. There was further evidence of a natural sardine decline in 2013 as they disappeared from Canadian waters.

The directed sardine fishery on the west coast, including Oregon, was closed beginning July 1, 2015, when the biomass estimate dropped below the 150,000 metric ton threshold specified in CPS Fishery Management Plan (FMP), which will be described in more detail below. While directed sardine harvest has been closed, small sardine landings have been allowed in CPS fisheries targeting other species such as anchovy and mackerel, as well as in non-CPS sectors, in order to enable continued operation of those fisheries while protecting the sardine resource. Coastwide sardine landings in these fisheries since the closure have totaled approximately 1-2% of the historical peak (Table 1, next page), and landings in Oregon are a very small fraction of this coastwide total.

Table 1. Pacific sardine landings (metric ton) by fishery sector, and key harvest specifications, for sardine fishing seasons (July 1-June 30 annually) since the coastwide directed fishery closure began in July 2015. Coastwide total landings for each category are shown as well as Oregon landings (in parentheses).

Fishing Season	2015/ 2016	2016/ 2017	2017/ 2018	2018/ 2019	2019/ 2020	2020/ Mar 2021¹
CPS Incidental ²	165 (0.7)	517 (2.5)	275 (0)	272 (0.04)	249 (0.06)	105 (0.006)
Non-CPS Incidental	1 (0.01)	1 (0.25)	11 (0.6)	12 (2.5)	4 (3.8)	1 (0.4)
Experimental Fishing Permits	-	-	-	470 (0)	728 (0)	855 (0)
Live Bait	2,097 (0.6)	1,614 (0.05)	1,894 (0)	1,694 (0)	1,008 (0)	1,035 (0)
Tribal	66 (0)	85 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Minor Directed ³	N/A	N/A	10 (2.8)	57 (8.1)	70 (5.2)	68 (0)
Total Catch	2,329 (1.3)	2,217 (2.8)	2,190 (3.4)	2,505 (10.6)	2,059 (5.3)	2,064 (0.4)
ACT	n/a	n/a	n/a	n/a	4,000	4,000
ACL	7,000	8,000	8,000	7,000	4,514	4,288

¹2020-2021 data as of March 31, 2021 and subject to change

²Incidental Pacific sardine in other CPS fisheries was limited to 40% landed weight prior to the 2019-2020 season, when it was reduced to 20%.

³Minor directed fishery defined as a separate category beginning March 2018; vessels may make no more than one trip per day and land no more than 1 mt per day; supplies specialty markets for human consumption or bait.

Pacific Sardine Fishery Management – Federal and Oregon Fishing Capacity Limitation

To control and monitor fishing effort and catch, federal limited entry permits for all CPS finfish were required in the area south of approximately Point Arena in north-central California beginning in 2000. In 2002, the Council established a total fishing capacity goal, and methods for monitoring effort, to ensure fishing capacity is in balance with resource availability. Currently, there are 65 federal limited entry permits for CPS finfish.

In Oregon, the fishery was managed by ODFW as a developmental fishery beginning in 1999 when targeting of this species in Oregon resumed. In 2005, the Commission created a limited entry permit system in response to industry request, with 20 state-issued permits available to qualifying participants. The Commission amended the eligibility criteria in August 2006, which resulted in

an addition of six permits, for a total of 26 Oregon sardine fishery permits. There are currently 24 permits issued, as two were not renewed. If the number of permits drops below 24, a lottery may be held, up to a maximum of 26 permits.

Pacific Sardine Stock Assessment and Fishery Research

As Pacific sardine is a federally managed species, NMFS's Southwest Fisheries Science Center (SWFSC) is primarily responsible for conducting the science and stock assessments necessary for management. The California Department of Fish and Wildlife, the Scripps Institute of Oceanography, and the CPS fishing industry are also involved in collecting scientific information on sardines. Multiple efforts are underway to address priority research and data needs, such as obtaining more data from areas inshore of the federal survey to improve stock assessments and biomass estimates, better understanding of stock structure, and additional exploration of environmental covariates of abundance and productivity (such as sea surface temperature).

Pacific Sardine Stock Status

Pacific sardine abundance remained low following the June 2015 directed fishery closure. The 2019 stock assessment indicated that biomass had dropped below the overfished threshold of 50,000 mt defined in the CPS FMP, and NMFS declared the northern subpopulation of Pacific sardine overfished, but not subject to overfishing (see Appendix 1 for definition of "overfished" and "overfishing"). In September 2020, the Council adopted a rebuilding plan that maintains the existing management framework for the Pacific sardine fishery, as this framework already includes measures to minimize fishing mortality when the stock is at low biomass levels. This includes closing the primary directed fishery when biomass is lower than 150,000 mt (three times the threshold for "overfished" status), and limiting incidental landings of Pacific sardine in other CPS fisheries when the stock is considered overfished.

The closure of the primary directed fishery since 2015 drastically reduced catch of Pacific sardine and has kept harvest at very low levels since that time. Fishing mortality since the closure (of which Oregon catch has accounted for less than one half of one percent, as shown in Table 1) is not considered to be the primary constraining factor on rebuilding the Pacific sardine stock.

Pacific Sardine Federal Harvest Quota Determination

NMFS manages the Pacific sardine fishery in the U.S. exclusive economic zone off the Pacific coast (California, Oregon, and Washington) in accordance with the CPS FMP, requirements of the Magnuson-Stevens Fishery Conservation and Management Act, and recommendations by the Council. The primary focus of federal management of CPS stocks is on biomass because of the importance of these stocks as forage in the ecosystem.

The CPS FMP contains an annual harvest specification framework and harvest control rules for sardine and other CPS fisheries. Biological reference points and formulas used in the framework and control rules to describe stock status and calculate catch limits are described in Appendix 2.

Each year, the SWFSC presents the stock assessment and biomass estimate to the Council and its advisory bodies during public meetings. The Council's CPS Management Team, CPS Advisory Subpanel, and SSC review the assessment and the status of the fishery, and recommend annual catch limits (ACLs) and management measures to the Council. SSC review and endorsement of the stock assessment and biomass estimate as best available science is a critical step in the decision-making process, and the SSC's characterization of the scientific uncertainty related to the biomass

estimate is an essential component of determining how large a buffer is applied to the ACL. Following review and public comment, the Council adopts a biomass estimate, harvest specifications, and management measures.

2021-2022 Pacific Sardine Biomass Estimate and Fishery Regulations

Normally, a stock assessment is conducted early each calendar year using data collected by the SWFSC's CPS surveys in the preceding year. Sardine biomass estimates resulting from the stock assessment are used to set harvest specifications for the fishing year that begins July 1 of that year. However, because the SWFSC's CPS survey was cancelled in 2020 due to COVID-19, there was no new survey data to inform an assessment this year. Therefore, the SSC recommended using the biomass estimate from the most recent prior assessment (which was conducted in early 2020 using 2019 survey data), along with a significantly increased scientific uncertainty buffer, to set harvest specifications for the July 2021 – June 22 fishing season.

Based on this biomass estimate, harvest control rules in the CPS FMP, and the larger uncertainty buffer, the Council adopted the following harvest specifications and management measures for 2021-22, which staff recommend the Commission adopt by reference to federal rules:

- Overfishing Level (OFL) = 5,525 mt (the same as last year)
- Allowable Biological Catch (ABC) = 3,329 mt (22% less than last year)
- Annual Catch Limit (ACL) = ABC (22% less than last year)
- Harvest Guideline (HG) = zero (the same as last year**)
- Annual Catch Target (ACT) = 3,000 mt (25% less than last year***)

** “Zero HG” means no commercial Pacific sardine catch except as part of the live bait, tribal, or minor directed fisheries, incidental catch in other fisheries, or under an exempted fishing permit (i.e., no catch allowed in the primary nontribal directed sardine fishery)

*** “Annual Catch Target”, set at 60% of the OFL and 55% of the ABC/ACL for 2021-22, triggers further restrictions on fisheries (see below) when coastwide sardine catch reaches this level, providing an additional conservative buffer

- If landings in coastwide live bait fisheries reach 1,800 mt (down from 2,500 last year), then a 1-mt per trip limit of sardine would apply to the live bait fishery.
- A 20% incidental per landing by weight catch allowance applies to fisheries directed at other CPS.
- If the ACT of 3,000 mt (25% lower than last year) is attained, then a 1-mt per trip limit of sardine would apply to all CPS fisheries regardless of target species.
- An incidental per-landing allowance of 2 mt of sardine applies to fisheries for non-CPS species.

All sources of sardine catch will be accounted for against the ACT and ACL.

Expected Impact of Proposed Regulations

As noted in the subsection on stock status, current coastwide fishing mortality is not considered to be the primary constraining factor in rebuilding Pacific sardine; Oregon catch has accounted for less than one half of one percent of the recent fishery mortality. The federal regulations will maintain the primary directed fishery closure and continue to limit other harvest to very low levels to ensure that fishing mortality is not interfering with the stock's potential to rebuild when environmental conditions become favorable.

In Oregon, the federal management measures will maintain protections for the sardine stock. The management measures are not expected to significantly constrain existing fishing activities beyond continuing the directed sardine closure for a seventh year. Commercial fishing for other CPS in waters off Oregon in recent years has primarily targeted market squid and northern anchovy (anchovy primarily in 2016), and vessels fishing for these species have maintained incidental Pacific sardine catch well below the 20% per landing limit.

OPTIONS

1. Adopt federal regulations for Coastal Pelagic Species fisheries as shown in Attachment 3, by reference.
2. Adopt other/additional measures.

STAFF RECOMMENDATION

1. Option 1

DRAFT MOTION

I move to adopt the staff recommended rules for Coastal Pelagic Species fisheries as proposed in Attachment 3, including the appropriate citations to the federal regulation, when available.

EFFECTIVE DATE: Upon filing.

Appendix 1. Acronyms and terms used in this document

Term	Definition
ABC	Acceptable Biological Catch, the catch level recommended by a Council’s SSC that accounts for scientific uncertainty in the estimate of OFL, as well as any other sources of scientific uncertainty
ACL	Annual Catch Limit, for total annual catch of a stock or stock complex
ACT	Annual Catch Target, optional, below the ACL to account for management uncertainty
CalCOFI	California Cooperative Oceanic Fisheries Investigations
CCE	California Current Ecosystem
CCIEA	California Current Integrated Ecosystem Assessment (annual CCIEA report)
CDFW	California Department of Fish and Wildlife
CPS	Coastal Pelagic Species (here, specifically those managed by the PFMC)
CPSAS	Coastal Pelagic Species Advisory Subpanel (PFMC advisory body)
CPSMT	Coastal Pelagic Species Management Team (PFMC advisory body)
EFP	Exempted Fishing Permit, allows for fishing activities that are exempt from the usual fishing regulations
ENSO	El Niño Southern Oscillation
FEP	Fishery Ecosystem Plan
FMP	Fishery Management Plan
HG	Harvest Guideline (for P. sardine, the primary non-tribal directed fishery harvest limit)
MSA	Magnuson Stevens Fishery Conservation and Management Act
MSY	The largest long-term average catch that can be taken from a stock under prevailing environmental and fishery conditions. See MSA National Standard 1 (e)(1)(i)(A)
NMFS	National Marine Fisheries Service (NOAA Fisheries)
NOAA	National Oceanic and Atmospheric Administration
OFL	Overfishing Level, the best estimate of the maximum amount of a stock that can be caught in a year without resulting in overfishing
Overfished	The stock size is smaller than an identified threshold (for any reason). See MSA National Standard 1 (e)(2)(i)(E)
Overfishing	The catch rate is higher than an identified threshold. See MSA National Standard 1 (e)(2)(i)(B)
PDO	Pacific Decadal Oscillation
PFMC	Pacific Fishery Management Council (Council)
SAFE	Stock Assessment and Fishery Evaluation, annual PFMC reports
SWFSC	Southwest Fisheries Science Center (of the National Marine Fisheries Service)
SSC	Scientific and Statistical Committee (PFMC advisory body)
WDFW	Washington Department of Fish and Wildlife

Appendix 2. Harvest Specifications and the Pacific Sardine Harvest Guideline Control Rule in the Coastal Pelagic Species Fishery Management Plan

The specification framework includes several key reference points defined here:

OFL - the Overfishing Limit is the annual amount of fishing mortality expected to keep the stock at a level that produces the largest long-term average catch under prevailing ecological and environmental conditions (maximum sustainable yield, MSY). Overfishing occurs if catch exceeds the OFL.

ABC - the Acceptable Biological Catch is always set below the OFL to incorporate a scientific uncertainty buffer and reduce the risk of unintentional overfishing. The amount of reduction from the OFL is based on a determination on scientific uncertainty in the stock assessment made by the Council's Scientific and Statistical Committee (SSC), and the Council's preferred level of overfishing risk aversion. The Council may not set an ABC higher than recommended by the SSC.

ACL - the Annual Catch Limit may be set at or below the ABC. Management measures and actions are designed to keep total catch from all sources below the ACL. Exceeding the ACL would trigger a response such as inseason closure of the fishery or a review of the management strategy for the fishery.

ACT - an Annual Catch Target may optionally be set below an ACL to account for management uncertainty, discard or bycatch mortality, and other factors.

HG - the term "Harvest Guideline" is used differently in several federally managed fisheries. For Pacific sardine, it means the amount of annual catch available to the directed commercial non-tribal sector, and it is determined by a formula in the FMP (see below).

The catch limit (Harvest Guideline, HG) for the primary directed commercial sardine fishery is determined by the following formula, with the parameters defined below:

$$\mathbf{HG = (Biomass-CUTOFF) * FRACTION * DISTRIBUTION}$$

1. *Biomass*. The estimated stock biomass of Pacific sardine age one and above.
2. *CUTOFF*. The biomass level below which the HG is zero and directed fishing is not allowed. This level is set at 150,000 mt in the FMP.
3. *DISTRIBUTION*. The average portion of the Pacific sardine biomass estimated in U.S. waters off the Pacific coast is 87%.
4. *FRACTION*. The percentage of the biomass above 150,000 mt that may be harvested; this amount varies with sea surface temperature (SST). (There are indications that previous assumptions about the relationship between sea surface temperature and sardine stock productivity may no longer hold; the SWFSC plans to review the relationship and the term that scales allowable harvest with SST, although the timing of review is uncertain.)