

COASTAL PELAGIC SPECIES MANAGEMENT TEAM REPORT ON ANCHOVY MANAGEMENT UPDATE

Introduction and Background

At its November 2015 meeting, the Pacific Fishery Management Council (Council) asked the Coastal Pelagic Species Management Team (CPSMT) to explore alternative management and policy approaches for northern anchovy, and report back to the Council in fall 2016. The Council also requested information on the potential to move northern anchovy to a more active management status, and consideration of management scenarios relevant to potential future changes in the management of northern anchovy.

Previously, in June and November 2015, the Council received information on anchovy landings, management catch limits, recent aerial survey work, public comment, and other recent survey information. In November 2015, the Southwest Fisheries Science Center (SWFSC) summarized available data and recent survey information from the NOAA spring and summer surveys, and other survey information (PFMC 2015). However, reliable abundance information is scarce for northern anchovy, and the population is not regularly assessed. Some Council members and members of the public expressed the need for a new assessment of the northern anchovy population, and for management options should the Council determine a need to amend the current harvest specifications.

The Council and SWFSC jointly convened a CPS assessment workshop in La Jolla, California, May 2-5, 2016 to develop advice on the best approaches for assessing CPS stocks, especially for data-limited stocks such as the central subpopulation of northern anchovy (CSNA). The workshop report will be presented at the September 2016 Council meeting. The CPSMT at the same time has been reviewing the CPS Fishery Management Plan (FMP) and past and current management to outline different approaches to management. Although occurring on similar timelines, these efforts are not necessarily linked, as current management for the CSNA does not utilize single point estimates of biomass. To date, the CPSMT has considered the process of assessing the current population of the central stock of northern anchovy (i.e., data poor assessment likely to be presented in November) and the review of management options presented in this white paper as two separate issues. Therefore, this white paper is not intended to provide the Council options on how or if that data-limited assessment (or data-limited assessments in general) might be utilized for management. The CPSMT will review whatever assessment of the stock is presented to the Council in November and provide comments at that time.

This white paper aims to present general information on CPS management categories and potential approaches available to the Council, should the Council choose to change any element of current northern anchovy management. The focus of this paper is on northern anchovy and in particular the central subpopulation of northern anchovy, although many of the management elements apply to all CPS stocks classified as Monitored, and managed under the CPS FMP. Additional general information including summaries of stock distribution, past and present management, recent landings history and fishery monitoring activity are presented in an appendix.

CPS Management Categories

Management unit stocks in the CPS FMP are classified under three management categories: Active; Monitored; and Prohibited Harvest species (krill). Categorization in either the Active or Monitored category depends on the nature of the fishery, management goals, assessment and monitoring capabilities, and available information. All stocks in these categories are “Management Unit Species.” The Active category is for stocks and fisheries with biologically significant levels of catch, or biological or socioeconomic considerations requiring relatively intense harvest management procedures. The Monitored category is for stocks and fisheries where it has been determined that intensive harvest management (e.g., annual stock assessments and annual harvest specifications) is not necessary and where monitoring of landings and available abundance indices and other biological information are sufficient to manage the stock in a sustainable manner and prevent overfishing.

Stocks in the Active category are relatively data-rich, supporting annual or regularly scheduled quantitative stock assessments, and annual adjustments of target harvest levels by the Council and NMFS. Annual catch levels for the two Active managed species (Pacific sardine and Pacific mackerel) are set based on formulas incorporating annual biomass estimates from stock assessments or projections.

Management of Monitored finfish stocks, in contrast, involves tracking landings against the precautionary ACLs and qualitative comparison to available abundance data, or other available scientific information (see Ecosystems Considerations chapter of SAFE). Typically data-limited or data-poor, Monitored stocks lack periodic stock assessments and regular adjustments to target harvest levels. Because stock assessments are not regularly conducted for species in the Monitored stock category (jack mackerel and northern anchovy), precautionary ABC control rules are utilized, along with any relevant biological data, to help gauge the need for more active or annual management. The primary reason for Active and Monitored management categories is to use available agency and Council resources in the most efficient and effective manner while satisfying goals and objectives of the FMP, including preventing overfishing. This distinction enables managers and scientists to concentrate efforts on stocks and segments of the CPS fishery that need greatest attention or where the most significant benefits might be expected.

If warranted, species in either the Active or Monitored category may be subject to management measures such as catch allocation, gear regulations, closed areas, closed seasons, or other forms of “active” management. Trip limits and a federal limited entry (LE) permit program are already in place for all CPS finfish in California south of 39°N Latitude. In addition, states may implement regulations to manage CPS. Washington utilizes a variety of rules tailored to meet species or fishery specific needs, including a LE license program, trip limits, area and season closures, and gear restrictions. Oregon also utilizes a variety of rules to meet species or fishery specific needs, such as a LE license program for sardines, gear restrictions, bycatch restrictions, wastage restrictions, and reporting requirements.

Potential Management Approaches

Depending on available information or an identified point of concern, the Council could leave a Monitored stock in the Monitored category, or move it into Active management. The FMP describes in detail the rationale and process for such changes, but it is important to note that changes to harvest specifications and certain other components may be made even without

changing management categories. Existing harvest specifications and reference points for CPS Monitored stocks are shown below (see Appendix for more information on current management):

Table 1: Harvest Specifications for CPS Monitored Stocks

Stock	OFL	ABC	ACL	ACT
NSNA	39,000mt	9,750mt	9,750mt	1,500mt
CSNA	100,000mt	25,000mt	25,000mt	
Jack mackerel	126,000mt	31,000mt	31,000mt	
Market squid	Fmsy proxy resulting in egg escapement $\geq 30\%$	Fmsy proxy resulting in egg escapement $\geq 30\%$	Exempt (lifecycle <1 year)	

Under the default ABC HCR for Monitored stocks, these current ABC levels for the finfish stocks have been reduced from their respective OFLs by 75 percent in recognition of the uncertainty surrounding the annual variability in their stock status and therefore their OFLs. The Council set the ACLs equal to the ABCs for NSNA, CSNA, and jack mackerel. Unlike Pacific sardine and Pacific mackerel where regular stock assessments are conducted enabling annual changes to their respective harvest specifications through routine management measures, the OFL/ABC/ACL levels for stocks in the Monitored category are intended to stay in place until 1) new scientific information becomes available to warrant changing them (OFL/ABC); 2) fishery operations change in a manner that there is new management uncertainty in the ability to track landings against the ACL necessitating a reduced ACL; or 3) if landings increase and consistently reach the ABC/ACL level, thereby necessitating a potential change to active management under the FMP (described below). Therefore retaining a stock as Monitored does not preclude changes to harvest specifications.

Amending the OFL and ABC for a Monitored stock may require a management strategy evaluation (MSE)-like process to analyze ecological and socio-economic impacts, particularly if the proposed modification represents a change from using the default monitored stock control rule, and/or potentially an FMP amendment if new stock-specific MSY values (the basis for the OFL) were determined for either CSNA or jack mackerel. Amending an ACL or the ACT could potentially be done in a two meeting process depending on the rationale for necessitating a change.

Alternatively, if there is a need to pursue increased management oversight of Monitored stocks, the FMP describes a process for transition to the Active management category (and vice versa). In moving a Monitored CPS stock to Active management status, it would be necessary to determine whether to use the default HCR, or whether to develop a stock-specific HCR. The default HCR for Active managed species is:

$$\text{Harvest} = (\text{Biomass} - \text{Cutoff}) * \text{Distribution} * \text{Fraction}$$

Where Cutoff equals the biomass below which there is no directed harvest, Distribution equals the proportion of the stock in U.S. water, and Fraction equals proportion of biomass above Cutoff that is allowable harvest. Currently, there are Distribution terms estimated for northern anchovy (CSNA only) and jack mackerel. The Northern Anchovy FMP and the EA to the CPS FMP Amendment 8 both compiled information that could be used to inform the Distribution parameter

for each. However, to use the default control rule Fraction and Cutoff parameters would have to be determined, requiring a workshop or series of workshops to provide the scientific information to develop options for these HCR parameters. If the Council chose to develop a stock-specific HCR, it could require an MSE-like process or a series of workshops, to develop and consider options for a new HCR. Harvest control rule parameters (e.g., Distribution, Fraction, Cutoff, or others) would need to be considered, but not necessarily included in a new HCR.

In moving to Active management, a stock would need to be assessed regularly (likely annually); and corresponding harvest specifications and management measures would need to be set (as with Pacific sardine and Pacific mackerel). Thus consideration should be given to the purpose of the Monitored stock classification, which is to maintain efficiency with regard to staff and institutional resources, especially for those stocks that are not heavily fished and are not at ecological risk.

Depending on need and Council objectives, strictly adhering to the categories is not necessary. An approach similar to that taken for Pacific mackerel could also be considered. While still categorized as an Active managed stock, the Council adopted in 2013 an assessment schedule that alternates full assessments every four years with catch-projection updates every two years. Harvest specifications for Pacific mackerel are adopted biennially.

Appendix: CPS Background

Northern Anchovy Distribution and Stock Structure

Historically, populations of the northern anchovy, *Engraulis mordax*, have extended from Baja California (Mexico) to British Columbia (Canada). These populations reside in coastal waters where they are believed to be distributed in three major stocks or subpopulations: the southern, central and northern subpopulations (Figure 1). The southern subpopulation occurs only in Mexican waters and ranges from south of Ensenada to Baja California. The central and northern subpopulations are transboundary stocks, although most of their population occurs in US waters.

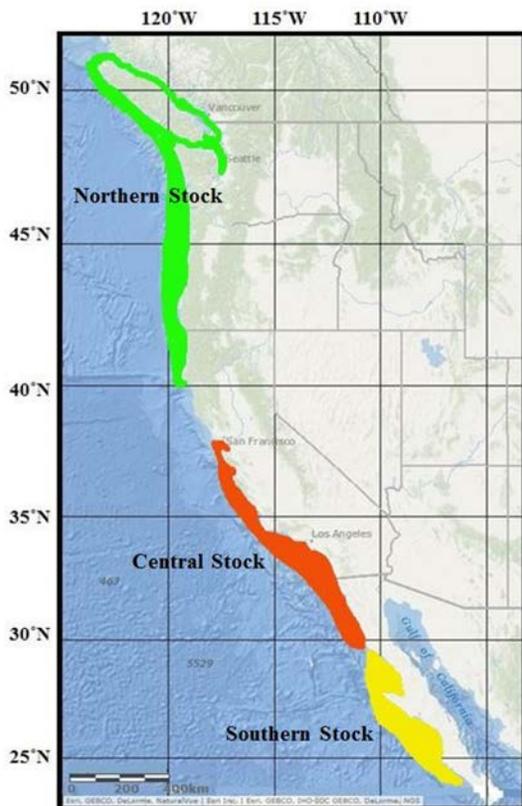


Figure 1. Geographic distribution of the three subpopulations of northern anchovy from Baja California (Mexico) to British Columbia (Canada).

Central subpopulation

The central subpopulation of northern anchovy (CSNA) ranges from north of San Francisco Bay (38°N) to Punta Baja (29°N) in northern Baja California. In summer, this stock typically moves northward from southern California to central California, whereas in winter it migrates southward from Central California to Ensenada (Mexico). The CSNA primarily spawns in the southern California Bight (SCB) in winter and spring, with most spawning occurring from February to April. This stock spawns in waters ranging from 13.5 to 15°C and a salinity of less than 33 parts per thousand. Although not used for management purposes, the last formal stock assessment was conducted in 1995 and estimated the spawning biomass of 388,000mt (CV=38%). Since the mid-

1990s the stock appears to have generally declined and it appears to now be mostly concentrated in nearshores waters. There are high uncertainties on current biomass estimates of the CSNA, due to very few studies having been conducted in recent years, and limited data.

Northern subpopulation

The northern subpopulation of northern anchovy (NSNA) is distributed approximately from Eureka, California (40.80°N) to the Queen Charlotte Islands off British Columbia, Canada (56.65°N). The NSNA mainly spawns off Oregon near the Columbia River plume, although spawning has been also observed in the Strait of Georgia (near the Fraser River, Canada). Its spawning habitat has similar characteristics as the CSNA, however this stock spawns mostly between May and November, with major peaks in June-July and October. Sea surface temperature influences the abundance of NSNA, and at lower biomass the stock tends to reside in inshore waters. The stock has not been formally assessed, however an acoustic survey conducted by the SWFSC in 1977 estimated spawning biomass to be 800,000 mt. In the 2000s the NSNA likely underwent a similar population decline to the CSNA.

Description of Fishery

Central Subpopulation of Northern Anchovy

The CSNA fishery in California is managed under the federal CPS limited entry program covering all CPS finfish landed south of 39°N latitude, with fishing effort concentrated within state waters. Historically in California, anchovy supplied a large reduction fishery, which produced fish meal, oil, and soluble protein. They are currently utilized for human consumption, bait, and animal feed. These uses may vary depending on time of year and oil content. Anchovy are also a substantial part of the live bait catch supplying the recreational fishery, especially the considerable commercial passenger fishing vessel industry.

Northern Subpopulation of Northern Anchovy

Several distinct fisheries target NSNA, and most are day operations with relatively small volume. In Washington, anchovy fisheries provide live bait for recreational and commercial fisheries, and packaged bait for retail sales to recreational fishermen. The Quinault Indian Nation is beginning a purse seine fishery for anchovy within their Usual & Accustomed fishing areas. In Oregon, a commercial purse seine fishery for anchovy intermittently operates out of Astoria to supply markets for bait and human consumption. A single beach seine operation occurs only in the Umpqua River estuary (southern Oregon) to supply live and packaged bait for retail to recreational fisheries. In addition, commercial fishers are allowed to harvest anchovy in Washington and in some estuaries in Oregon for use as live bait in their own fishing operations, primarily for albacore tuna.

Commercial fisheries for NSNA are open access in Washington and Oregon. Washington rules limit the catch, possession or landing of anchovy to 5 mt daily and to 10 mt weekly, and the amount of anchovy taken for reduction (or the conversion of fish to products such as fish meal or fertilizer) to 15 percent of a landing by weight. In Oregon, landings are not limited, but rules are in place to reduce bycatch mortality and potential wastage of anchovy. The amount of anchovy used for reduction is limited to 10 percent of a landing by weight.

Recent Landings

Catches of the three finfish stocks in the Monitored category (both subpopulations of northern anchovy, and jack mackerel) have remained well below their respective ABC/ACL levels since implementation of the CPS FMP in 2000. Average catches over the last 10 years have been approximately 7,300 mt, 270 mt, and 660 mt for CSNA, NSNA, and jack mackerel, respectively. Annual landings are documented in the SAFE which also provides information documenting significant trends or changes in the resource, marine ecosystems, and fishery over time, and assessing the relative success of existing state and Federal fishery management programs.

Central Subpopulation of Northern Anchovy

Unlike other CPS fisheries, California northern anchovy landings have primarily been in northern California ports, including Monterey Bay within the last decade. Additionally, when higher value fisheries such as market squid and Pacific sardine are slow due to lack of availability to the fishery or season closures, northern anchovy landings tend to increase. This is the most likely cause of the fluctuations in landings observed in (Figure 2). Landings of anchovy vary greatly depending on availability of other CPS to the fishery, market demand, and market price. Compared to recent years, there was a noticeable increase in landings in 2015.

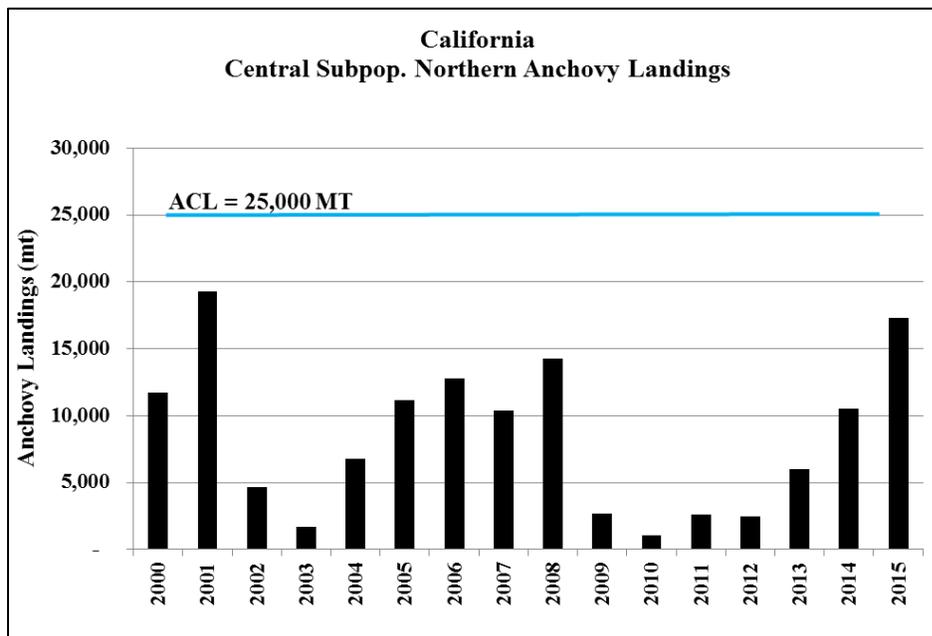


Figure 2. California commercial landings of northern anchovy from 2000-2015.

Northern Subpopulation of Northern Anchovy

Although of a smaller magnitude than the Pacific sardine fishery, northern anchovy support important fisheries on the Washington and Oregon coasts. Because these are small fisheries, recent landing data from state fish receipts for the two states are combined here to allow catch to be presented for all years (to protect confidentiality; see Figure 3). Through 2014, the majority of

landings were into Washington, averaging 215 mt over the prior decade compared to 54 mt for Oregon. In contrast, landings into Oregon increased significantly in 2015 pushing up the combined state total.

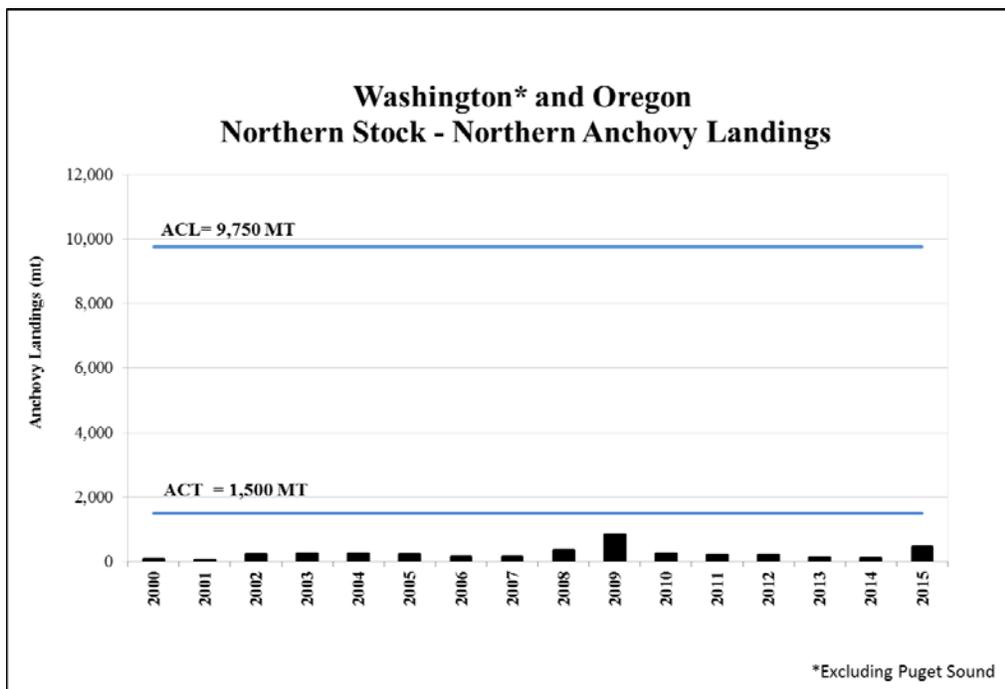


Figure 3. Washington and Oregon commercial landings of Northern anchovy from 2000-2015.

Current Management

In 2010, the Council adopted Amendment 13 of the CPS Fishery Management Plan (FMP) which set harvest control rules for CPS. The OFL for Monitored stocks was set equal to existing stock-specific MSYs, except for NSNA for which MSY was not defined in the FMP necessitating the determination of a stock specific OFL. The MSY for the NSNA was later set at 0.3 F_{MSY} in 2013 by the Council in response to litigation and was subsequently included in the FMP as Amendment 14.

The Monitored stock default ABC control rule sets ABC as 25 percent of the OFL. This non-discretionary reduction in allowable catch is built into the harvest policy. Thus, although more generic and simpler than those used for stocks in the Active category, the Monitored HCR is also generally more precautionary. For instance, this results in the ABC for subpopulation CSNA being set 75,000 mt below its OFL to account for scientific uncertainty in that estimate and to prevent overfishing. Overfishing occurs in the CPS fishery whenever catch exceeds OFL. Values for OFL, ABC and ACL resulting from the default HCR for Monitored finfish stocks are shown in Tables 1-3.

Table 1. Harvest Control Rule for Central Subpopulation Northern Anchovy

OFL	MSY* DISTRIBUTION	100,000 MT
ABC	OFL * 0.25	25,000 MT
ACL	LESS THAN OR EQUAL TO ABC	25,000 MT

Table 2. Harvest Control Rule for Northern Subpopulation Northern Anchovy

OFL	Stock specific OFL	39,000 MT
ABC	OFL * 0.25	9,750 MT
ACL	LESS THAN OR EQUAL TO ABC	9,750 MT
ACT		1,500 MT

Table 3. Harvest Control Rule for Jack Mackerel

OFL	MSY * DISTRIBUTION	126,000 MT
ABC	OFL * 0.25	31,000 MT
ACL	LESS THAN OR EQUAL TO ABC	31,000 MT

Historical Management

In 1978 the Northern Anchovy FMP was drafted, and federal authorities assumed management of the anchovy fisheries for CSNA. Over the years the FMP was amended, with the 8th Amendment expanding the scope of the FMP and changing the plan name to reflect the addition of other CPS species. Implemented in 2000, Amendment 8 introduced Active and Monitored management categories and placed northern anchovy in the Monitored category. Prior to 1995, northern anchovy were actively managed in that routine assessments were conducted and used to inform management. Management and agency resource focus then changed as the fishery shifted from targeting primarily anchovy to sardine as environmental conditions began to favor the latter.

In establishing policy, the Northern Anchovy FMP considered three fisheries: the reduction fishery, the live bait fishery and a non-reduction fishery. Management was accomplished through a combination of a harvest control rule and fixed catch limits, season closures and geographic catch allocation. Overfishing was defined in the FMP using a spawning biomass criterion. If the spawning biomass fell below 50,000 mt for two consecutive years, all harvests (including those for live bait and other non-reduction purposes) were disallowed until the spawning biomass exceeded 50,000 mt.

The harvest control rule policy applied only to the reduction fishery and specified an optimum yield (OY) of (1) zero, if the estimated spawning biomass was less than or equal to 300,000 mt, or (2) 100 percent of the spawning biomass above 300,000 mt, up to a limit of 200,000 mt, if the spawning biomass was greater than 300,000 mt. And in the absence of a bilateral agreement with Mexico that also harvests CSNA, the FMP for northern anchovy allocated 70 percent of total OY to the U.S. reduction fishery and 30 percent to Mexican fisheries. Non-reduction use of northern anchovy was allocated 70 percent of a fixed 7,000 mt quota or 4,900 mt. The FMP imposed no numeric limit on live bait.

Fishery Monitoring and Biological Sampling

In response to recent increases in landings, in January 2014 the CDFW incorporated northern anchovy into the finfish sampling program and began collecting biological information from the fishery to aid in monitoring the changes in the California fishery and to gather data that could be used in the development of a CSNA stock assessment. Since 2014, 160 northern anchovy samples (4,000 fish) have been collected statewide. CDFW staff processed the samples for weight, length,

sex, and maturity. Otoliths of northern anchovy samples are being extracted from these samples and stored, and ageing of these samples is ongoing.

The WDFW and ODFW likewise expanded sampling programs to begin routine collection of northern anchovy from commercial landing. In Washington, anchovy samples are collected from the directed purse seine bait fish fishery which operates seasonally from about mid spring to late fall. Since 2014, biological data have been collected from a total of 2,100 fish. Of these, approximately 200 were sampled for age. Sampling coverage in 2016 has been expanded to achieve a minimum of 1000 total fish sampled with at least 500 processed for ageing. In Oregon, anchovy samples have been infrequently collected due to the low level of anchovy landings. During 2013-2015, biological data for 3 samples, representing 75 fish, were collected from directed or incidental landings by purse seine fisheries. Sampling in 2016 increased markedly due to an increase in directed fishing for anchovy. As of mid-August, 20 samples, representing 500 fish, were collected for biological data.

The California Cooperative Oceanic Fisheries Investigations (CalCOFI), a cooperative effort between NOAA Fisheries, CDFW, and Scripps Institution of Oceanography, also collects fishery, environmental, and ecological data in the Southern California Bight. Other ongoing sources of data include the NOAA Fisheries spring and summer coastwide surveys, the SWFSC Juvenile Rockfish Survey, and a SWFSC ichthyoplankton survey off the Central Oregon Coast.