

Proposal for Methodology Review of the Southern California Coastal Pelagic Species Survey

1. Title: Southern California Coastal Pelagic Species Survey (SCCPSS)
2. Name of Proposers:
 - a) California Department of Fish and Wildlife: Kirk Lynn, Dianna Porzio, Laura Ryley, Trung Nguyen.
 - b) California Wetfish Producers Association: Diane Pleschner-Steele.
3. How the proposed methodology will improve assessment and management for the stock(s) in question:

The proponents request a methodology review of the SCCPSS so the results can be used in future stock assessments for sardine and anchovy to inform federal management. The SCCPSS provides information on both the southern portion of the northern subpopulation of Pacific sardine (sardine) stock and part of the central subpopulation of northern anchovy (anchovy) stock, in nearshore waters (within two miles) of the Southern California Bight (SCB).

Goals: The SCCPSS aims to provide the following information to improve assessments of these stocks: 1) nearshore relative indices of abundance for these species, while collecting length and age composition information (Project 1); and 2) inshore correction factors to more accurately determine nearshore fish abundance inshore of the areas covered by research vessel transects in the SCB (Project 2).

Background

The population center and recruitment of Pacific sardine is assumed to concentrate near the Southern California Bight (SCB) and Baja California (Hill et al. 2015). Assessment methods include the daily/total egg production (DEP/TEP) and acoustic/rawl surveys conducted seasonally by the Southwest Fisheries Science Center, which are focused only on offshore waters in and around the SCB. Survey information from nearshore waters in existing CPS surveys is lacking – yet these areas are known habitat for CPS, and a significant portion of the commercial CPS fishery in Southern California occurs in nearshore waters. Similar to sardine, young anchovy congregate in nearshore waters, suggesting that nearshore areas may provide important information on recent recruitment. As there has been ongoing interest by the Council in a current assessment of the abundance of the central subpopulation of northern anchovy, SCCPSS survey information may serve as a valuable data stream in a future full assessment of this stock. It has been recognized that additional sampling efforts are needed to supplement current surveys to provide more data on the abundance of both species in nearshore waters (PFMC 2016).

In 2012, the California Department of Fish and Wildlife (CDFW) and the California Wetfish Producers Association (CWPA) began collaboration on an aerial survey project which includes nearshore areas. Since its inception, the survey has flown the coastline and coastlines of offshore islands in the Southern California Bight (within two nautical miles) (Figure 1). The survey provides data with which to develop a nearshore index of relative abundance for both species. Providing a nearshore index of relative abundance in southern California waters adds important information to complement the

estimates of sardine and anchovy biomass generated from other surveys conducted offshore, and will improve total stock biomass estimates for use in management of these species (described below as Project 1).

The May 2016 CPS data-limited stock assessment workshop (PFMC 2016) recommended the use of aerial survey methods to estimate abundance and/or calculate inshore correction factors for anchovy, to augment the survey data from offshore acoustic survey transects (discussed below as Project 2).

Methods

Project 1: Provide a nearshore relative index of abundance for sardine and anchovy within the SCB survey area.

The Project 1 study area was surveyed by transects tracking the coastlines of the mainland from Point Conception to San Diego and each of the islands within the SCB to visually estimate biomass of encountered schools extending out two nautical miles from shore (Figure 1). Surveys began in summer (Jul-Aug) 2012 and have continued with spring and summer field work in subsequent years. The basic method was to fly strip transects with an experienced spotter pilot observer. Transect width was based on effective observer detection distance, as determined from survey data. When fish schools were identified and confirmed, the plane flew over the fish and photos were taken with the camera system set to fire at a rate achieving 80 percent overlap between successive photographs. The camera system software recorded time, location, speed, altitude and other information with each image. While on the plane with the spotter, CDFW staff recorded on a log sheet the time and frame number when photos of fish are being taken, the spotter's estimated number of schools, and metric tonnage (including percent species composition of mixed schools). Boat samples (via diver video, hook-and-line, gillnet) were used to validate observer identification of species, and provide information on size and age structure of the observed fish.

Spotter tonnage estimates from survey flights (shown in Figures 2 and 3) were then adjusted based on point set data collected in 2010 by our current spotter as part of the Northwest Sardine Survey effort in the SCB (Jagiello et al. 2010). This data set included spotter estimates from the air as well as landed tonnage, allowing for validation of tonnage estimate accuracy. Raw tonnage estimates were adjusted with a correction factor ($r = \Sigma \text{Tons landed} / \Sigma \text{Tons observed}$) derived from the 2010 data. For each season, nearshore island observations were treated as separate sampling units and combined with mainland observations to obtain total nearshore estimates of abundance. Annual estimates were determined from averaging spring and summer estimates. Abundance estimates were standardized for area covered by each survey for use as a new relative index.

Project 2: Develop an inshore correction factor to account for sardine and anchovy not surveyed from offshore acoustic surveys to supplement or replace extrapolations.

For Project 2, the survey plane conducted overflights of existing ship transects within the SCB to compare sightings between plane and ship while the ship conducted its SCB survey. The study area was based on the 17 transect lines currently used by the acoustic-trawl survey (ATM) in the SCB (J. Zwolinski, pers. comm., Figure 4). SCCPSS staff coordinated with the ATM survey to attempt survey flights of the innermost 20-mile segment of these ship transects on the same day as the ship surveys. The plane then continued from the most inshore point of the transect line all the way to shore to survey fish not surveyed by the ATM. Efforts were made to fly as many of these transects as possible. The methods

described above for Project 1 regarding fish sighting, identification, documentation, and tonnage adjustment also apply to Project 2.

In September 2016, the SCCPSS flew overflights of 5 acoustic trawl transect lines in the SCB (Figure 4). Three replicates of these lines were flown. Observed fish species and tonnages from the areas covered by both plane and ship will be compared to evaluate what was seen and missed by each survey method. A correction factor will then be developed from these data to account for nearshore fish not detected by other surveys. These results will be used to calibrate plane observations inshore of the transect lines, which will then be combined with offshore estimates to obtain total minimum absolute estimates for the SCB. The proposed methodology review is expected to result in more precise methods to determine appropriate correction factors.

References

Hill, K. T., P. R. Crone, N. C. H. Lo, E. Dorval, and B. J. Macewicz. 2015. Assessment of the Pacific sardine resource in 2015 for U.S. management in 2015-16. Pacific Fishery Management Council, April 2015 Briefing Book, Agenda Item G.1.a. 168 p.

Jagiello, T. H., Hanan, D., Howe, R., and M. Mikesell. 2010. West Coast Aerial Sardine Survey Sampling Results in 2010. Prepared for Northwest Sardine Survey and the California Wetfish Producers Association. Pacific Fishery Management Council, November 2010 Briefing Book, Agenda Item I.2.b. 51 p.

Pacific Fishery Management Council (PFMC). 2016. Report of the NOAA Southwest Fisheries Science Center & Pacific Fishery Management Council Workshop on CPS Assessments. Pacific Fishery Management Council, September 2016 Briefing Book, Agenda Item E.2.a. 38 p.

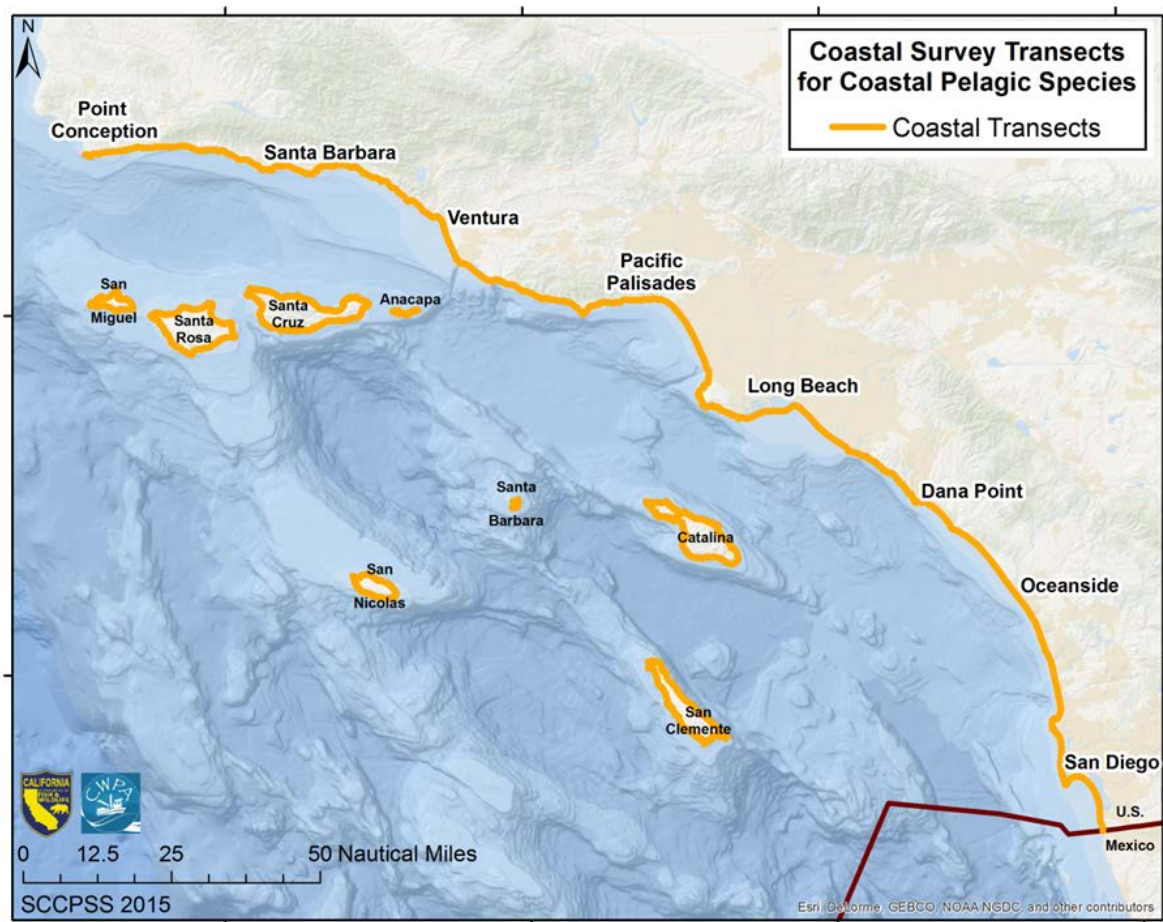


Figure 1. Survey design for Project 1 consisting of mainland and island coastal transects for nearshore areas within 2 nautical miles (orange lines).

Pacific Sardine Observations

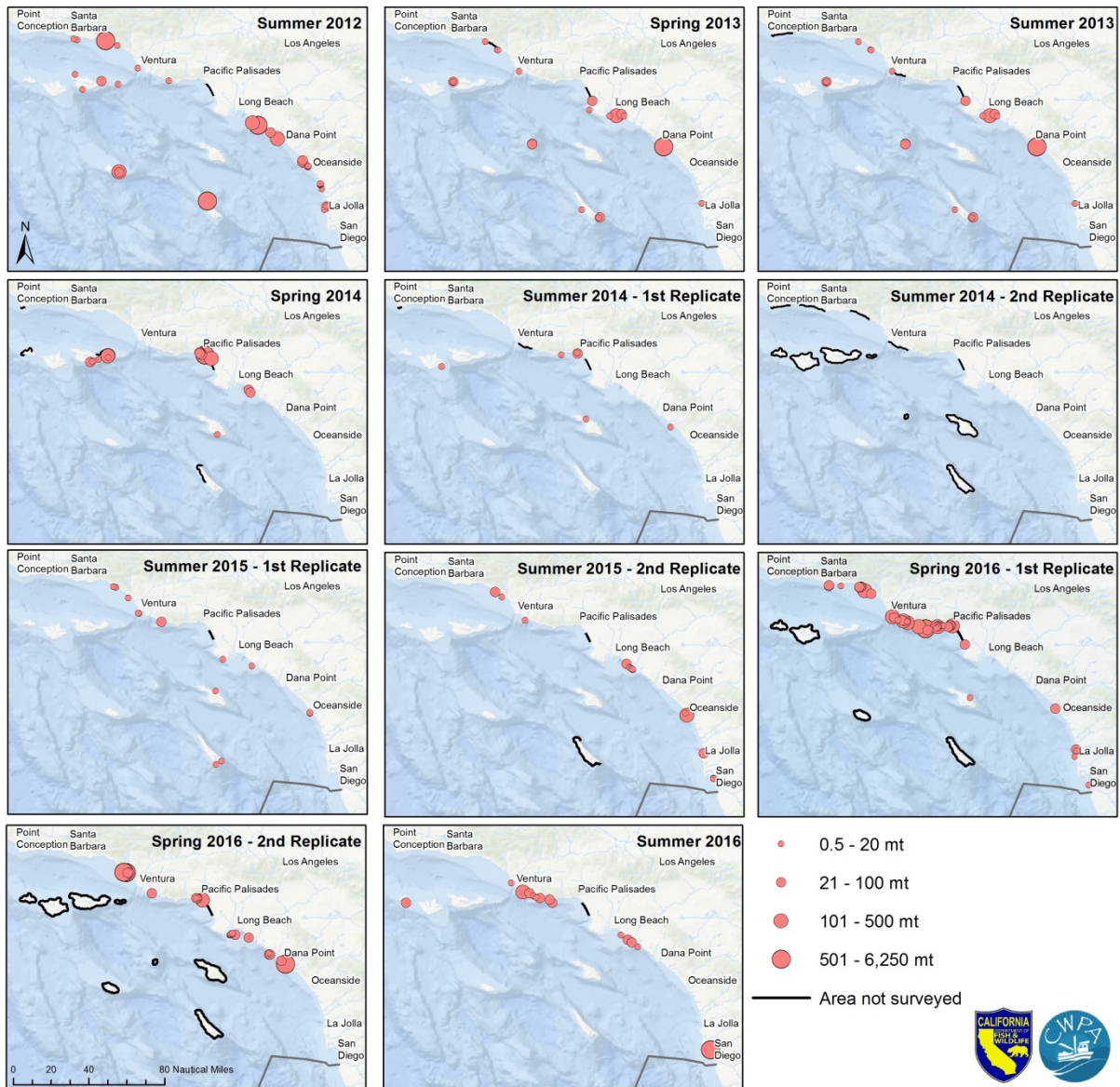


Figure 2. Project 1 sardine sightings from 2012-2016 surveys, for nearshore areas only . Locations of study area not able to be surveyed are in bold.

Northern Anchovy Observations

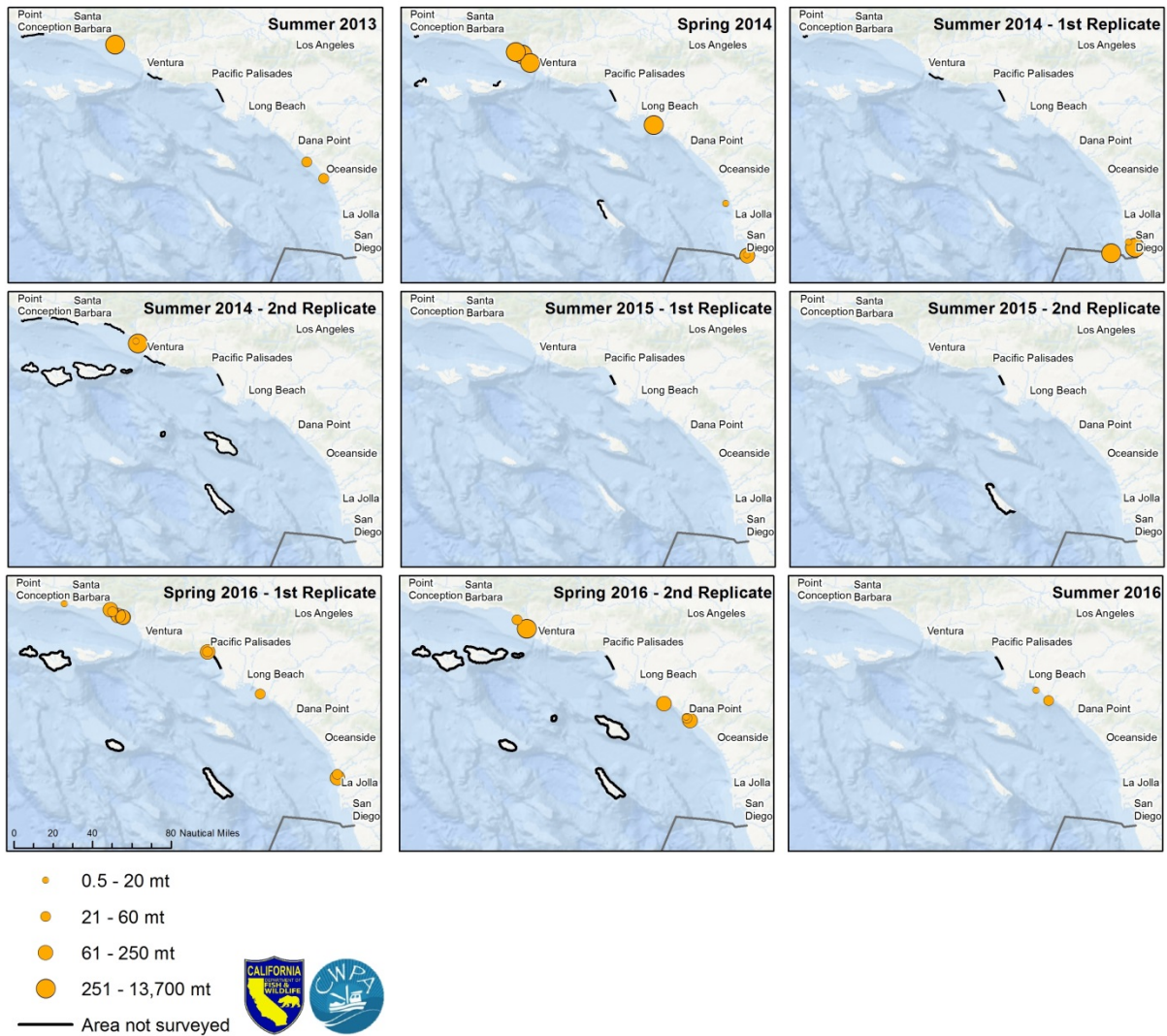


Figure 3. Project 1 anchovy sightings from 2013-2016 surveys, for nearshore areas only. Locations of study area not able to be surveyed are in bold. Anchovy sightings were documented beginning in summer 2013.

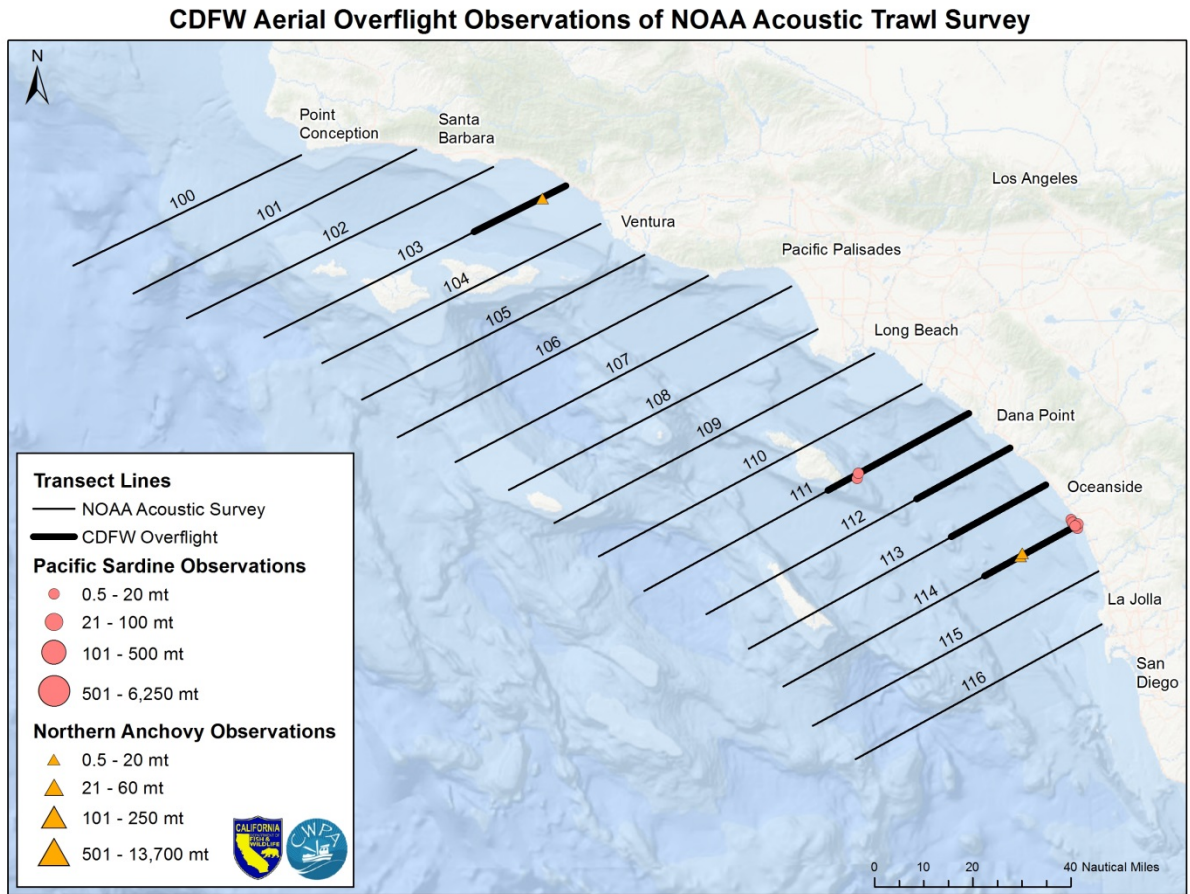


Figure 4. Project 2 transect lines and overflight observations, September 2016.