

CDFW–CWPA COASTAL PELAGIC SPECIES AERIAL SURVEY 2018 RESULTS

The California Department of Fish and Wildlife (CDFW) and the California Wetfish Producers Association (CWPA) have conducted coastal pelagic species (CPS) nearshore aerial surveys off the California coast since 2012 ([Lynn et al. 2017](#)). These surveys have obtained abundance estimates of Pacific Sardine (sardine) and Central Subpopulation of Northern Anchovy (anchovy; added to the survey in 2013). The survey underwent a Pacific Fishery Management Council (PFMC) methodology review in April 2017 ([PFMC 2017](#)). The Scientific and Statistical Committee conditionally approved the survey protocol for use in management (described as “Project 1”) and recommended a focus on providing nearshore sardine and anchovy biomass estimates for areas shoreward of those represented by National Oceanic and Atmospheric Administration acoustic-trawl (AT) survey estimates. Both the 2017 and 2018 aerial surveys documented significant abundance of sardine and anchovy not likely accounted for in the AT survey.

Surveys were conducted within the Southern California Bight (SCB) during the first five years, then extended north of Point Conception in August 2017. The 2017 summer survey was intended to sample nearshore coastal areas corresponding to offshore transects of the summer AT survey conducted at the same time. The survey period was scheduled to coincide with the southernmost extent of the AT survey as it proceeded south from Vancouver, British Columbia. Results from this survey are described in Agenda Item C.3.a, CDFW Report 1, from the April 2018 PFMC meeting ([PFMC 2018a](#)).

In 2018, the aerial survey was conducted in spring and summer within the SCB, and in the fall off the Northern California coast. The spring Southern California aerial survey was flown on April 23, 24, 26, and 27, and May 3 and 4. The survey documented 4,464 mt of sardine and 587 mt of anchovy (Figure 1) along approximately 492 miles of coastline. The summer survey was concurrent with the AT survey on September 10, 11, and 13 and documented 496 mt of sardine and 29 mt of anchovy (Figure 2) in approximately 478 miles of coastline surveyed. The fall survey in Northern California was flown on October 13. Due to weather and logistical constraints, this last survey covered only approximately 79 miles of coastline south of Monterey but recorded 13,473 mt of sardine and 62,438 mt of anchovy (Figures 3 and 4). This represents nearly 40 percent of the entire sardine population estimate generated from the AT survey (AT estimate = 35,501 mt, [[Hill et al. 2019](#)]) in approximately 7 percent of the 1,100-mile California coastline.

As with previous surveys, these are minimum estimates of biomass within the survey area. These surveys are limited to depths less than 10 m and conducted in daytime when many CPS are found in deeper waters. In addition, this survey covered only a fraction of the respective sardine and anchovy stock ranges. However, the aerial survey observed CPS that are likely exclusive of those

observed by the AT survey conducted offshore, as the area surveyed was significantly shoreward of and shallower than the AT transects (PFMC 2017).

These estimates, in Northern California especially, represent significant sardine biomass in nearshore areas compared to offshore estimates from the 2018 AT survey. Aerial survey estimates in 2017 in Northern California for both sardine and anchovy were also comparatively large to those from the AT survey: 18,118 mt sardine compared to a revised AT estimate of 14,103 mt, and 67,684 mt anchovy compared to an AT estimate of 153,460 mt (Zwolinski et al. 2019). Additionally, 2017 nearshore extrapolation values from the AT were considerably lower than observations from the aerial survey (sardine = 146 mt, anchovy = 45,446 mt). Accounting for the significant CPS biomass inshore of the AT survey coverage is a continuing concern that needs to be addressed by aerial or other surveys covering nearshore waters.

A collaborative nearshore research effort within the SCB began in August 2018 to address aerial survey review panel recommendations to facilitate use of these data in CPS assessments and management to account for biomass shoreward of the waters surveyed by the AT method. Efforts are being made to validate aerial observer tonnage estimates and species identifications using multiple aerial observers and to develop a variance estimator for observer estimates (PFMC 2018b, 2019). Preliminary results indicate an acceptable degree of accuracy and precision in observer biomass estimations (Figure 5). The linear model from Figure 5 shows that the observers tend to underestimate school biomass, and the model can be used to reliably adjust biomass estimated from the observer.

Additional aerial surveys are planned for spring and summer 2019 within the SCB and in Monterey Bay (PFMC 2019) to collect more nearshore biomass information for sardine and anchovy. The summer surveys will be coordinated with offshore AT surveys to match time and latitude as closely as possible. CDFW plans to work with the stock assessment team to facilitate using this important dataset in the 2020 benchmark stock assessment to inform sardine management.

Southern California Spring 2018 CDFW-CWPA Aerial Survey Observations

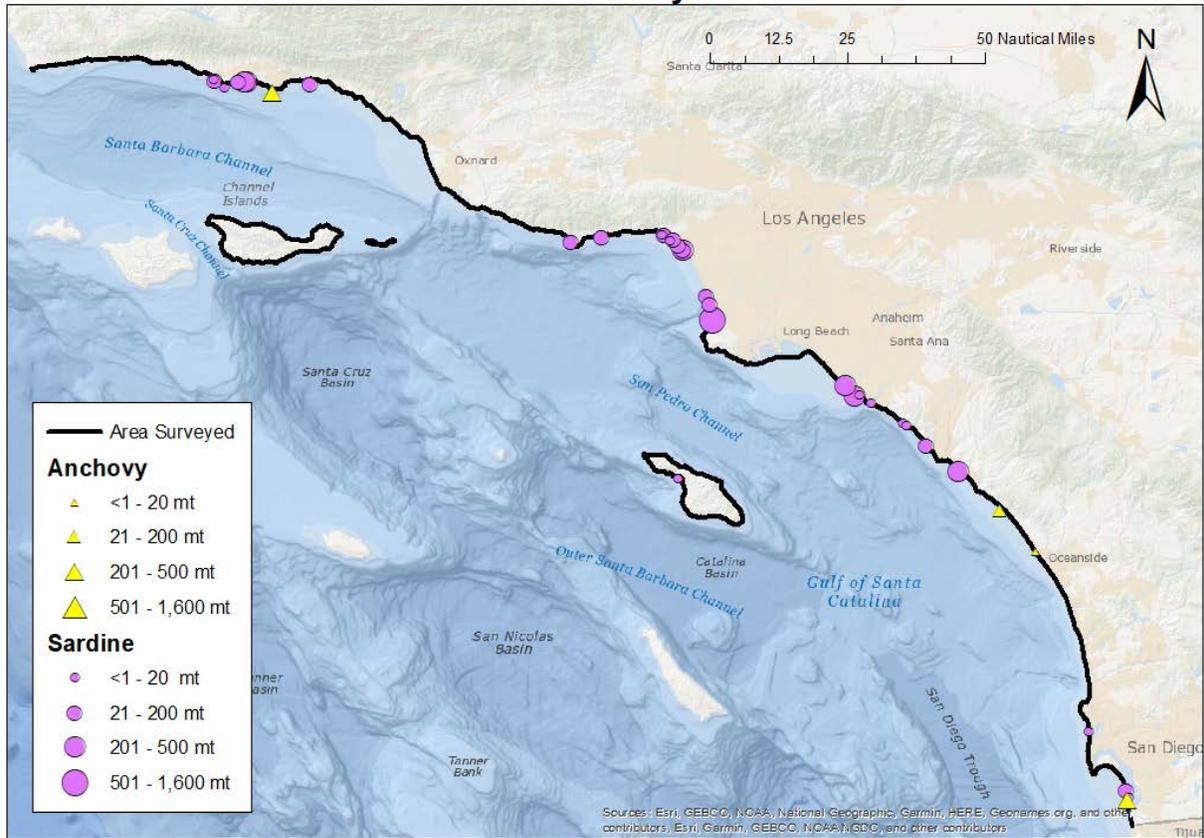


Figure 1. April-May 2018 CDFW-CWPA aerial survey observations of sardine and anchovy schools in nearshore waters within the Southern California Bight. Observations totaled 4,464 mt of sardine and 587 mt of anchovy.

Southern California Summer 2018 CDFW-CWPA Aerial Survey Observations

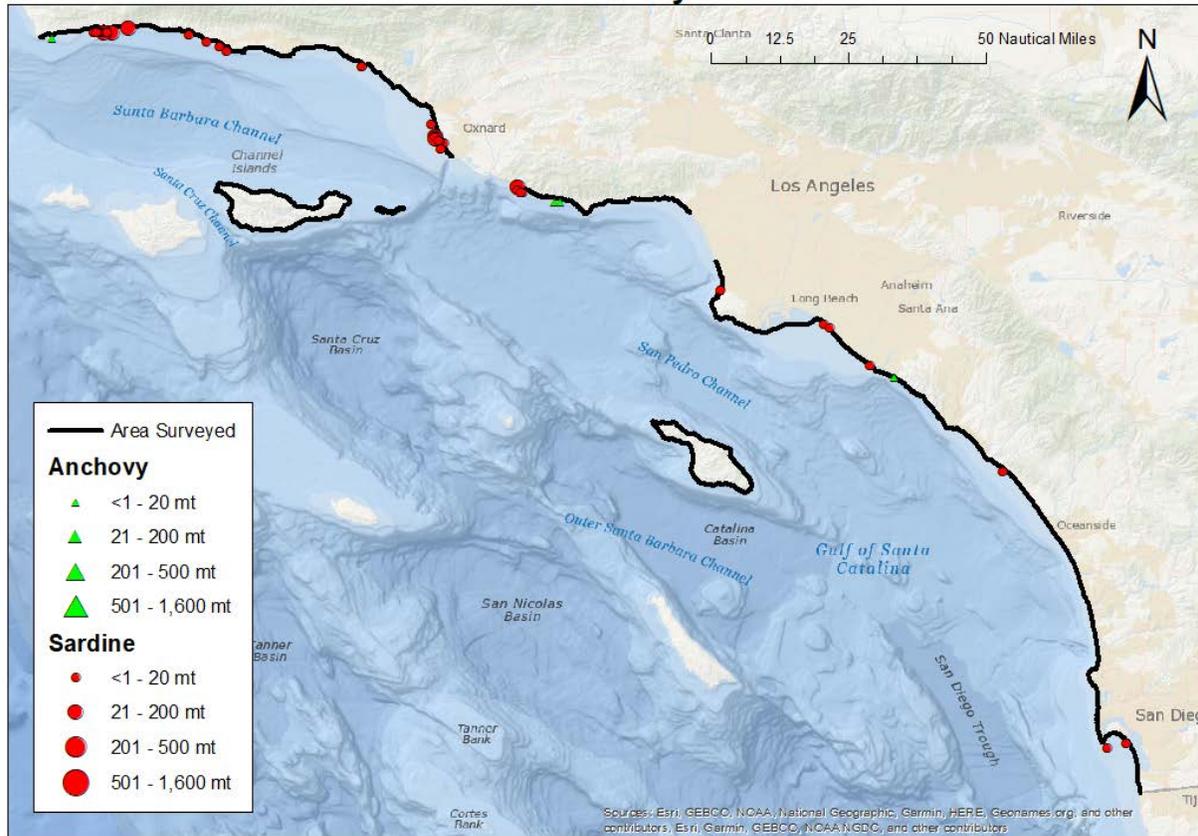


Figure 2. September 2018 CDFW-CWPA aerial survey observations of sardine and anchovy schools in nearshore waters within the Southern California Bight. Observations totaled 496 mt of sardine and 29 mt of anchovy.

Southern California Fall 2018 CDFW-CWPA Aerial Survey Observations

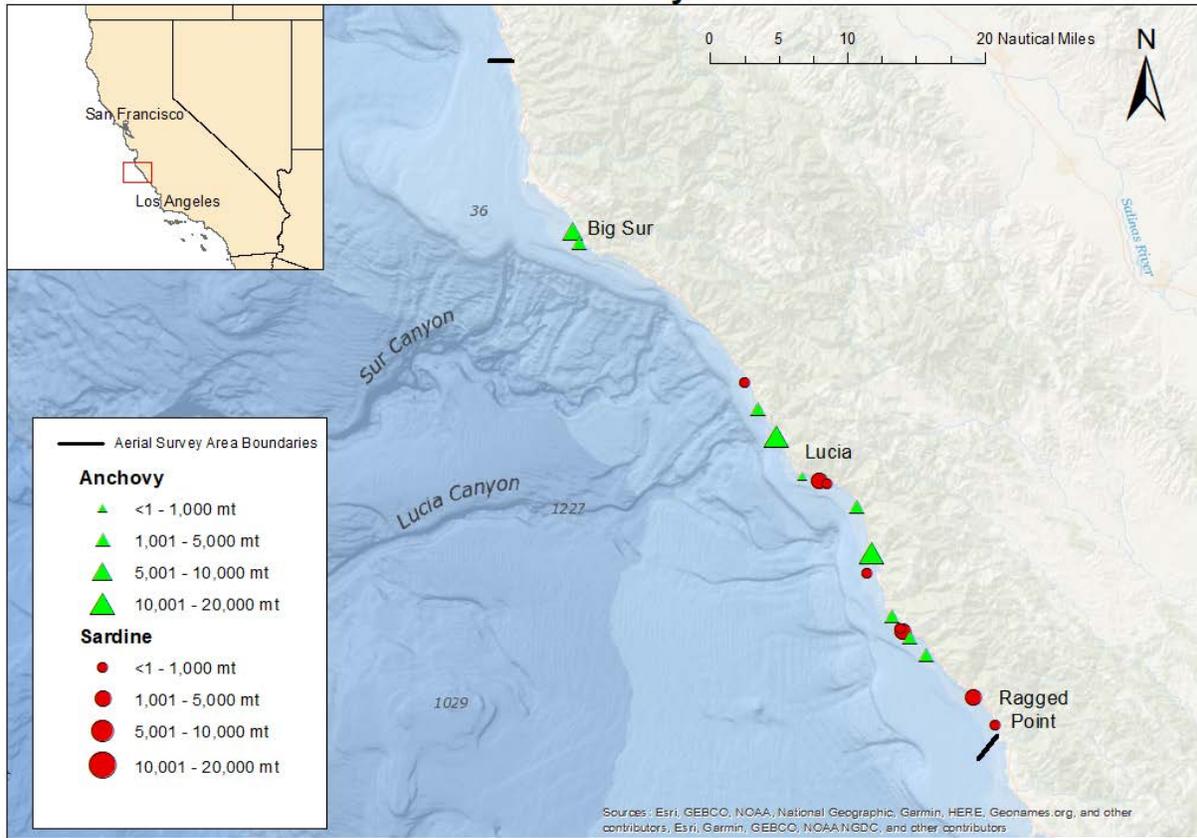


Figure 3. October 2018 CDFW-CWPA aerial survey observations within nearshore waters off Northern California. Observations totaled 13,473 mt of sardine and 62,438 mt of anchovy.



Figure 4. Portion of sardine school estimated at 4,200 mt observed in October 2018 off Northern California. Photos taken at 2,500 feet altitude.

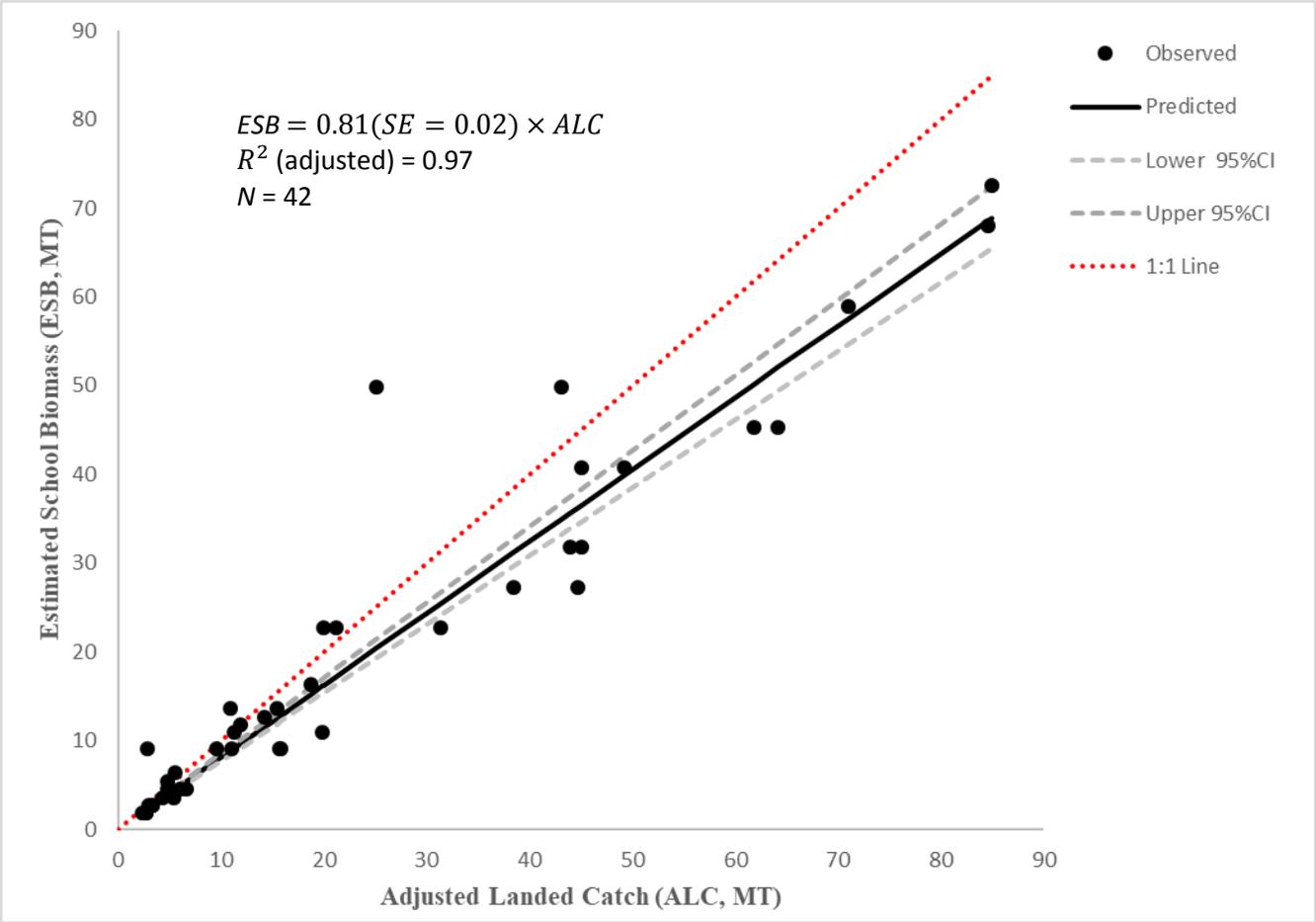


Figure 5. Linear model used to compute the ratio (0.81) between estimated school biomass (ESB) and adjusted landed catch (ALC) of captured schools during point set sampling in 2010 and 2018. Dotted line represents 1:1 ratio of ESB to ALC. Adapted from CWPA Report Agenda Item E.2.

References

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