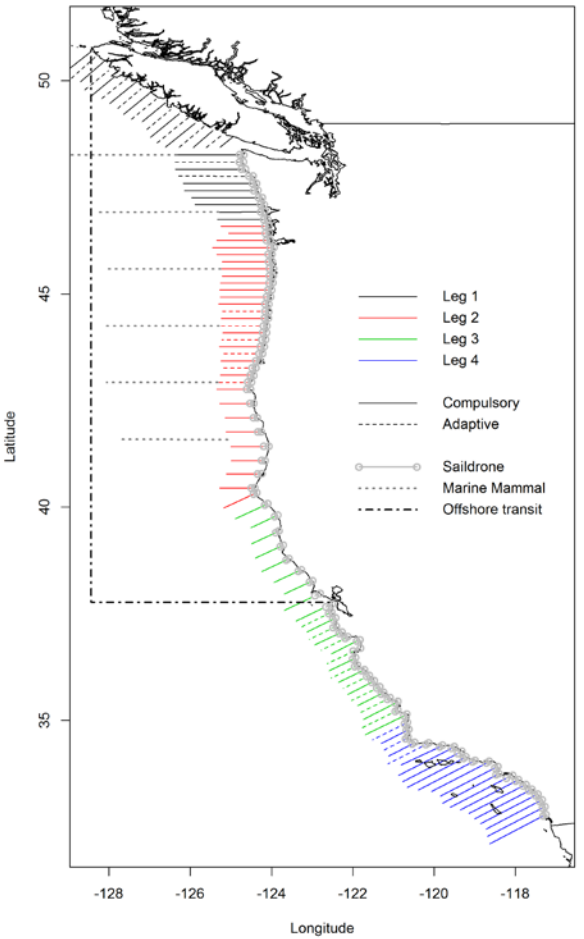
Agenda Item E.1.b
Supplemental SWFSC Presentation 1
April 2019

NMFS Report
SWFSC Activities
Coastal Pelagic Species

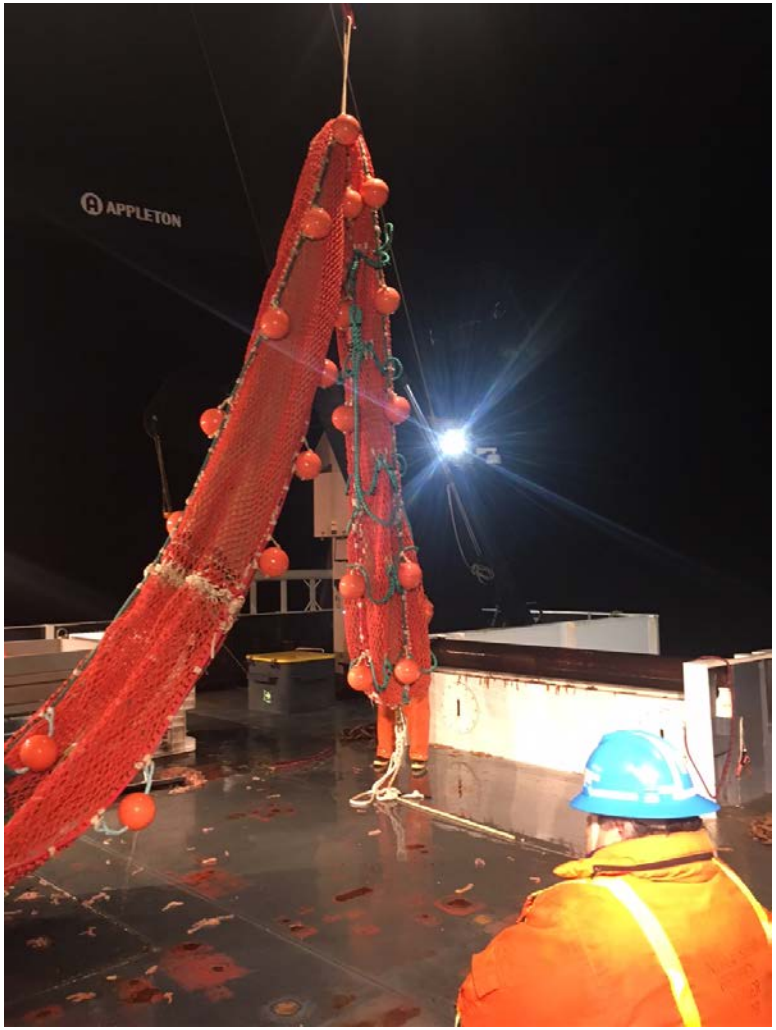
Gerard DiNardo
Dale Sweetnam

Southwest
Fisheries
Science Center



Presentation Outline

1. CPS Stock Assessments
2. Research Survey Activities/Results
   - 2017 CPS Survey, 2018 Joint CPS/MMTD Survey
   - Biomass Reports
3. Inshore Biomass Estimation
4. Recent Scientific Publications
5. Future Activities

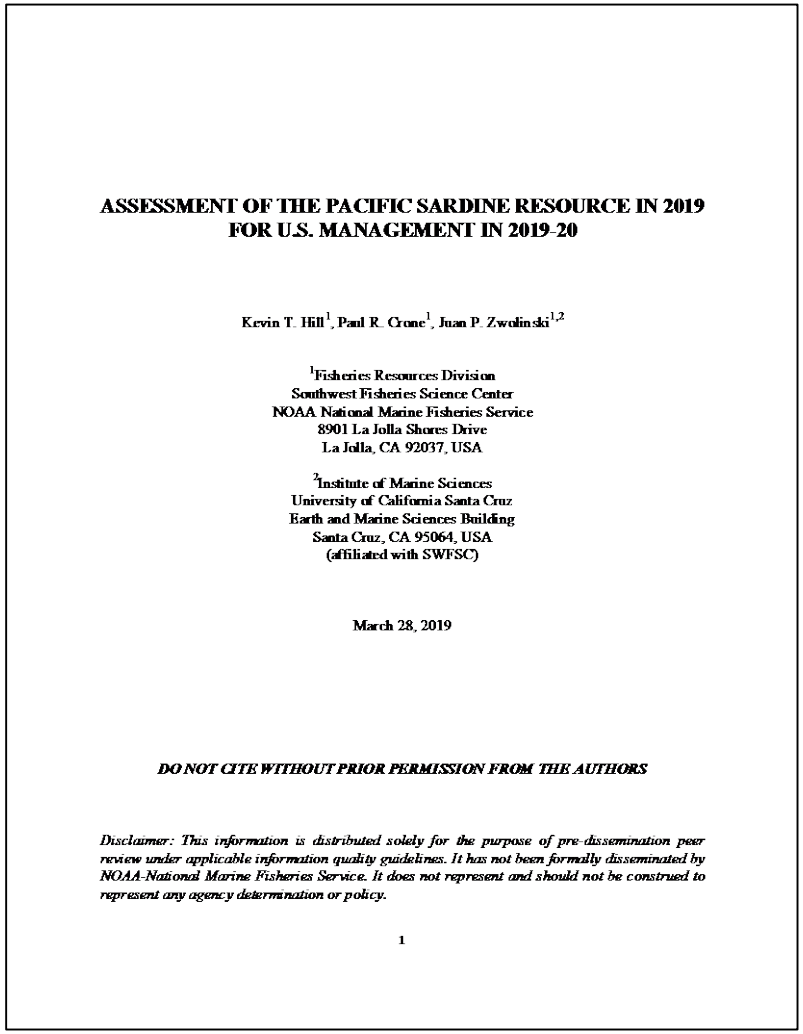


CPS Stock Assessments: North. P. Sardine / P. Mackerel

Northern Stock Pacific Sardine

Changes to the Update Model

- Landings for 2017 updated using final data;
- Landings for 2018 were appended using preliminary data;
- Habitat model used to ascribe SCA and ENS landings to NSP;
- Revised biomass estimate and age composition from the summer 2017 AT survey;
- New biomass estimate and age composition from the summer 2018 AT survey;
- One additional recruitment deviation



ASSESSMENT OF THE PACIFIC SARDINE RESOURCE IN 2019 FOR U.S. MANAGEMENT IN 2019-20

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March 28, 2019

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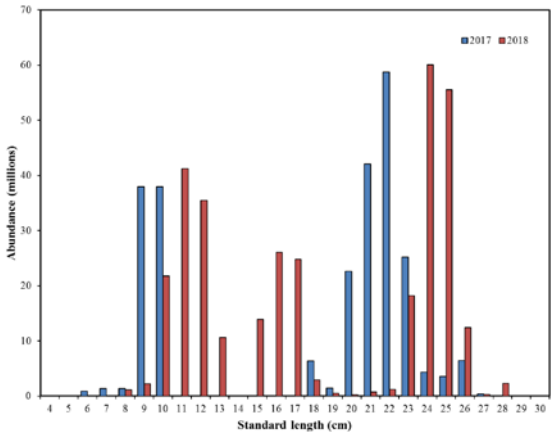
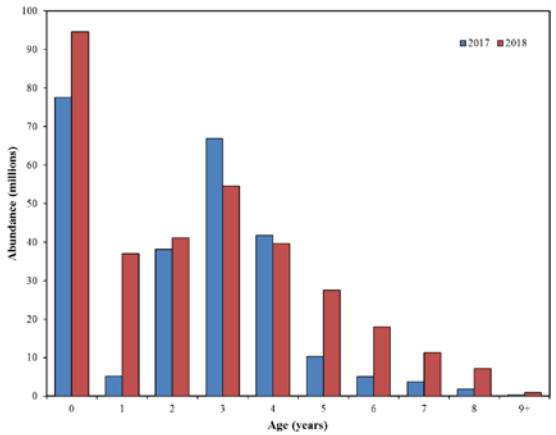
Correction to Summer 2017 AT Biomass Estimate

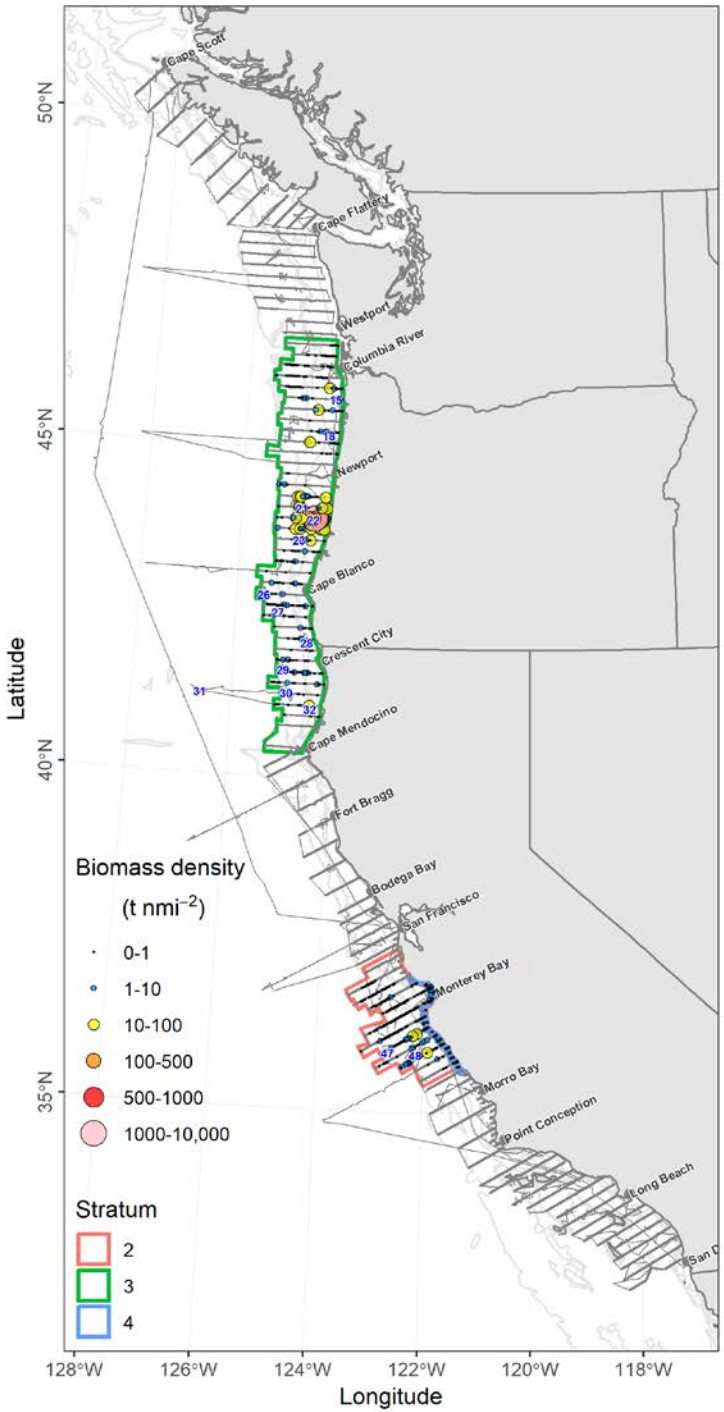
- 2018 sardine assessment update (Hill et al. 2018) included a point estimate of biomass (36,644 mt; CV=30.1%) and age composition from the summer 2017 AT survey.
- During the course of preparing a NOAA Technical Memorandum regarding that survey (Zwolinski *et al*. in press), analysts discovered an error in the depth range (10-250 m) used for calculation of the integrated CPS backscatter. By extending beyond the typical depth-range of the CPS, these vertically integrated values included backscatter from non-CPS species with swimbladders (e.g., rockfishes and hake).
- The appropriate depth/potential habitat filters have since been applied, and the revised 2017 biomass estimate (24,349 mt; CV=37%) and age composition were included in this update.

Summer 2018 AT Survey
Northern Sardine Biomass Density

Stratum		Transect		Trawls		Biomass (t)				
Number	Area (nmi^2)	Number	Distance (nmi)	Cluster number	Number of Sardine	Point	Lower $CI_{95\%}$	Upper $CI_{95\%}$	SD	CV (%)
2	6,201	12	657	7	202	2,002	419	4,246	1,021	51
3	17,240	37	1,778	13	2,324	33,475	3,563	86,297	25,875	77
4	335	19	213	3	20	23	31	42	3	11
All	23,776	68	2,648	20	2,546	35,501	5,169	89,103	25,975	73

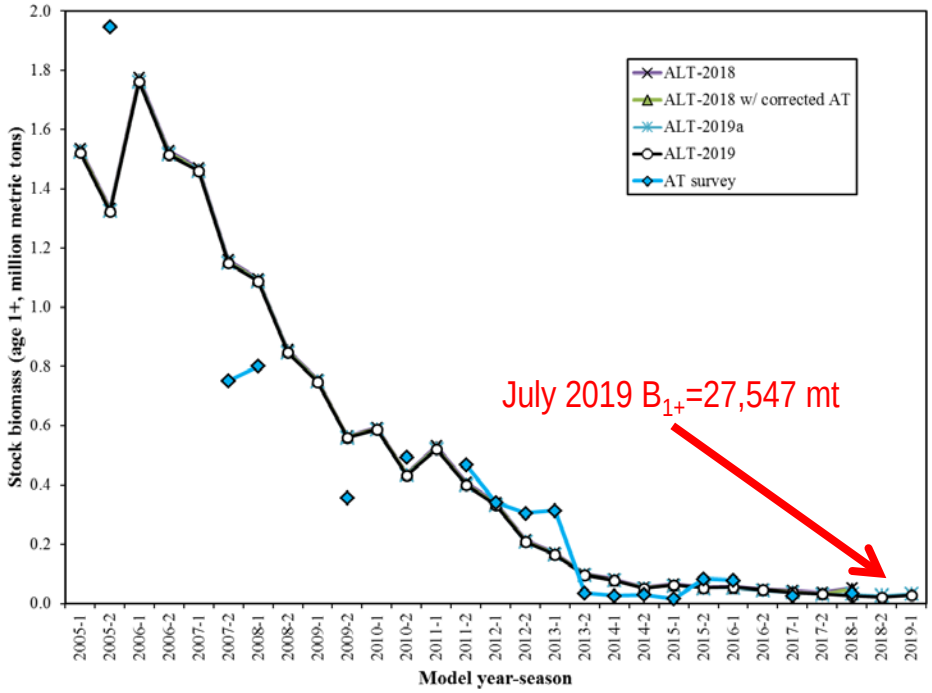


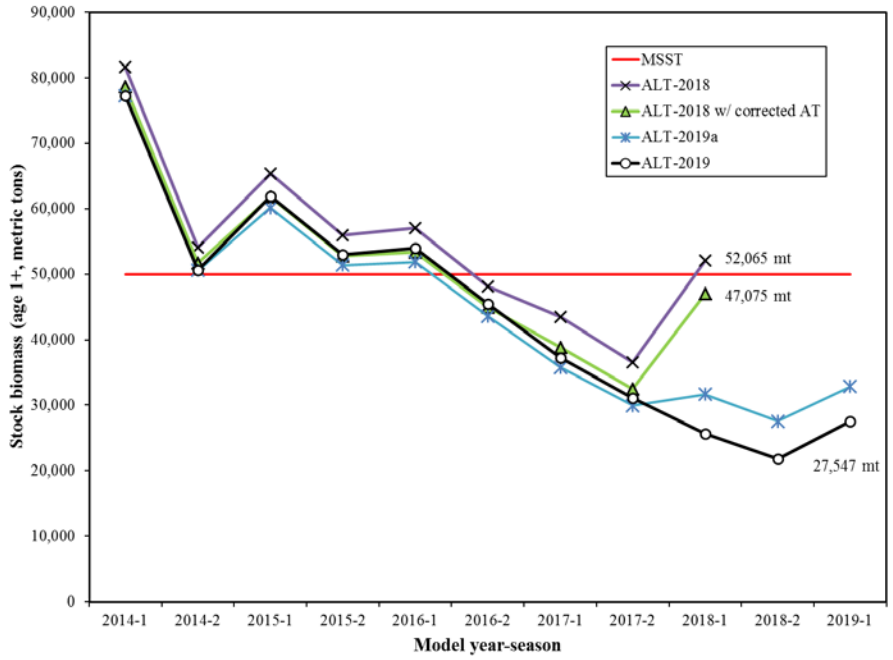




NOAA FISHERIES

Northern Sardine Stock Biomass Time Series & Status

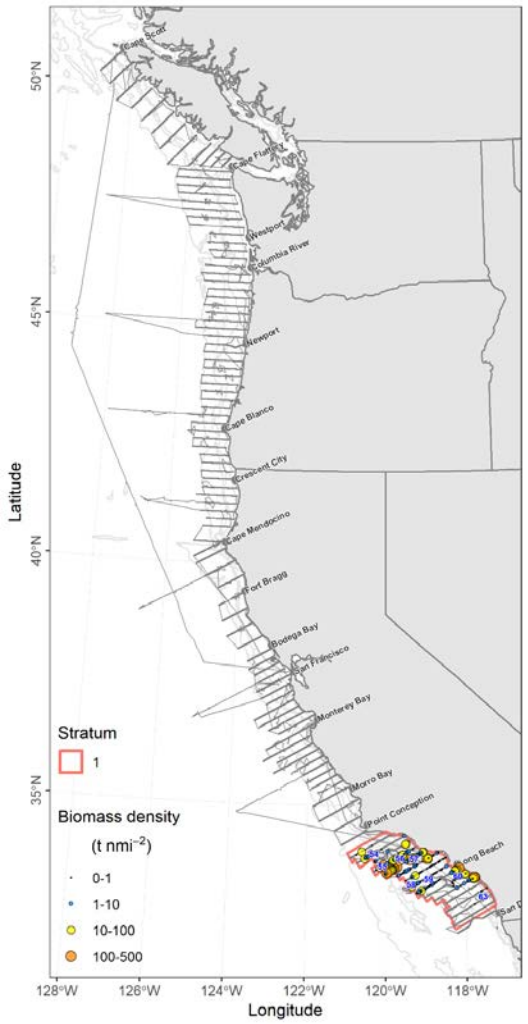




Projected 2019 Biomass < Minimum Stock Size Threshold (MSST)

Summer 2018 AT Survey
Southern Sardine Biomass Density

Stratum		Transect		Trawls		Biomass (t)				
Number	Area (nmi^2)	Number	Distance (nmi)	Cluster number	Number of Sardine	Point	Lower $CI_{95\%}$	Upper $CI_{95\%}$	SD	CV (%)
1	9,017	15	918	9	6,270	33,093	8,957	65,417	14,561	44
All	9,017	15	918	9	6,270	33,093	8,957	65,417	14,561	44

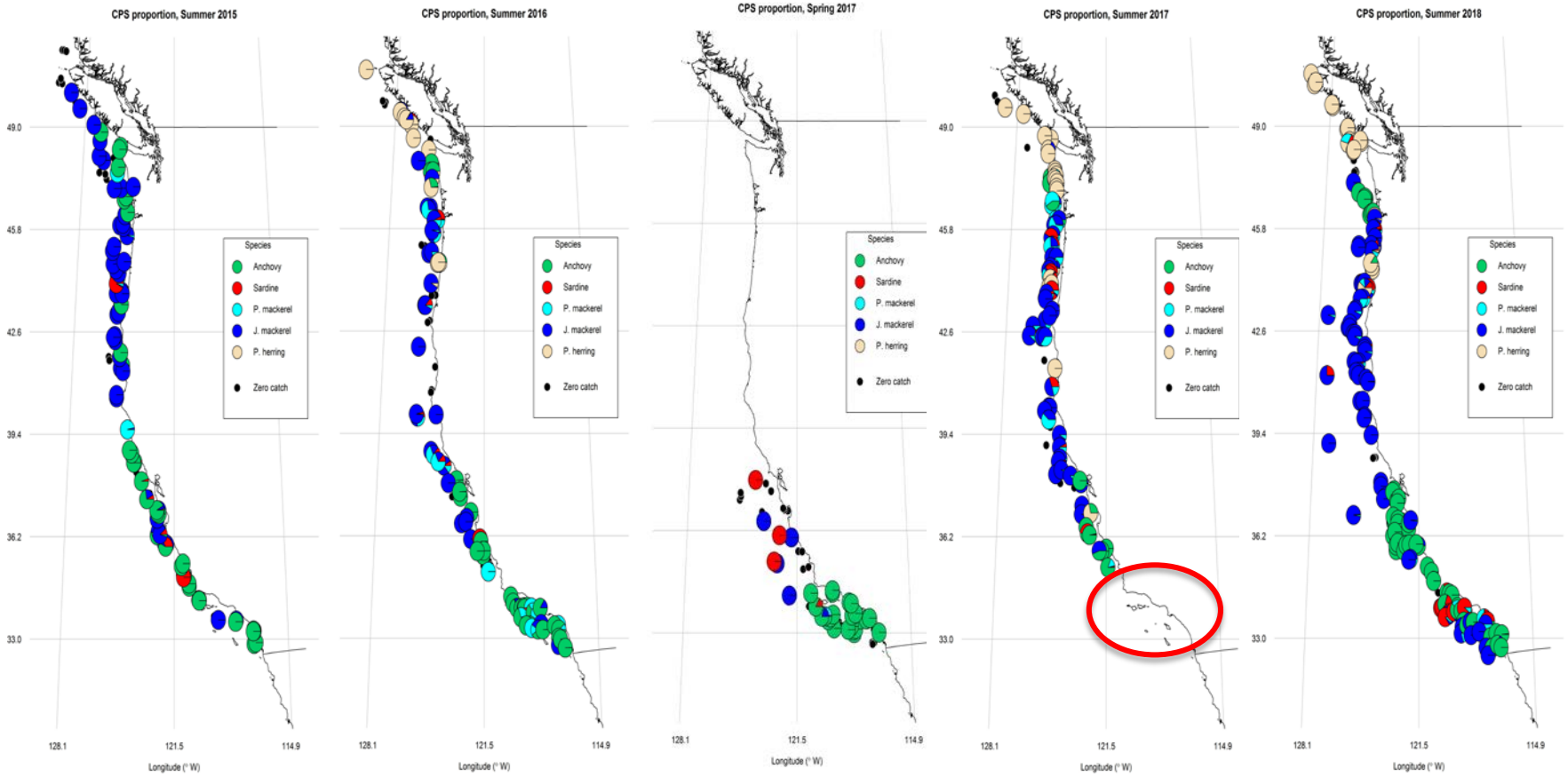


Future Improvements to the AT Survey and 2020 Benchmark Northern Sardine Stock Assessment Model

- Further efforts for inshore sampling (saildrone, aerial, industry, etc…);
- Target strength (TS) assumptions/improvements:
  - New herring TS and adjustments to all sardine estimates since 2006;
  - TS testing in SWFSC technology tank;
- Informative prior on survey catchability (*q*) in SS;
- Meta-analysis and informative prior on *M*;
- Further explore survey selectivity assumptions;
- Explore use of environmental indices to inform recent recruitment.

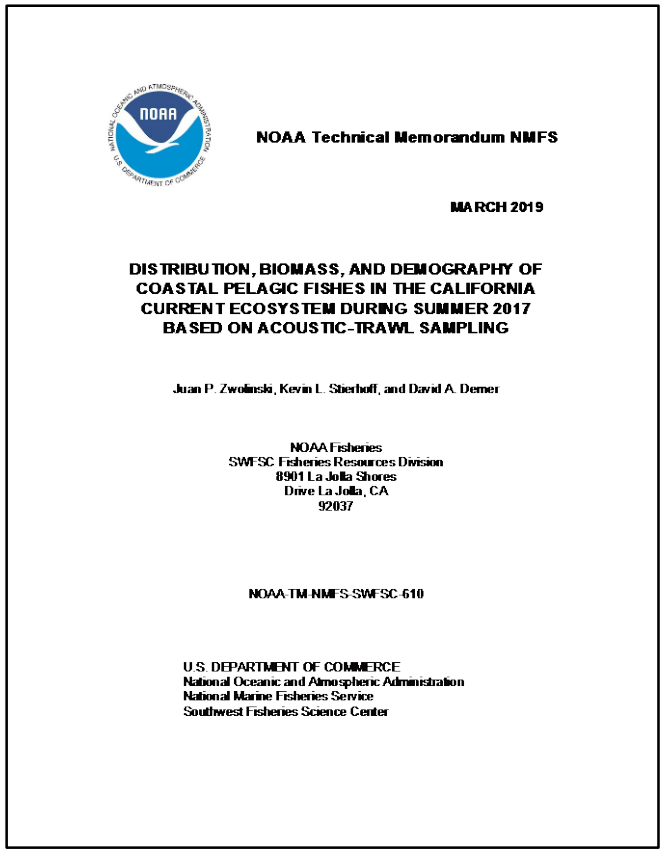
Research Survey Activities/Results

CPS Proportion by Survey



Summer 2015 | Summer 2016 | Spring 2017 | Summer 2017 | Summer 2018

Distribution, Biomass, & Demography Reports



NOAA Technical Memorandum NMFS

MARCH 2019

DISTRIBUTION, BIOMASS, AND DEMOGRAPHY OF COASTAL PELAGIC FISHES IN THE CALIFORNIA CURRENT ECOSYSTEM DURING SUMMER 2017 BASED ON ACOUSTIC-TRAWL SAMPLING

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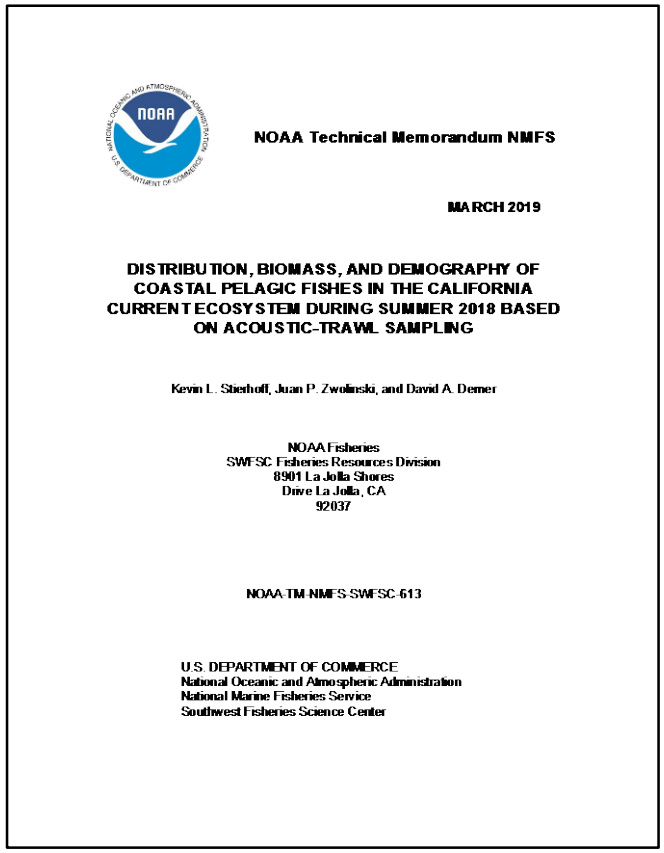
NOAA-TM-NMFS-SWFSC-610

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Science Center

CONTENTS

- Survey Design
- Acoustic Sampling
- Oceanographic Sampling
- Trawl Sampling
- Data Processing/Analysis
- Distribution, Demography, and Biomass



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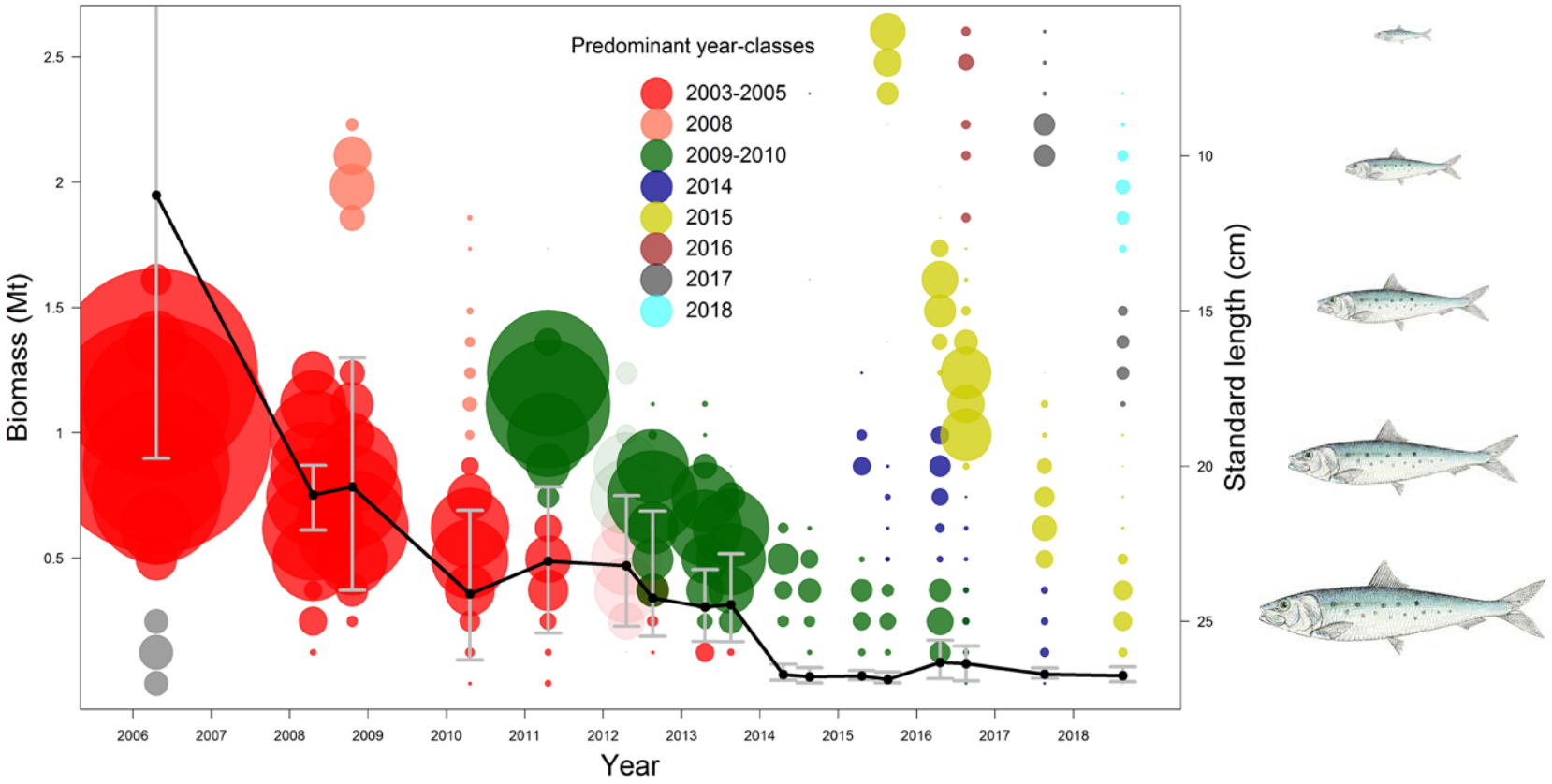
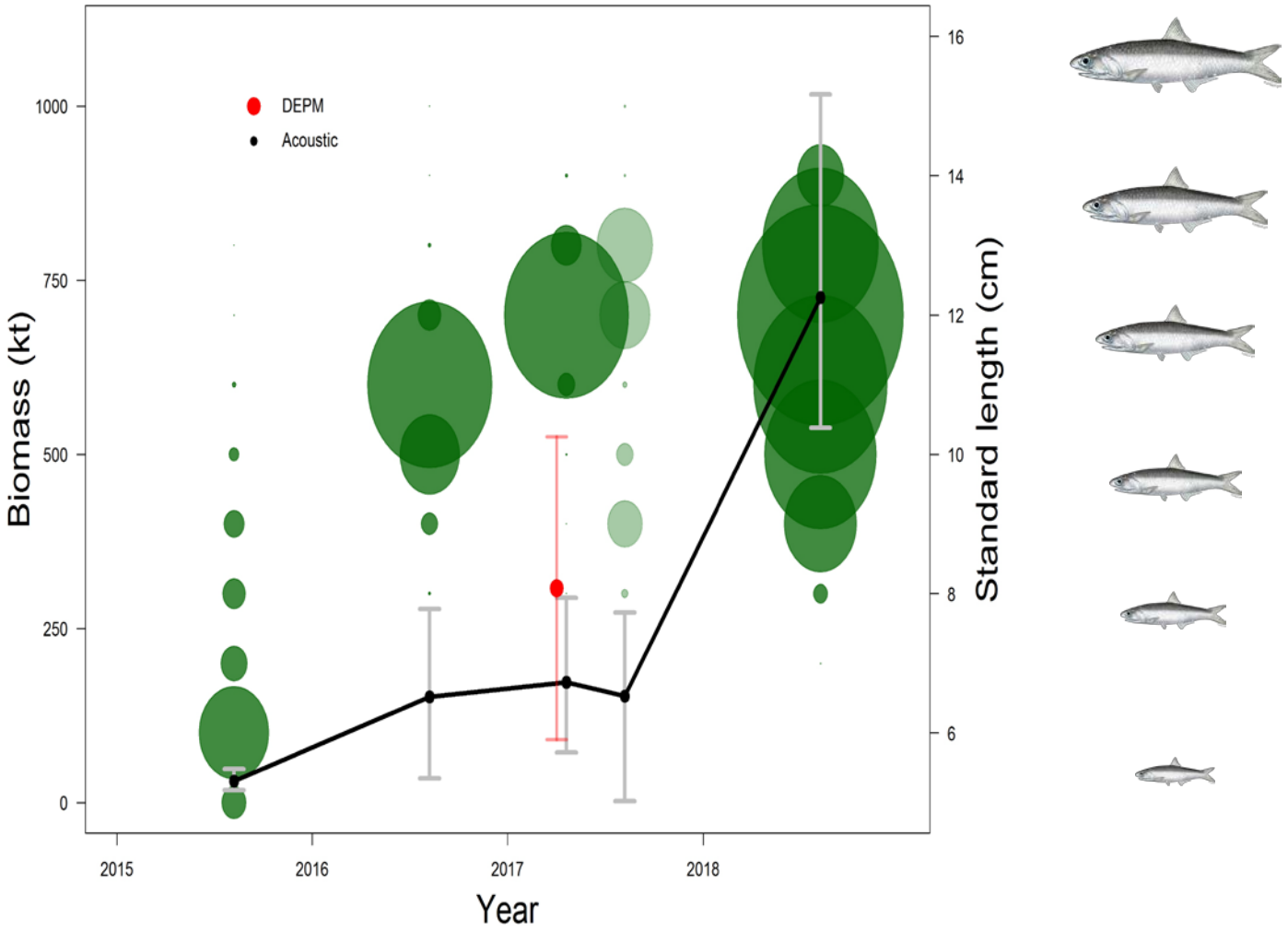
* Incomplete Sampling

	NS Pacific Sardine		SS Pacific Sardine		NS Northern Anchovy		CS Northern Anchovy		Pacific Mackerel		Jack Mackerel		Pacific Herring	
	Biomass (t)	CV (%)	Biomass (t)	CV (%)	Biomass (t)	CV (%)	Biomass (t)	CV (%)	Biomass (t)	CV (%)	Biomass (t)	CV (%)	Biomass (t)	CV (%)
Summer 2017*	14,103	(30)			22,709	(64)	153,460	(45)	41,139	(26)	128,313	(22)	63,418	(31)
Summer 2018	25,148	(67)	33,093	(44)	24,419	(38)	723,826	(17)	31,211	(22)	202,471	(17)	79,053	(37)

Sardine Lengths and Biomass



Anchovy Lengths and Biomass



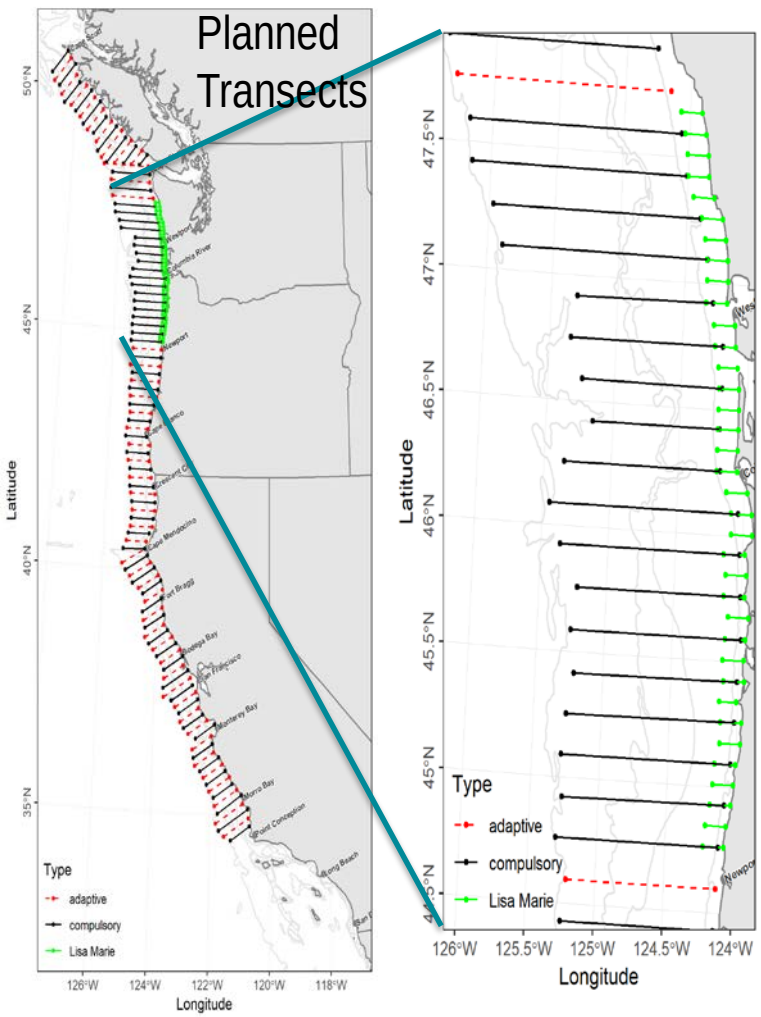
Inshore Biomass Estimation

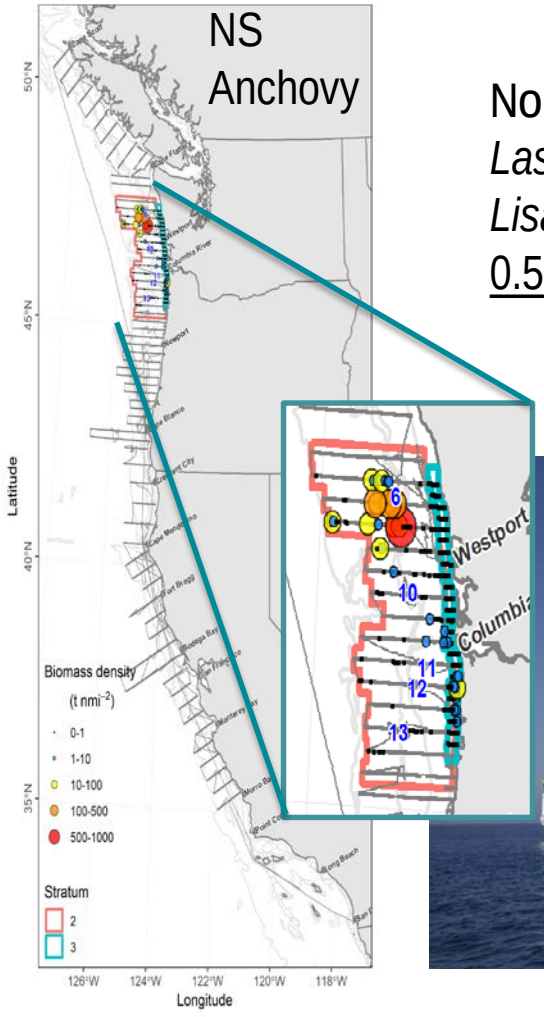
Why Do

- 2018 ATM Methodology Review Recommendation
- Viable CPS Habitat
- Industry Observations & Fishing Operations
- Scientist Observations (Aerial & Direct)

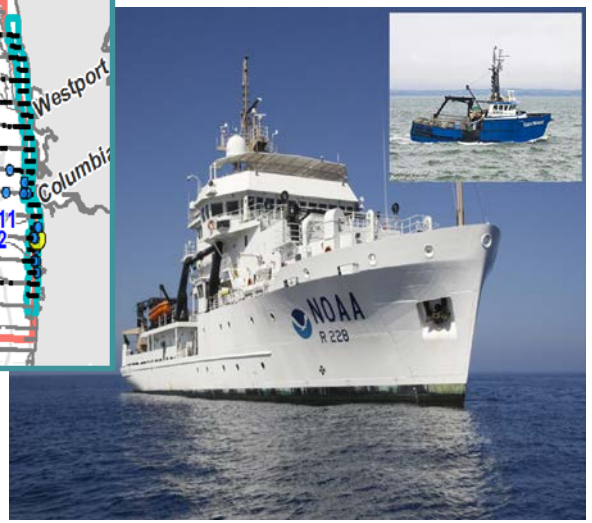
No one disputes observations – but what is the proportion relative to total estimated biomass; $$$

Summer 2017 Nearshore Measurements





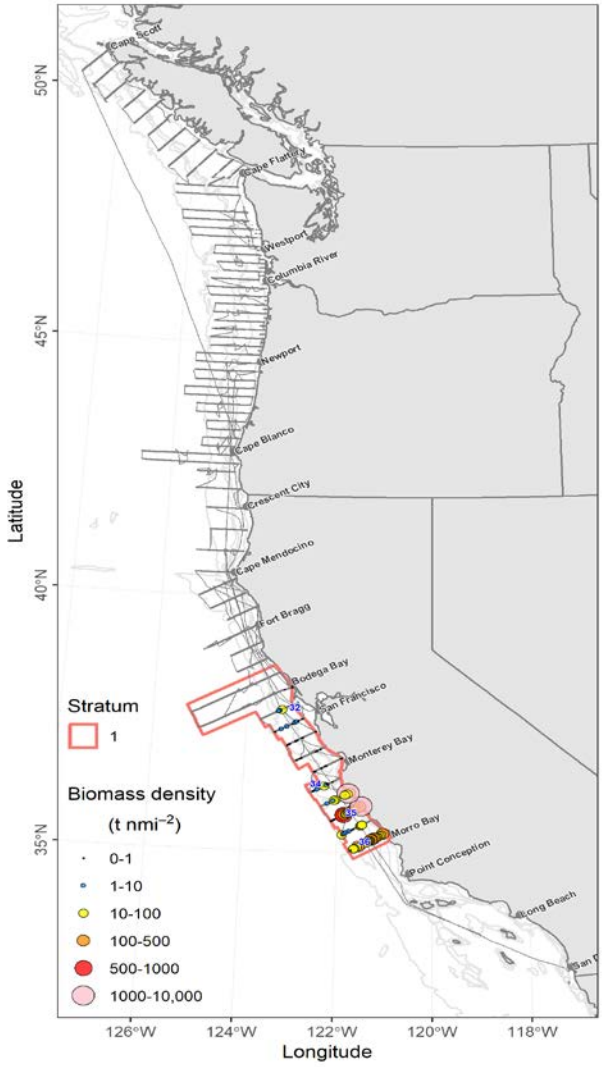
Northern stock anchovy
Lasker – 22,607 t (CV=64%)
Lisa Marie – 102 t (CV=34%)
0.5% more anchovy nearshore



Summer 2017 Nearshore Measurements

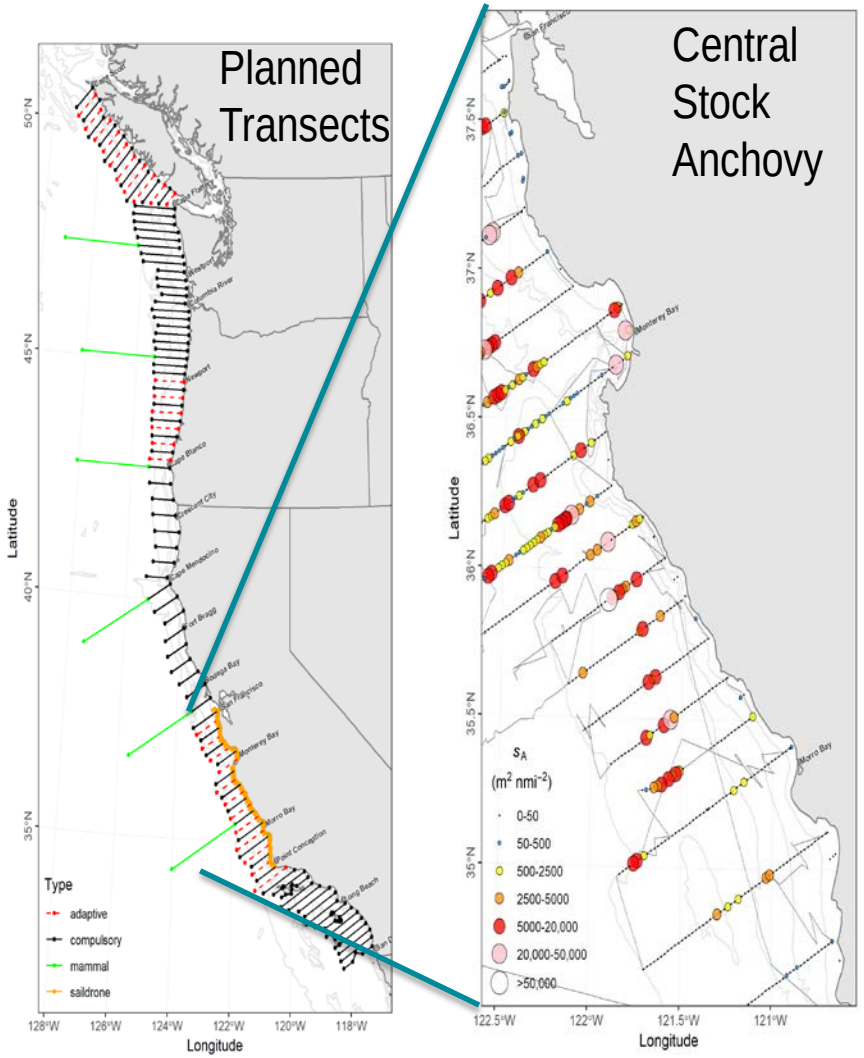
Central Stock of Northern Anchovy

Stratum		Transect		Trawls		Biomass (t)				
Number	Area (nmi^2)	Number	Distance (nmi)	Cluster number	Number of Anchovy	Point	Lower $CI_{95\%}$	Upper $CI_{95\%}$	SD	CV (%)
1	815	12	42	5	86,143	45,446	454	48,240	13,634	30
All	815	12	42	5	86,143	45,446	454	48,240	13.634	30

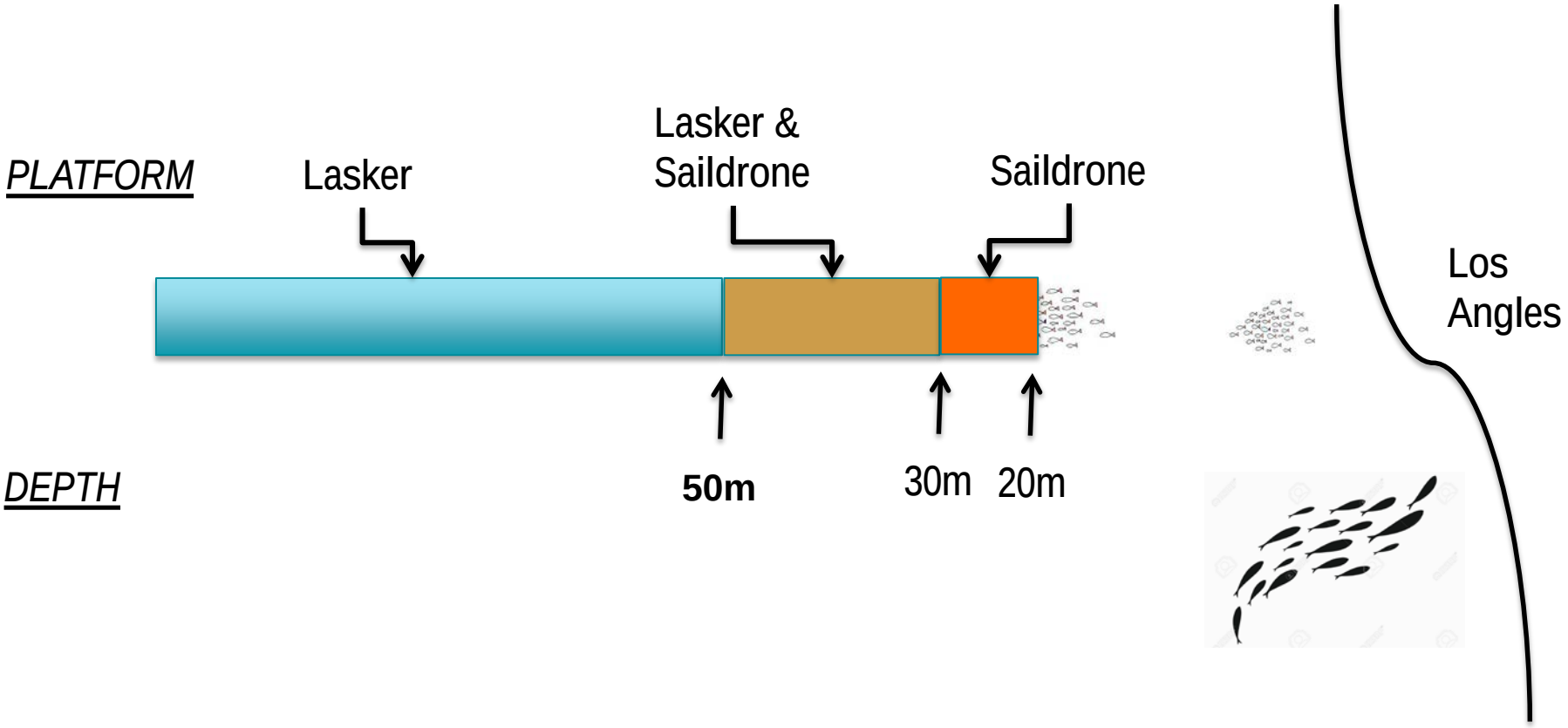


Summer 2018 Nearshore Measurements

Central stock anchovy
Lasker – 716,887 t (CV~17%)
Saildrone – 6,939 t (CV=71%)
<u>1% more anchovy nearshore</u>



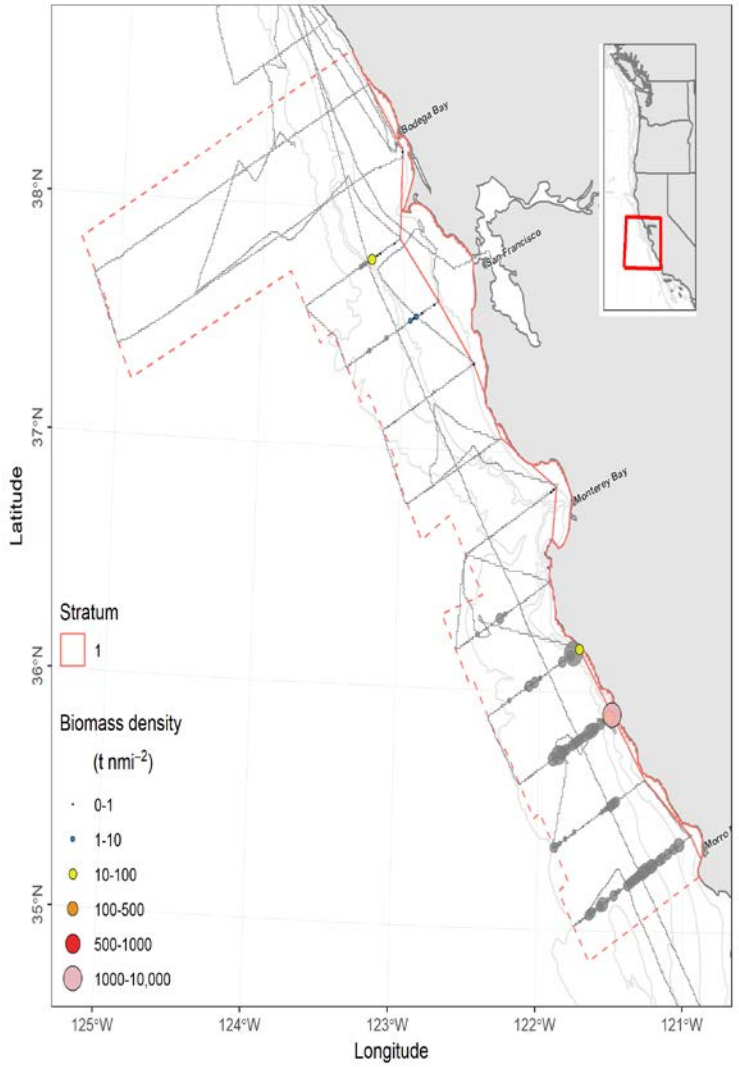
Summer ATM Survey



2017 – Lasker only to 50m depth
2018 – Lasker and Saildrone to approximately 30m depth, Saildrone to approximately 20m depth

Nearshore Extrapolations

1. Distances were calculated for the projections of each transect to the 5-m isobath.
2. The biomass densities along these unsampled transect extensions were assigned the values measured along the sampled transects, equal distances from the eastern ends of the transects.

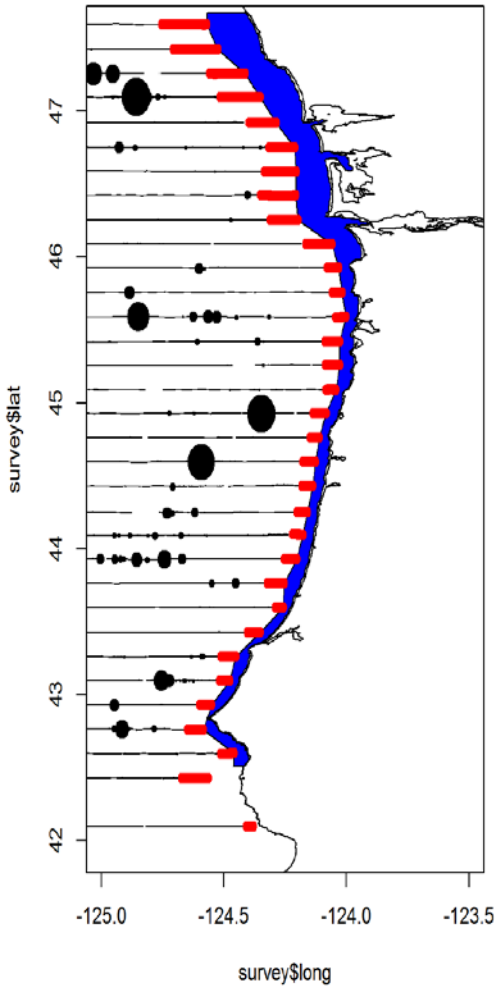


Central Stock Northern Anchovy

Nearshore biomass “data”

The biomass density data used to calculate the abundance in the nearshore strata are taken from an interval in the nearest acoustic transects, with a length equal to the distance between the transect endpoint and the 5-m isobath.

The intervals in red have the same length as the distance to the 5-m isobath – their density is assumed to reflect the near-shore density



Nearshore Extrapolations results

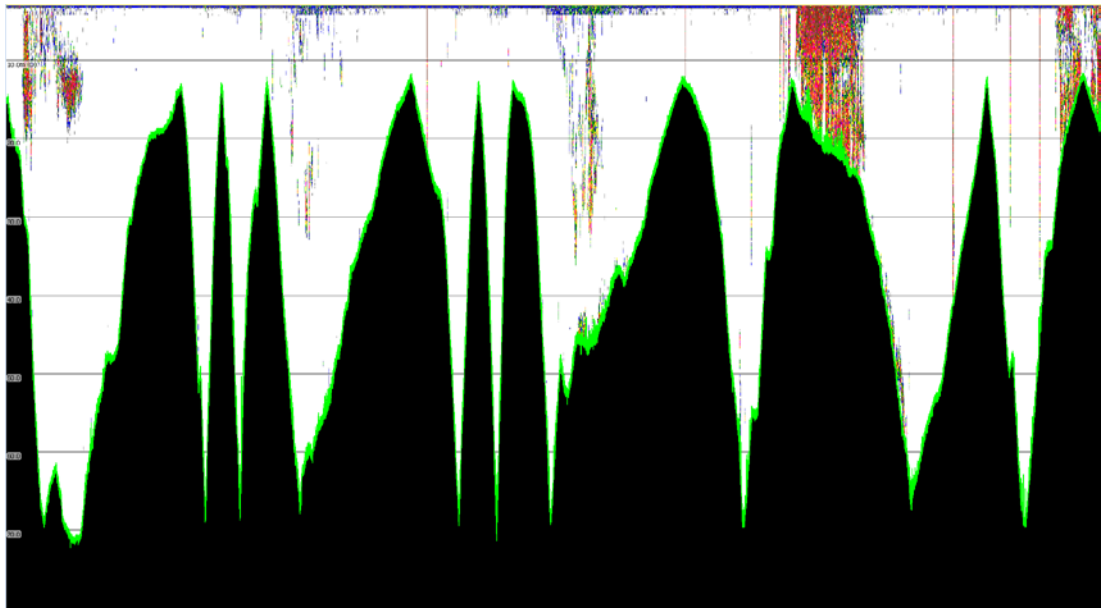
The extrapolated values depend on the nearest measurements (acoustic and trawl samples) to the unsampled areas, which primarily depend on the stock distributions at the time of the survey.

	NS Pacific Sardine		SS Pacific Sardine		NS Northern Anchovy		CS Northern Anchovy		Pacific Mackerel		Jack Mackerel		Pacific Herring	
	Biomass (t)	CV (%)	Biomass (t)	CV (%)	Biomass (t)	CV (%)	Biomass (t)	CV (%)	Biomass (t)	CV (%)	Biomass (t)	CV (%)	Biomass (t)	CV (%)
Summer 2017	142	(57)			19	(42)	45,446	(28)	548	(43)	971	(38)	7,372	(64)
Summer 2018	308	(86)	1,870	(74)	1,310	(84)	4,110	(56)	1,320	(75)	9,954	(75)	8,449	(52)

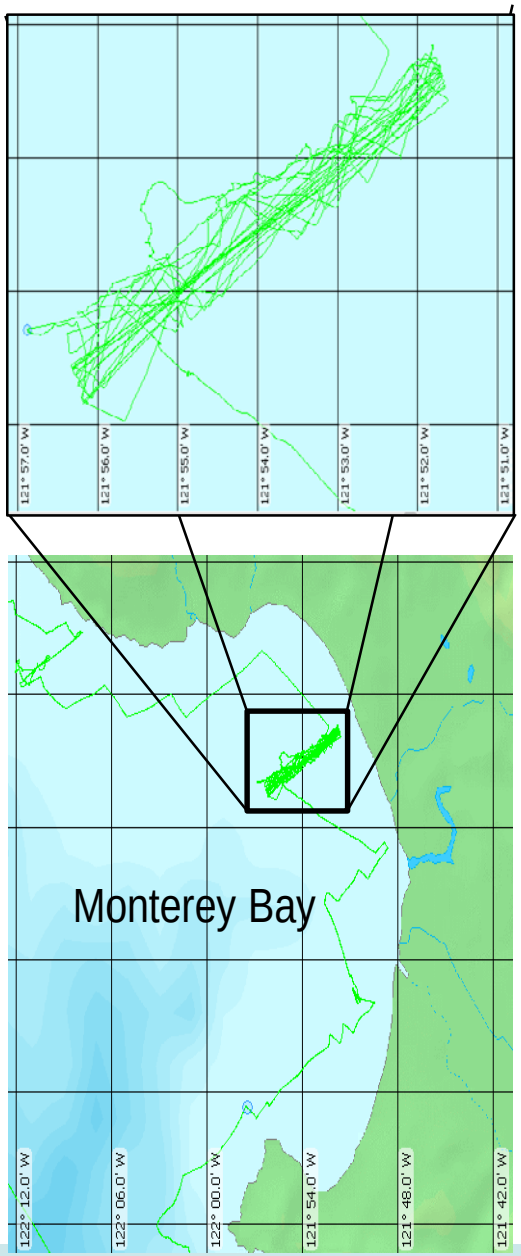
Transect Dynamics

SD1024 Repeat of *Lasker* Transect 34 (~ 8 km), Monterey Bay

4-Day “Repeated” Transect



Day 1 **Day 2** **Day 3** **Day 4**



When and where you sample matters!
Especially important at low population levels.

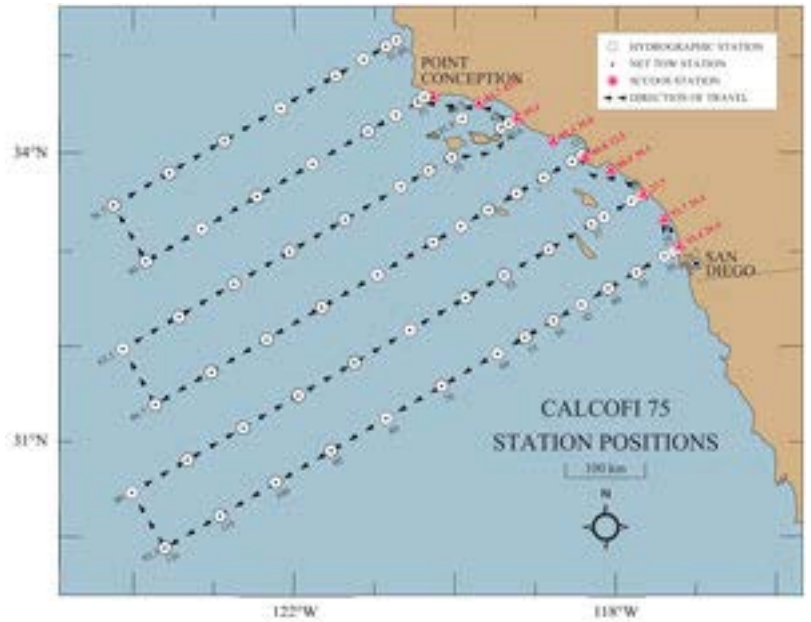
Recent Scientific Publications

- **Zwolinski, J. et al. (2019). Distribution, biomass, and Demography of coastal pelagic fishes in the California Current Ecosystem during Summer 2017 based on acoustic-trawl sampling. NOAA Technical Memorandum NMFS, NOAA-TM-NMFS-SWFSC-610. 93 pg.**
- **Stierhoff, K. et al. (2019). Distribution, biomass, and Demography of coastal pelagic fishes in the California Current Ecosystem during Summer 2018 based on acoustic-trawl sampling. NOAA Technical Memorandum NMFS, NOAA-TM-NMFS-SWFSC-613. 81 pg.**
- **Hill, K. et al. (2019). Assessment of the Pacific sardine resource in 2019 for U.S. management in 2019-20. PFMC April 2019. 116 pgs.**
- **Crone, P. et al (in review). Pacific mackerel (Scomber japonicus) stock assessment for U.S. management in the 2019-20 and 2020-21 fishing seasons. PFMC April 2019. 99 pgs.**
- **Zwolinski, J. and D. Demer (*in press*). Re-evaluation of the environmental dependence of Pacific sardine recruitment. Fisheries Research.**

Future Activities

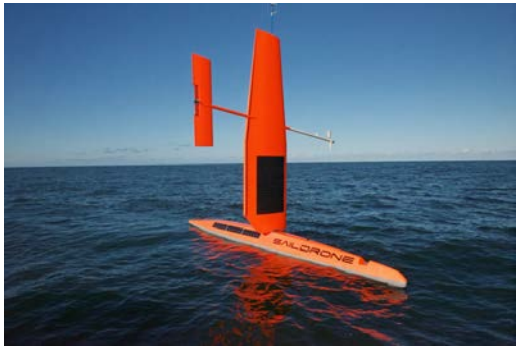
Surveys – 2019

- 2019 Spring CalCOFI survey/Gear Testing: April 3-29 – FSV Reuben Lasker
- 2019 Summer ATM CCES survey: June 13-Sept. 9 (~ 75 days) – FSV Reuben Lasker → CPS Acoustic Trawl Survey with unmanned system, Industry, etc.



Data Analyses

- Saildrone Report – utility
- Trawl Selectivity



Workshops

- CPS Fishery-Dependent Monitoring
- CPS Research Coordination


Questions