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Assessment of the Pacific Sardine Resource in 2016 for USA Management in 2016-17



Agenda Item H.1.a

Acknowledgments

CDFO: Linnea Flostrand, Vanessa Hodes, Sean MacConnachie, Jordan Mah

NWFSC: Richard Methot, Ian Taylor

WDFW: Carol Henry, Robert Le Goff, Lorna Wargo, Sandra Rosenfield, Jennifer Topping

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INAPESCA: Manuel Nevarrez, Concepción Enciso-Enciso

Outline

- Updated assessment data
- Issues arising in 2016
- Update model results
- Harvest control rules for 2016-17
- Spring 2016 CPS Survey Results - Preliminary

Northern Subpopulation Distribution Fishing Areas, & Modeled Fleets

*Summer/Fall
(Feeding)*

*Winter/Spring
(Spawning)*



Updated Assessment

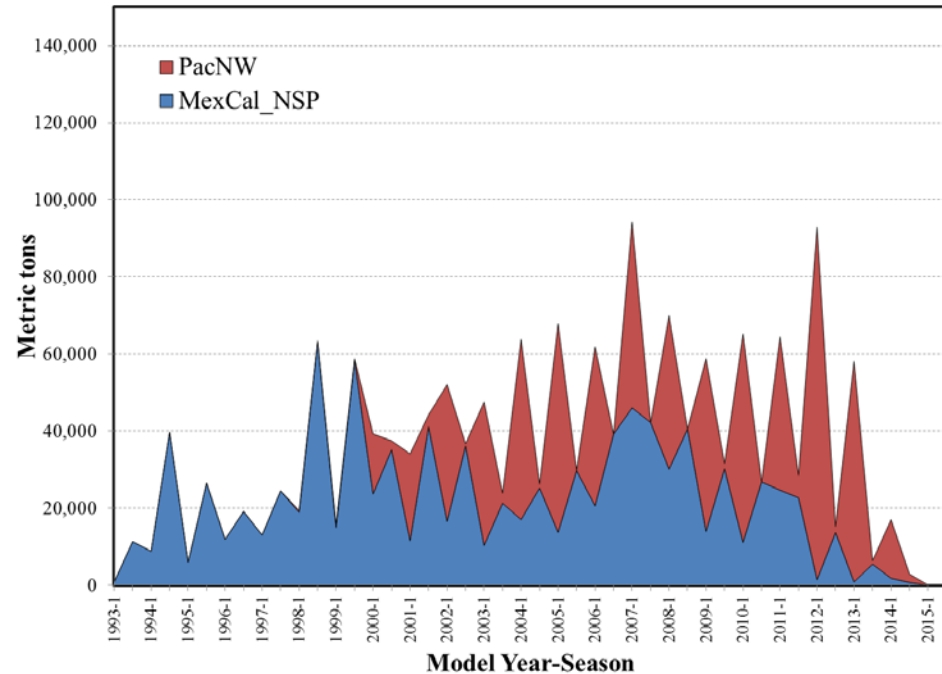
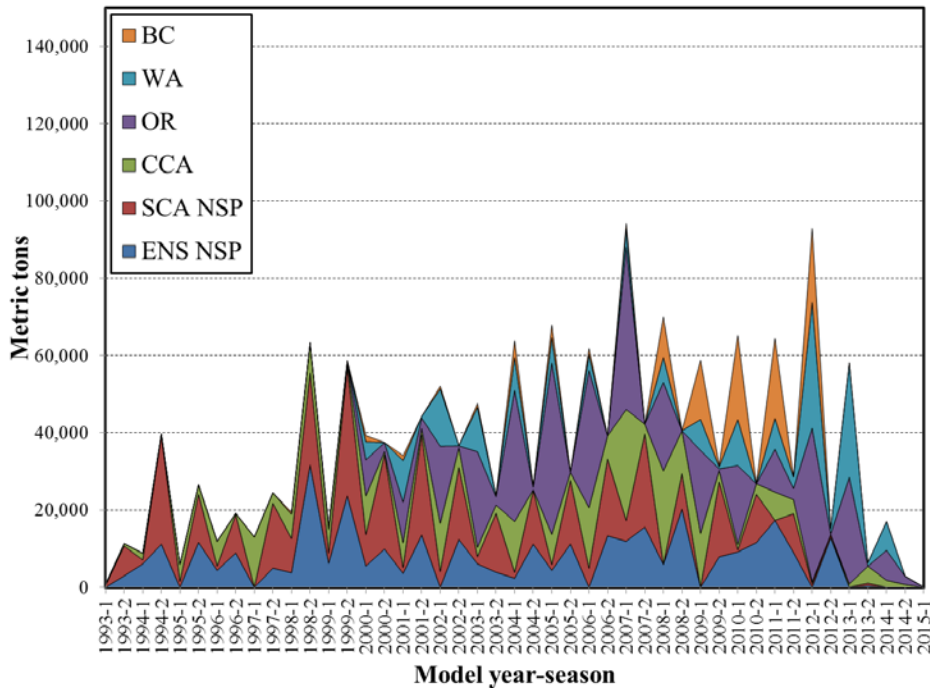
Data:

- Fishery
 - o Landings updated 2013-2015; projected Jan-Jun 2016
 - o Lengths updated through 2015
 - o Conditional age-at-length updated through 2015
- Surveys (Appendices)
 - o DEPM Spring 2015 (Dorval et al.)
 - o ATM biomass - Spring & Summer 2015 (Zwolinski et al.)

Parameterization:

- Last year of main rec_devs and bias adjustment parameters advanced one year
 - o 2015 YC is estimated in SS (for projecting age 1+ biomass for July 2016)

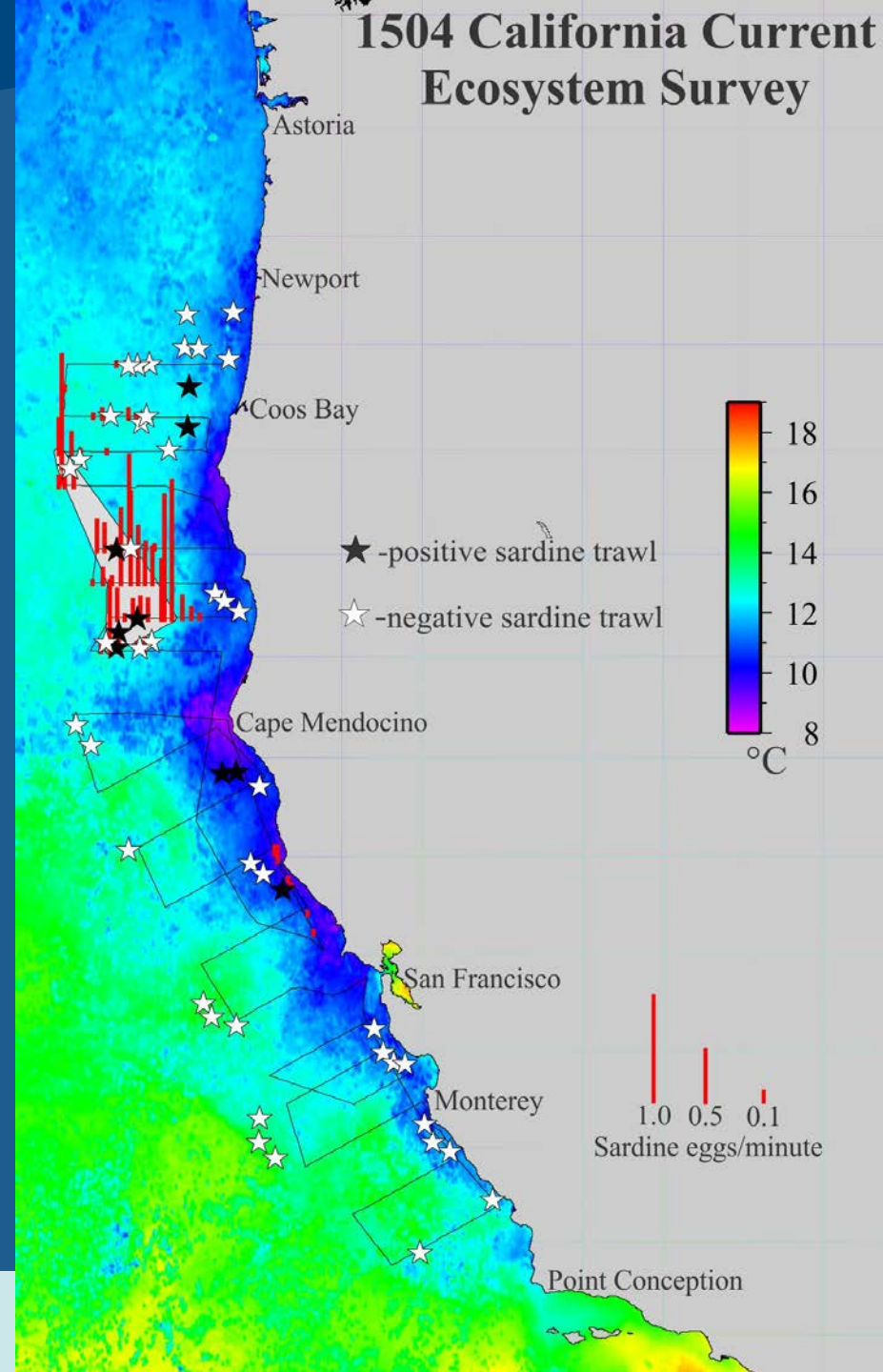
Pacific Sardine Northern Subpopulation Landings by Fishing Region & Fleet



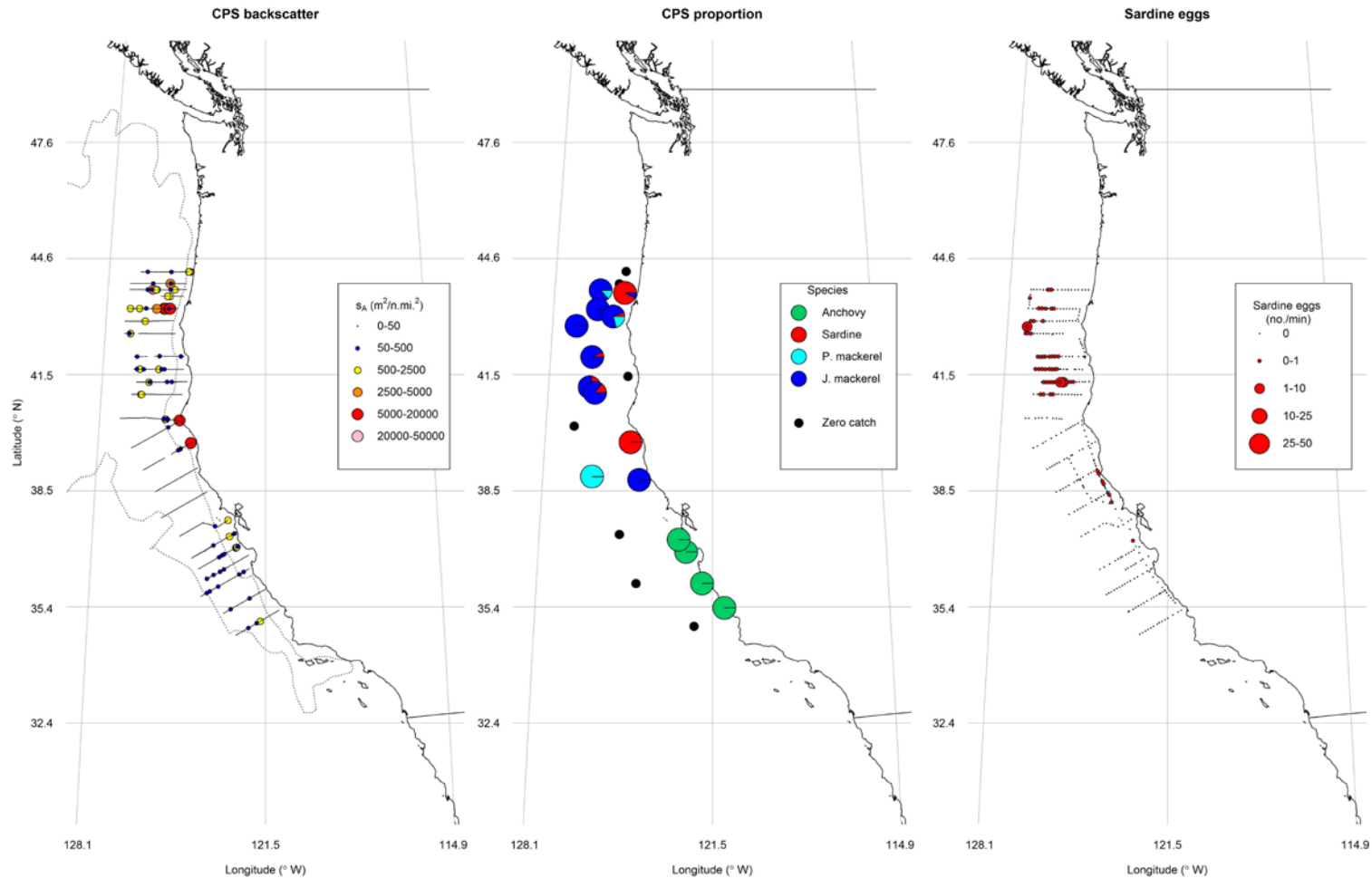
Spring 2015 Survey

Daily Egg Production Method Estimate of SSB

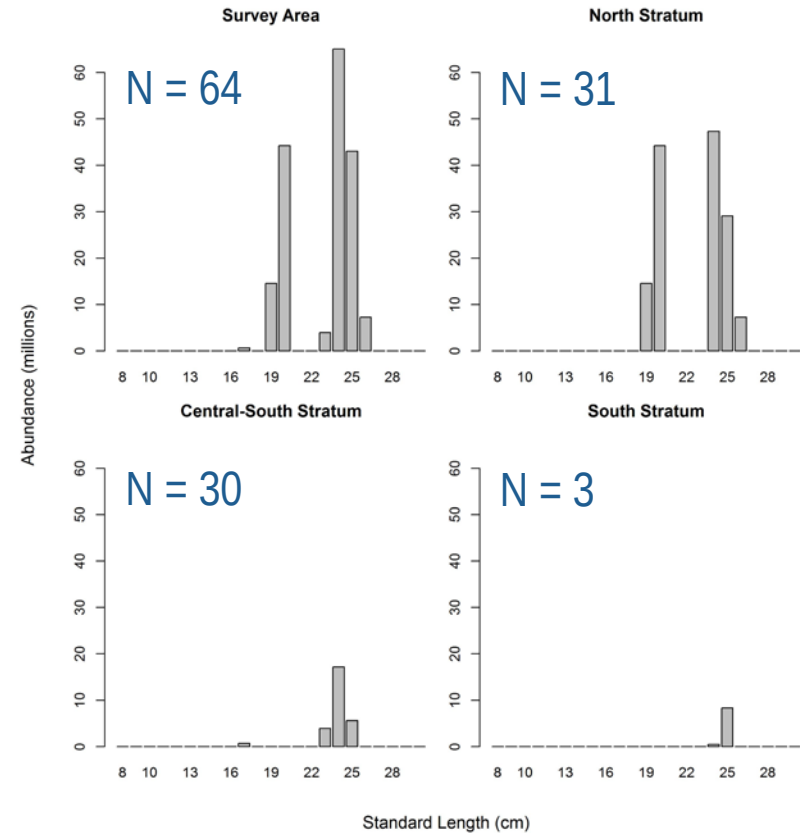
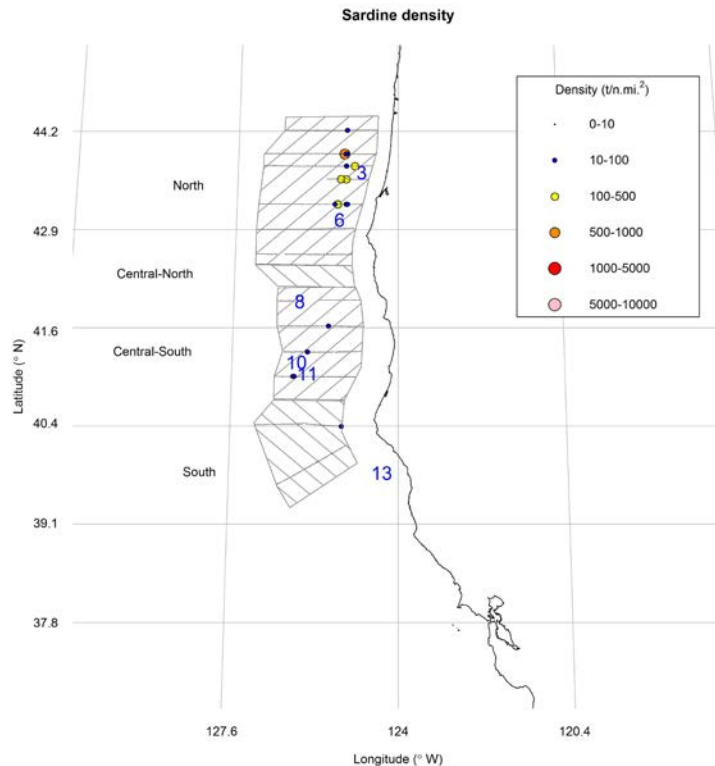
- Post-stratified survey area
 - CUFES samples: 351
 - High density area (≥ 0.3 egg/min)
Region 1 = 8,814 km²
 - Low density area (< 0.3 egg/min):
Region 2 = 172,436 km²
 - Whole DEPM survey area
181,250 km²
- Female SSB = 19,376 (0.58) mt



Spring 2015 Survey: Acoustic-Trawl Method

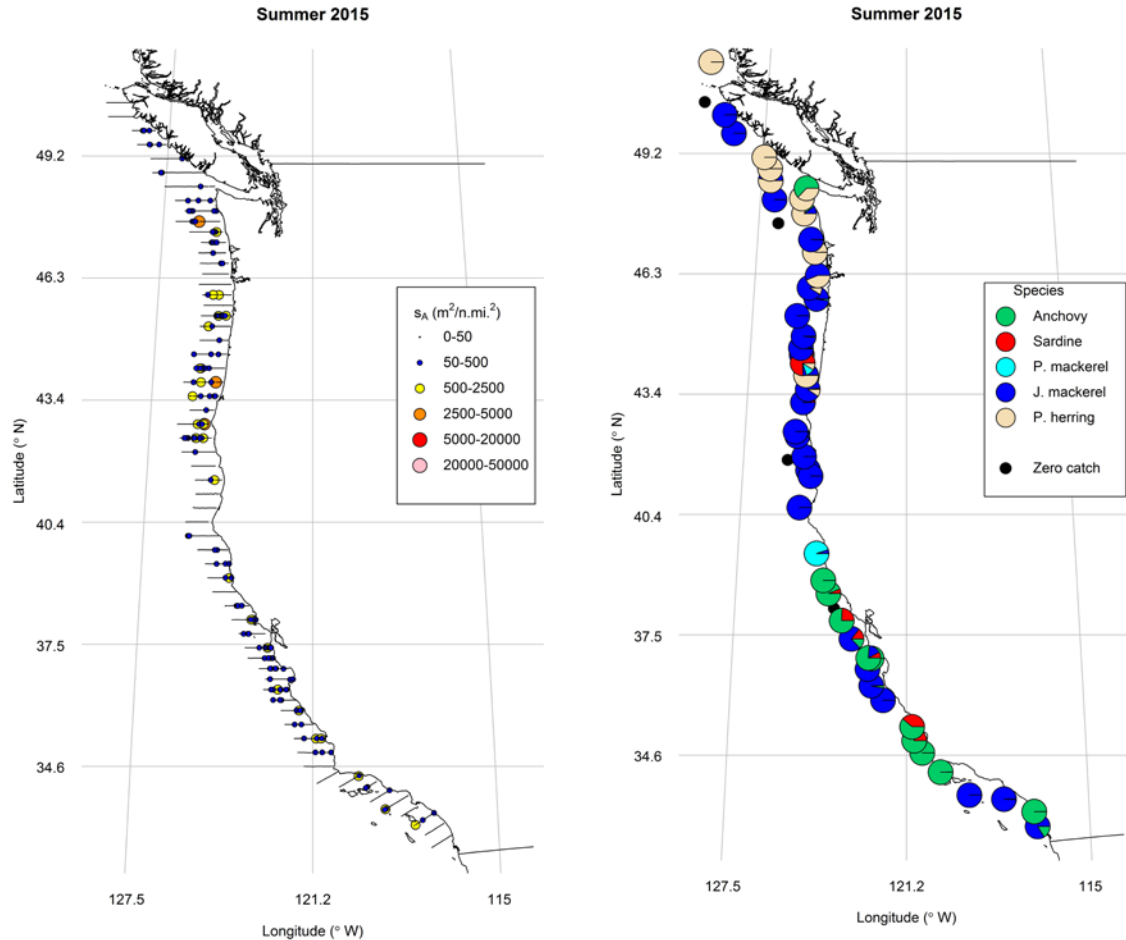


Spring 2015 Survey: Acoustic-Trawl Method

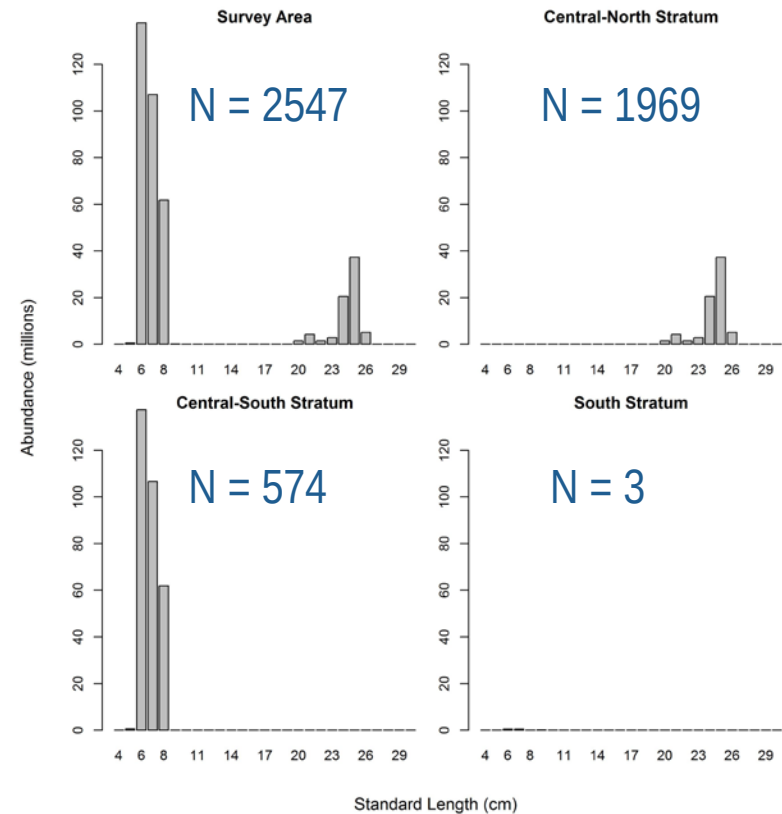
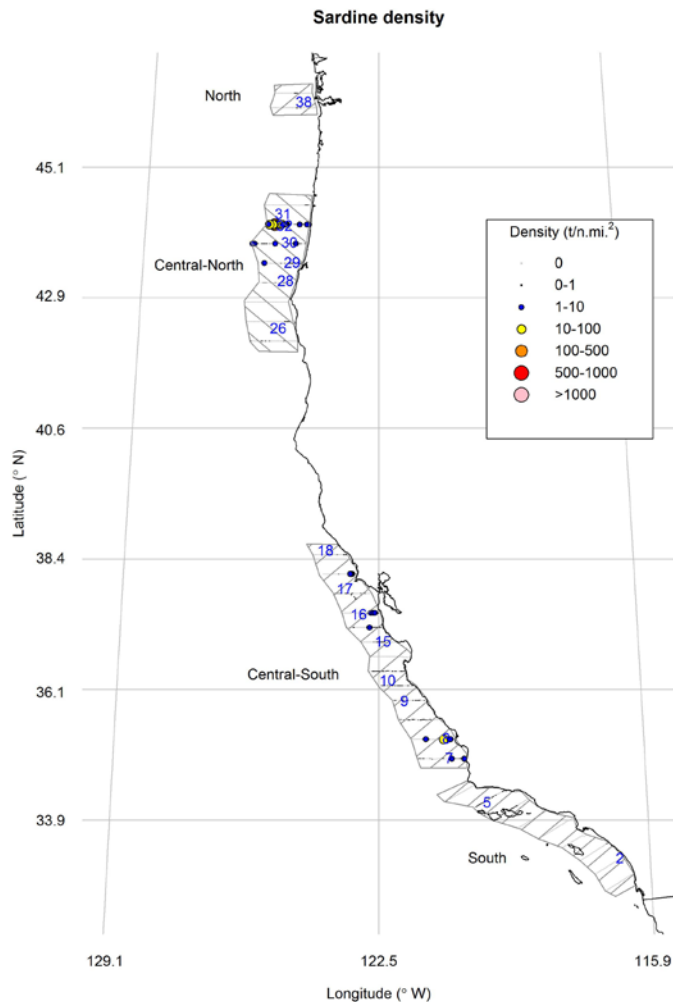


Spring ATM Biomass
 $B = 29.0 * 10^3 \text{ t (CV = 29.9\%)}$

Summer 2015 Survey: Acoustic-Trawl Method

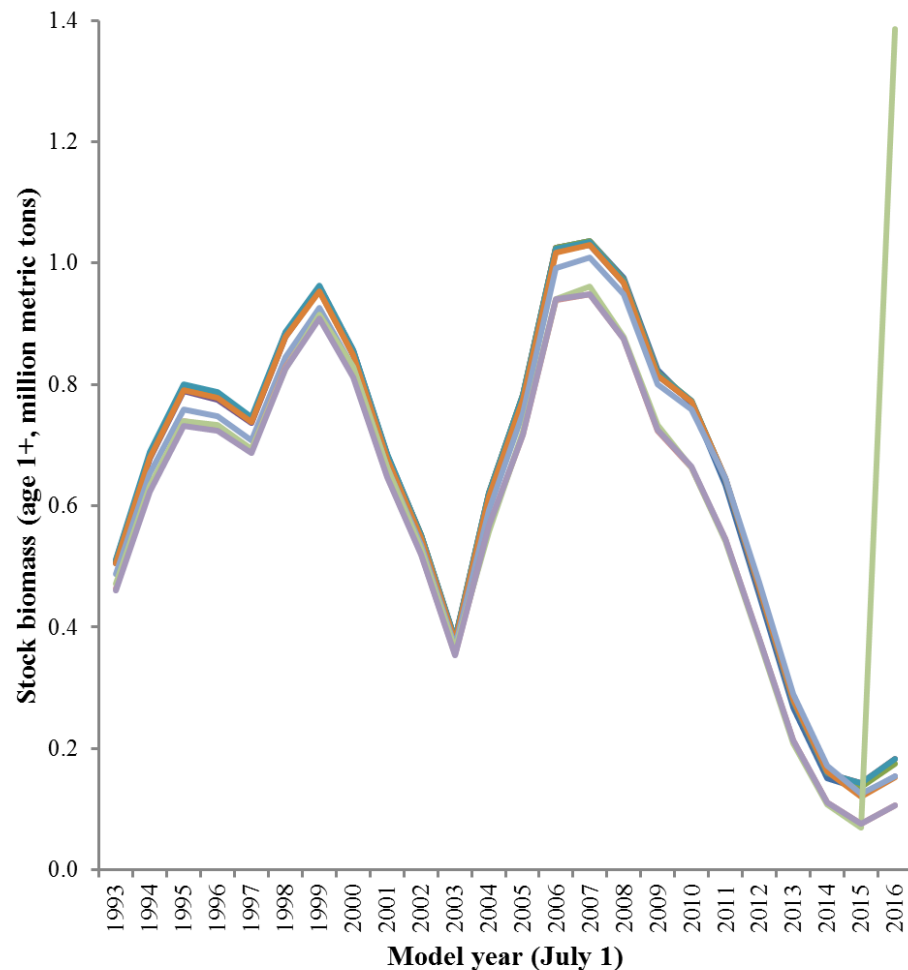
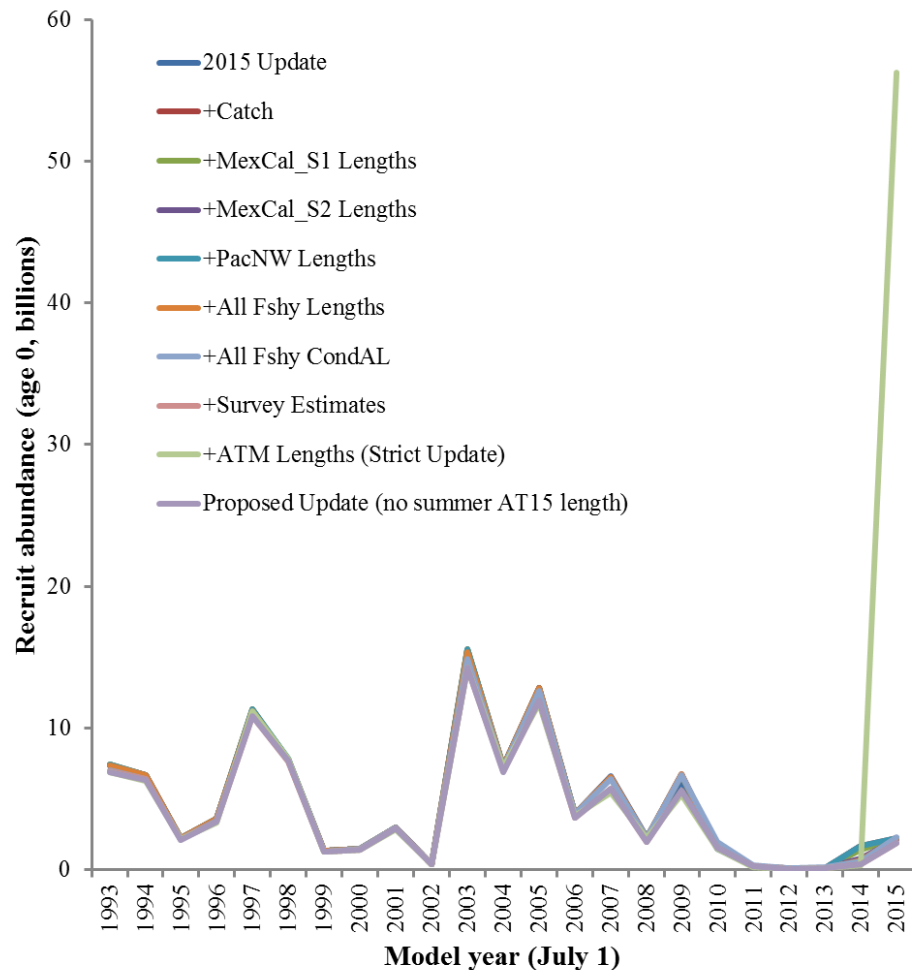


Summer 2015 Survey: Acoustic-Trawl Method

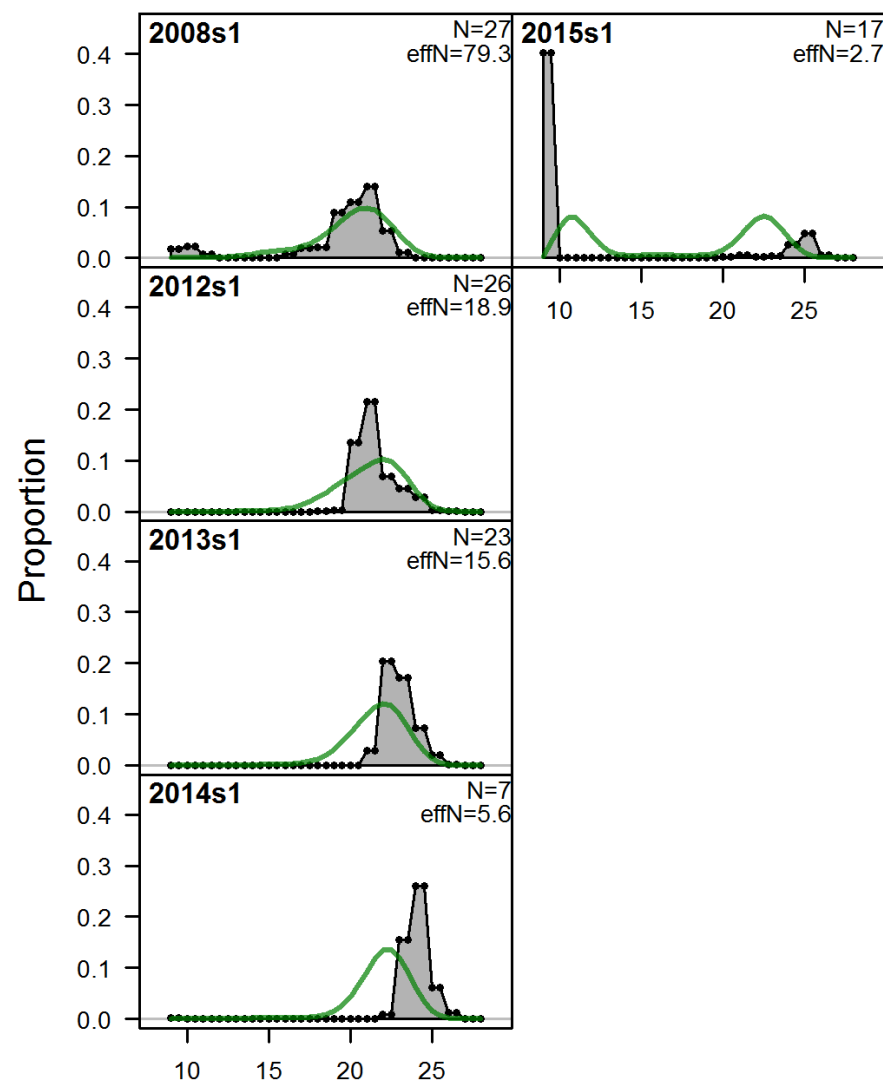
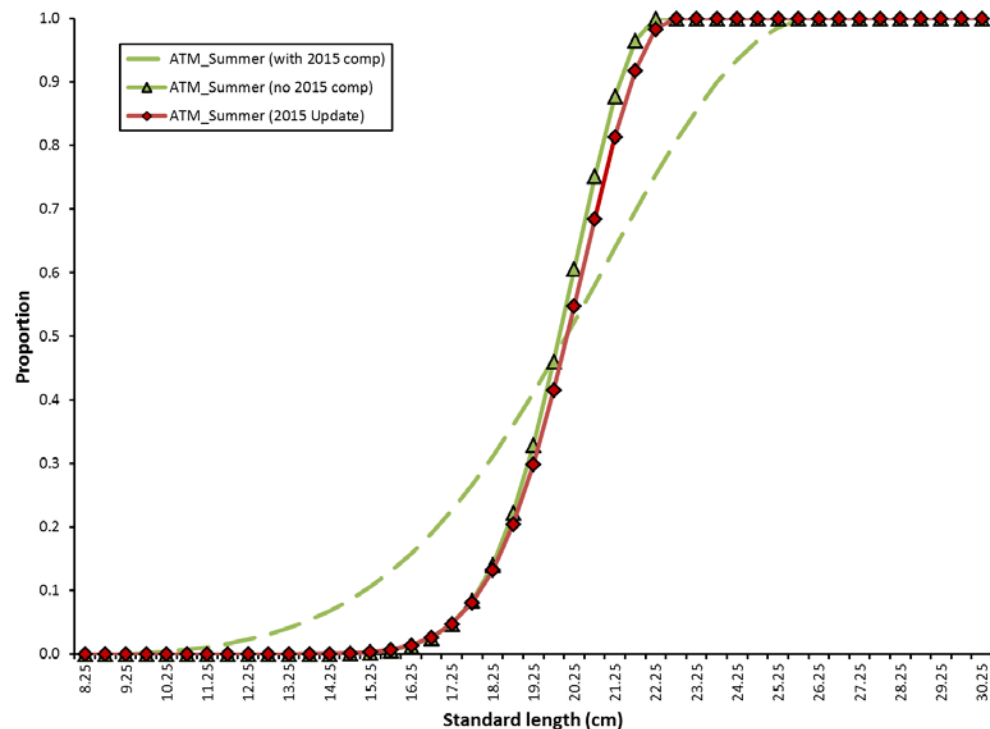


Summer ATM Biomass
 $B = 15.9 \times 10^3 \text{ t}$ (CV = 80.2%)

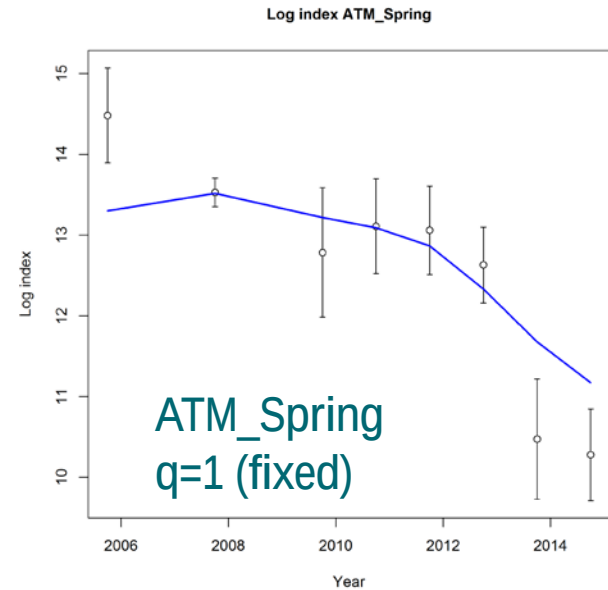
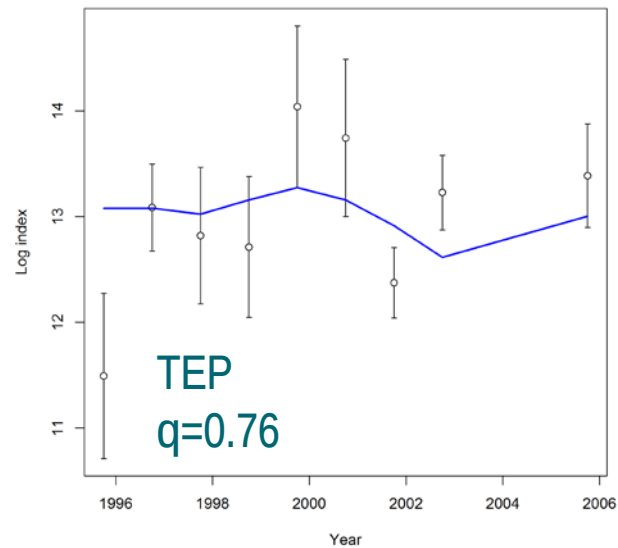
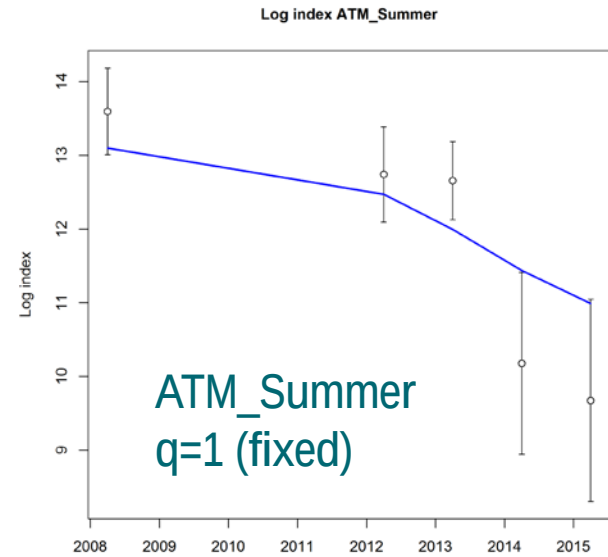
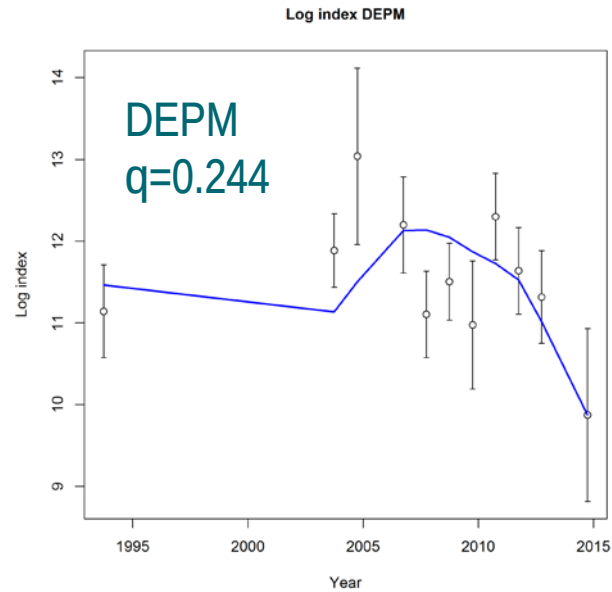
Recruitment and Stock Biomass Estimates for Stepwise Addition of New Data (Fig. 38, p. 114)



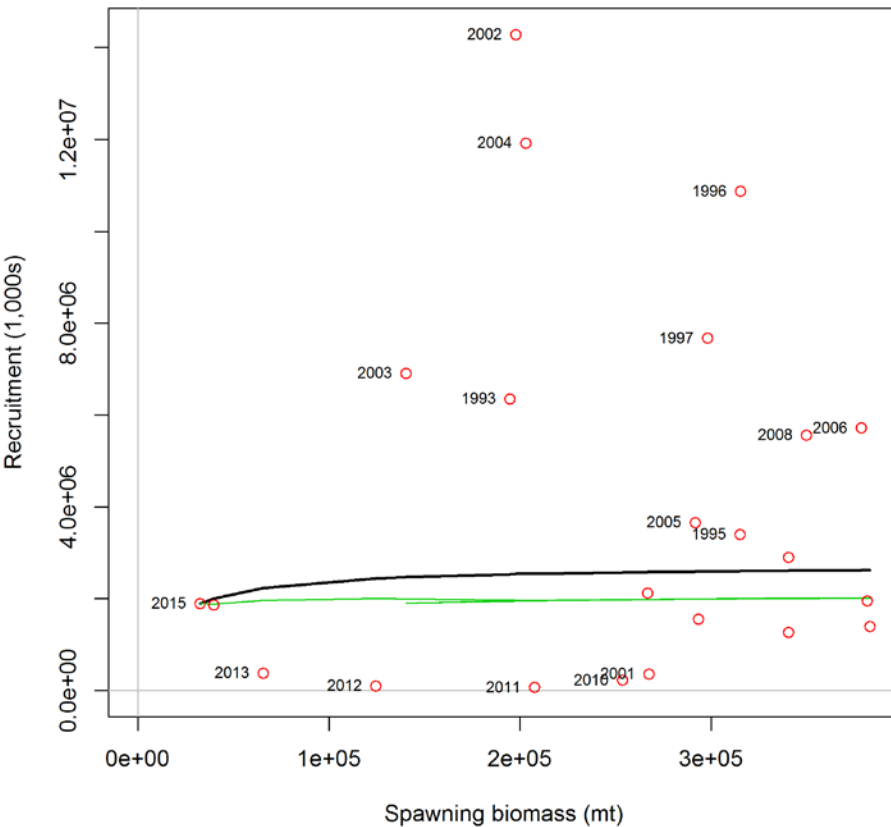
Summer ATM Selectivity and Fits (Strict Update)



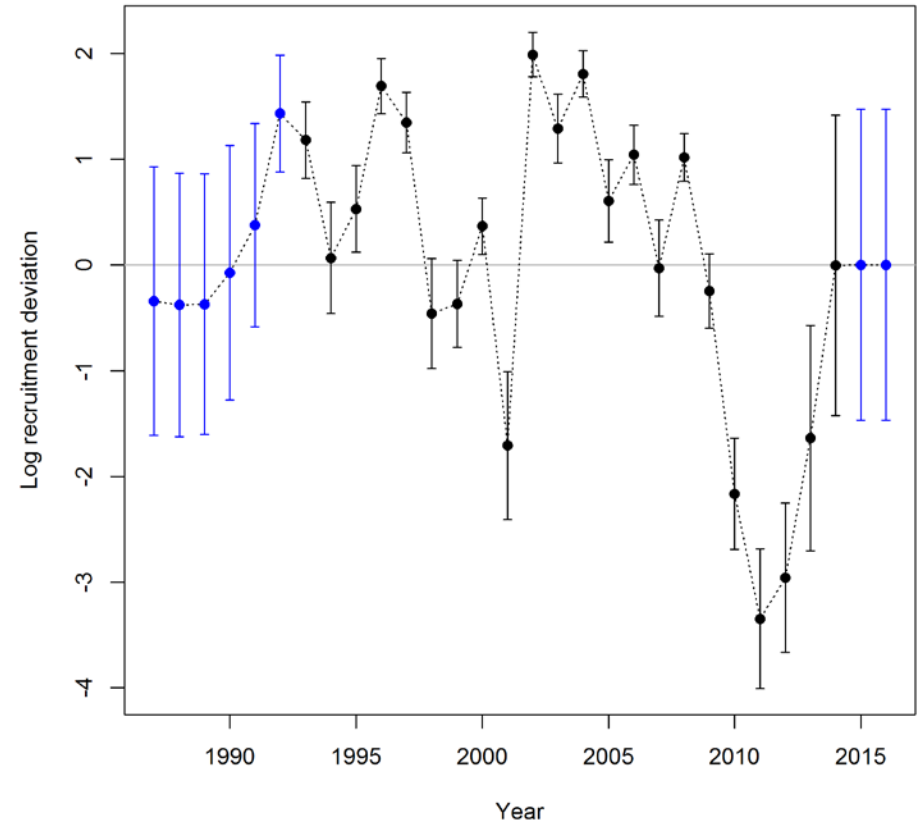
Fits to Survey Time Series



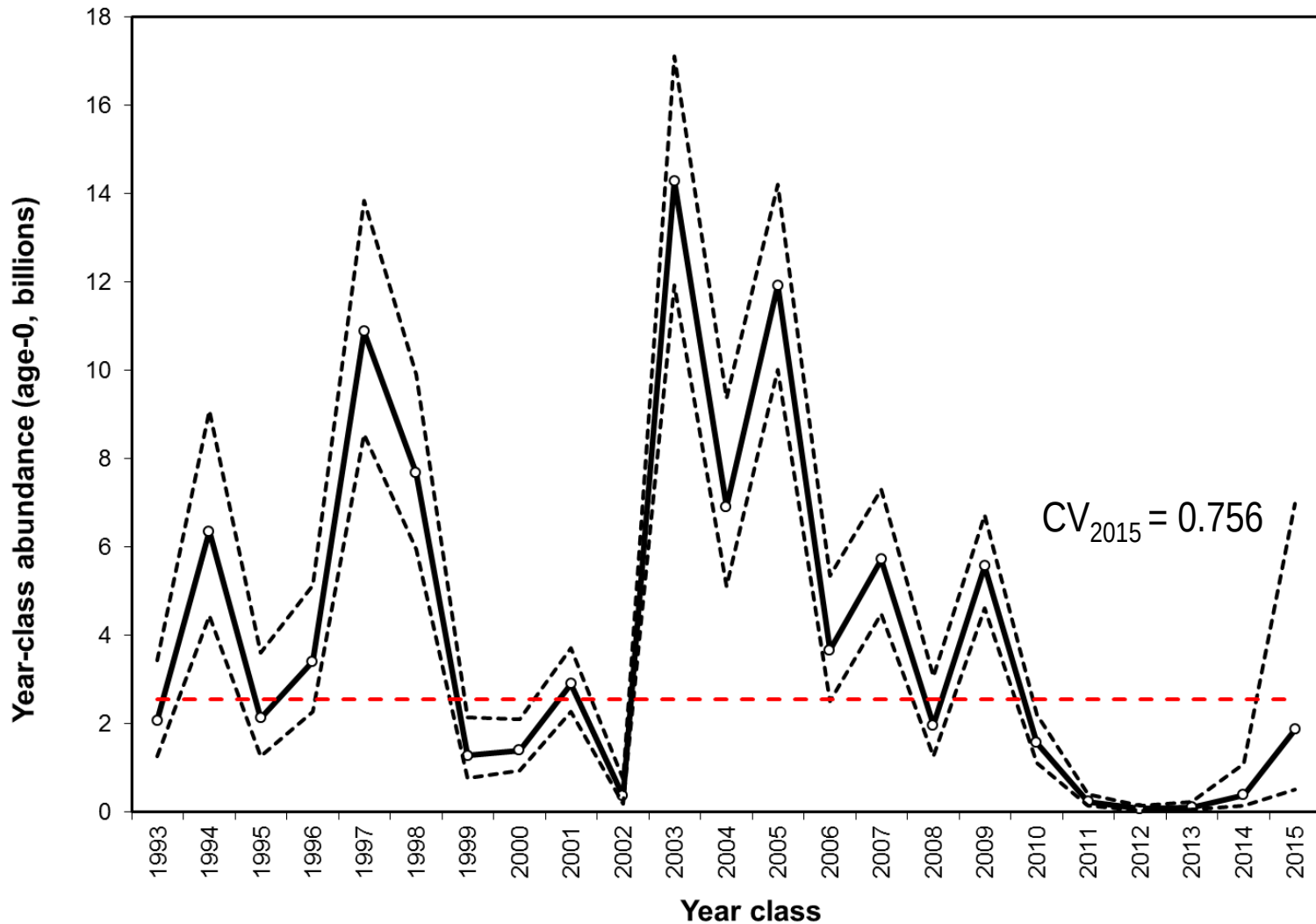
B-H spawner-recruit relationship ($h=0.8$ (fixed), $\sigma_R=0.75$)



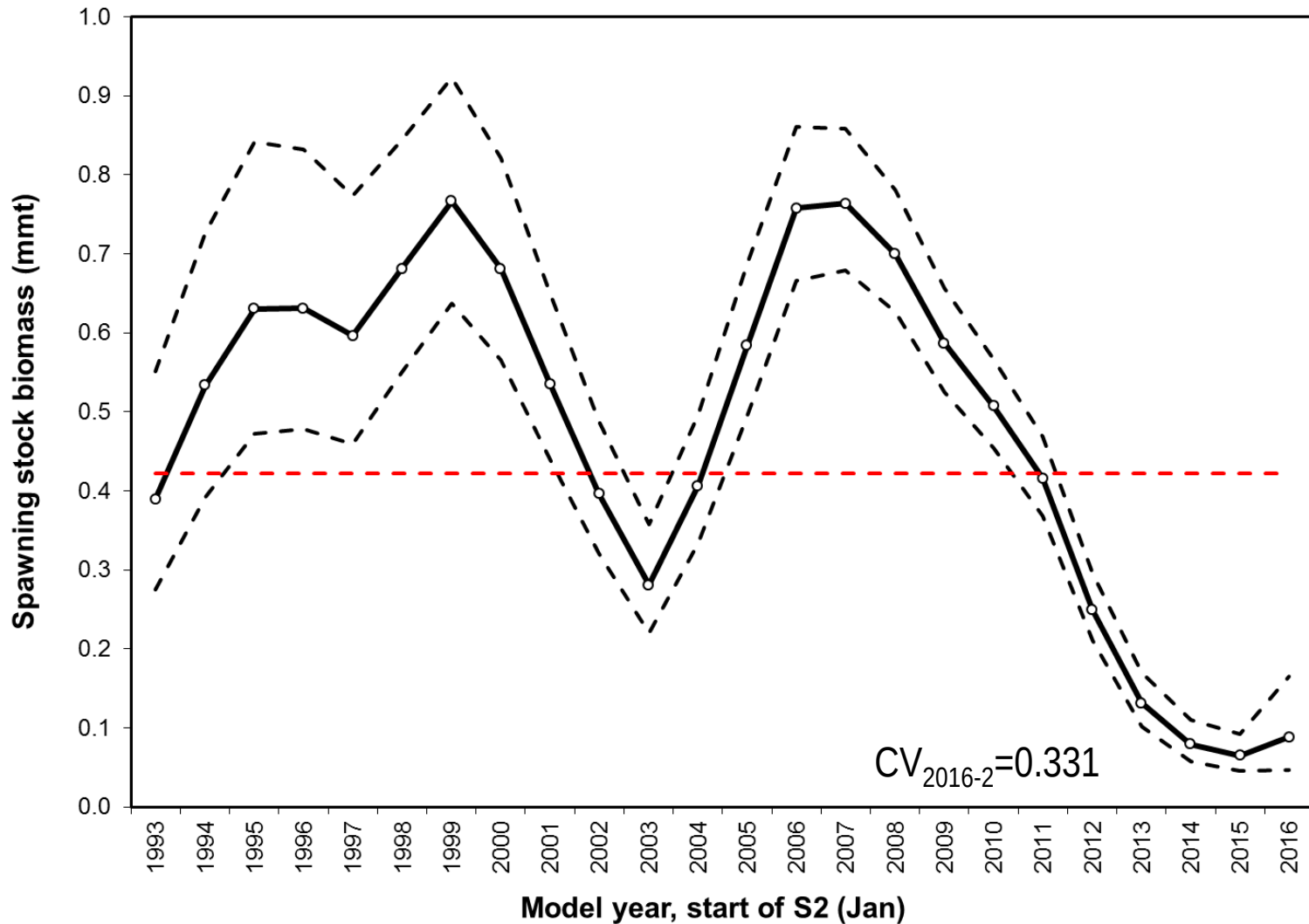
Recruitment deviation time series & standard errors



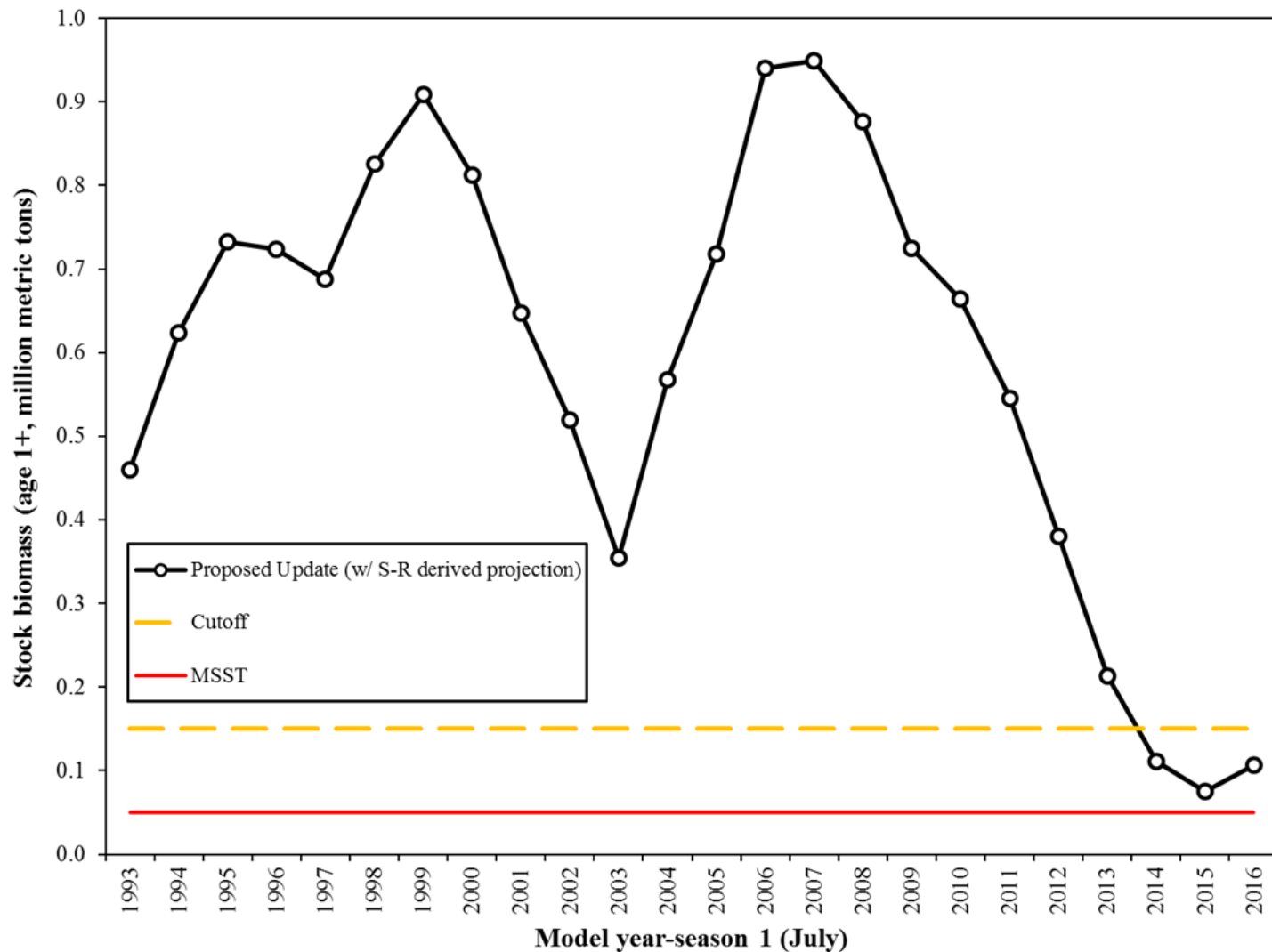
Recruit (age-0) abundance



Spawning Stock Biomass



Estimated Stock Biomass Series For Two 2015 Year-Class Scenarios



Harvest Specifications for 2016-17 (Table 16, p. 63)

a) HCRs when 2015 YC is derived from S-R Curve (proposed approach).

Harvest Control Rule Formulas										
OFL = BIOMASS * E_{MSY} * DISTRIBUTION; where E_{MSY} is bounded 0.00 to 0.25										
ABC _{P-star} = BIOMASS * BUFFER _{P-star} * E_{MSY} * DISTRIBUTION; where E_{MSY} is bounded 0.00 to 0.25										
HG = (BIOMASS - CUT OFF) * FRACTION * DISTRIBUTION; where FRACTION is E_{MSY} bounded 0.05 to 0.20										
Harvest Formula Parameters										
BIOMASS (ages 1+, mt)	106,137									
P-star	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05	
ABC Buffer _{Tier 1}	0.9558	0.9128	0.8705	0.8280	0.7844	0.7386	0.6886	0.6304	0.5531	
CalCOFI SST (2013-2015)	16.3891									
E_{MSY}	0.25									
FRACTION	0.20									
CUT OFF (mt)	150,000									
DISTRIBUTION (U.S.)	0.87									
Harvest Control Rule Values (MT)										
OFL =	23,085									
ABC _{Tier 1} =	22,064	21,072	20,095	19,113	18,108	17,051	15,896	14,553	12,769	
HG =	0									

b) HCRs when 2015 YC is based on the average of 2012-2014 YC sizes.

Harvest Control Rule Formulas										
OFL = BIOMASS * E_{MSY} * DISTRIBUTION; where E_{MSY} is bounded 0.00 to 0.25										
ABC _{P-star} = BIOMASS * BUFFER _{P-star} * E_{MSY} * DISTRIBUTION; where E_{MSY} is bounded 0.00 to 0.25										
HG = (BIOMASS - CUT OFF) * FRACTION * DISTRIBUTION; where FRACTION is E_{MSY} bounded 0.05 to 0.20										
Harvest Formula Parameters										
BIOMASS (ages 1+, mt)	64,422									
P-star	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05	
ABC Buffer _{Tier 1}	0.95577	0.91283	0.87048	0.82797	0.78442	0.73861	0.68859	0.63043	0.55314	
CalCOFI SST (2013-2015)	16.3891									
E_{MSY}	0.25									
FRACTION	0.20									
CUT OFF (mt)	150,000									
DISTRIBUTION (U.S.)	0.87									
Harvest Control Rule Values (MT)										
OFL =	14,012									
ABC _{Tier 1} =	13,392	12,790	12,197	11,601	10,991	10,349	9,648	8,833	7,750	
HG =	0									



Spring 2016 CPS Survey

The NOAA ship *Reuben Lasker* completed leg 1 of the spring Coastal Pelagic Species (CPS) survey on the evening of April 5 and began the transit to San Francisco Bay.

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During leg 1, eight and a half lines were sampled acoustically which were all located off of the Oregon coast.

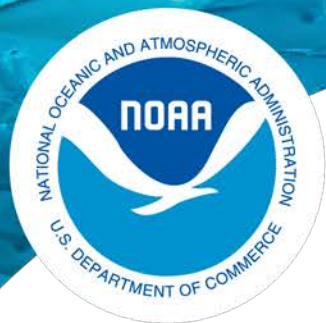


A total of 23 surface trawls were conducted in which 13 were positive for Pacific sardine (*Sardinops sagax*), 9 were positive for Pacific mackerel (*Scomber japonicus*), 9 were positive for jack mackerel (*Trachurus symmetricus*) and 6 were positive for market squid (*Doryteuthis opalescens*). No adult northern anchovies were captured in the trawls although eggs were seen consistently in the coastal stations.



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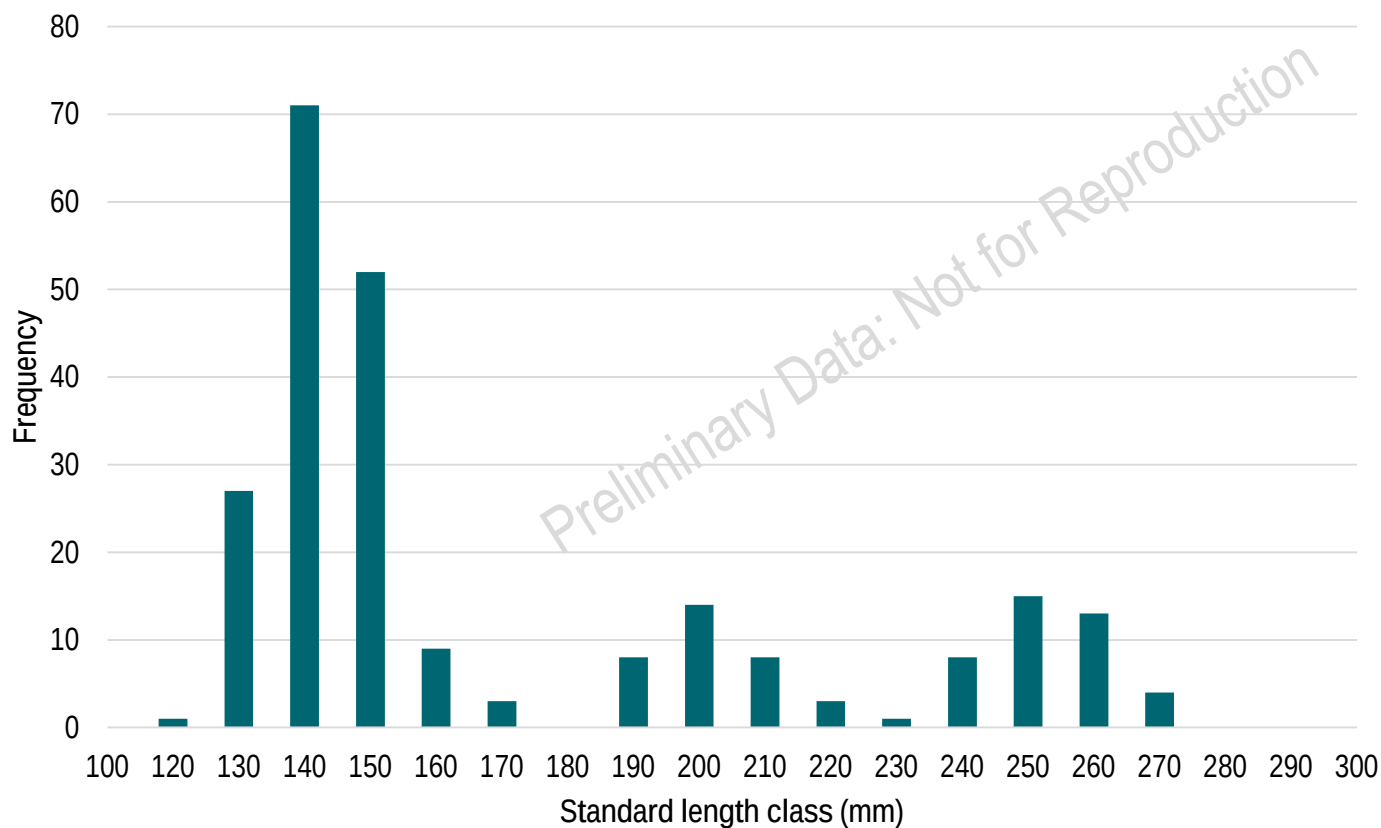
Spring 2016 CPS Survey - Leg 1



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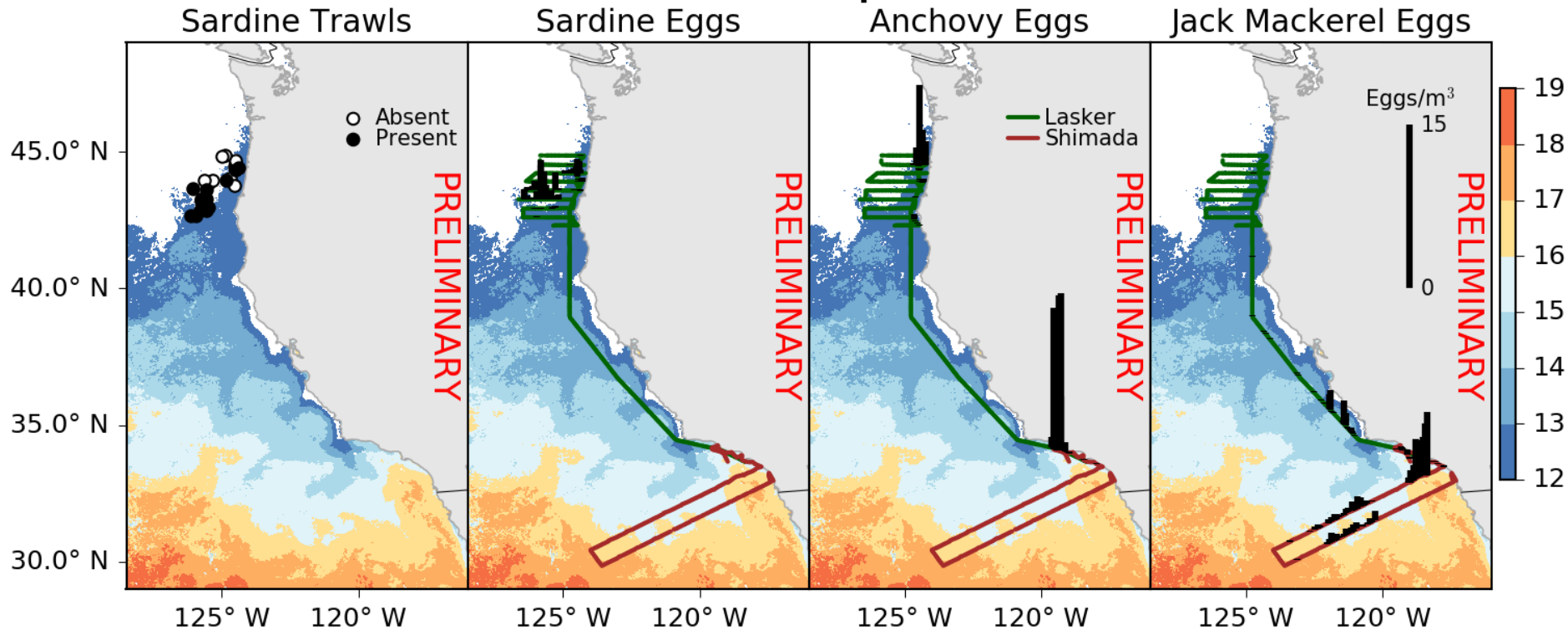
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Pacific sardine length frequency (2016 DEPM)



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FSV Bell M. Shimada and FSV Reuban Lasker
22 March to 08 April 2016



- Spring 2016 Survey Leg 1
 - 13,682 individual sardines, weighing 797 kg, from 13 out of 23 hauls
- Spring 2015
 - 64 fish, 11 kg, 9 hauls
- Summer 2015
 - 3,230 sardines, 267 kg, 22 hauls



QUESTIONS?

