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Methods for computing estimates of CPS biomasses from the 2022 Summer ATM Survey of CPS in the California Current Ecosystem

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Southwest Fisheries Science Center

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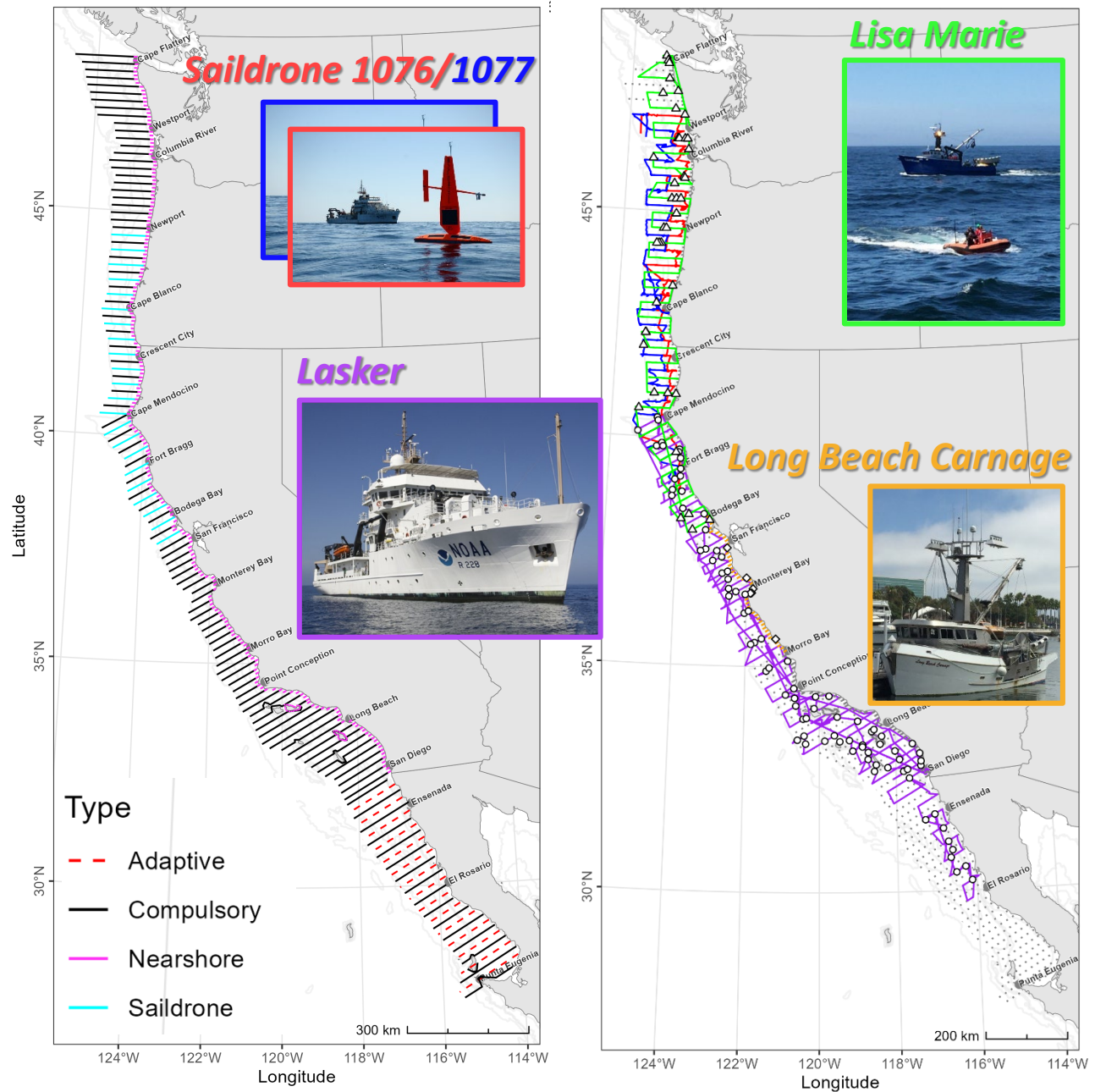
Survey Design, Plan, & Execution

Plan:

- *Lasker* (82 DAS): VI to Baja CA
- Saildrone (100 DAS): Newport to SF
- *Lisa Marie* & *Long Beach Carnage*: Cape Flattery to San Diego (Nearshore)

Actual:

- *Lisa Marie*: Cape Flattery to Bodega Bay (Core and Nearshore)
- *Lasker* (42 DAS): Cape Mendocino to Baja CA
- Saildrone: 100 DAS, Westport to Fort Bragg
- *Long Beach Carnage*: Bodega Bay to San Diego (Nearshore)



Backscatter, Eggs, and Catch Proportions

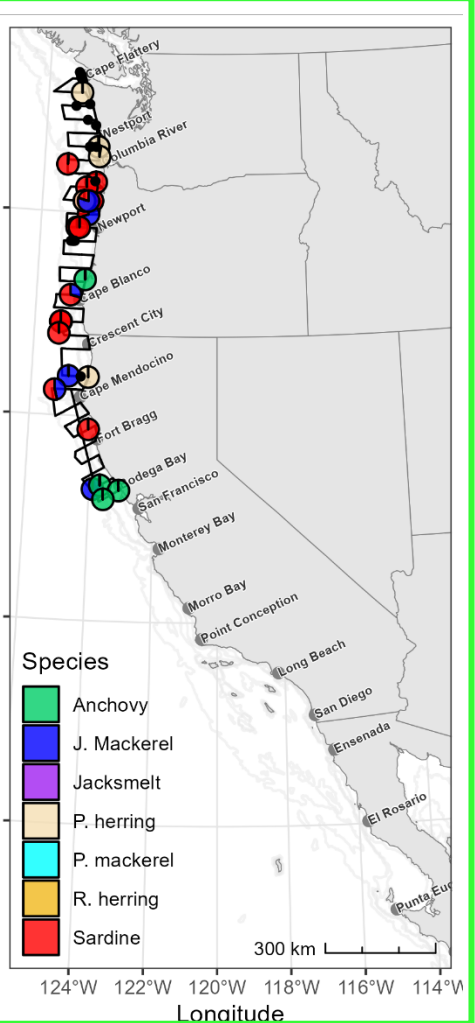
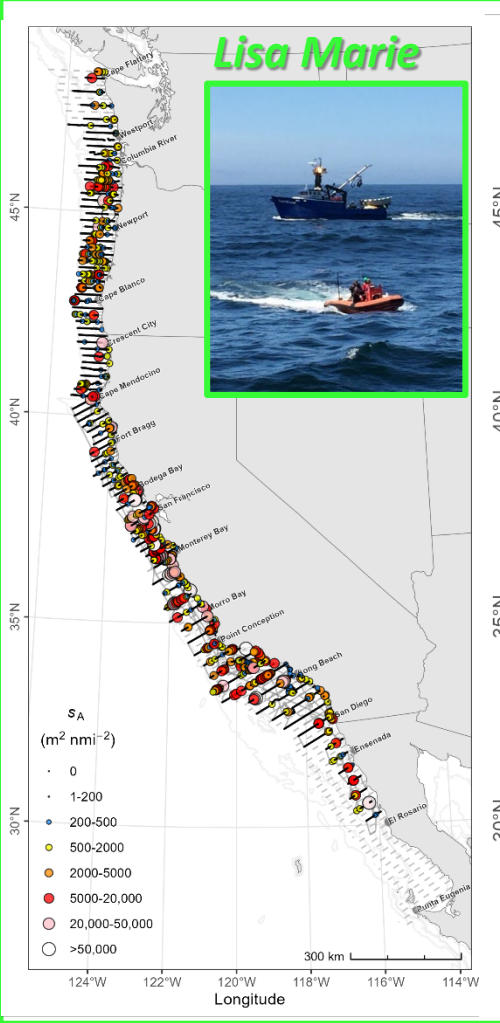
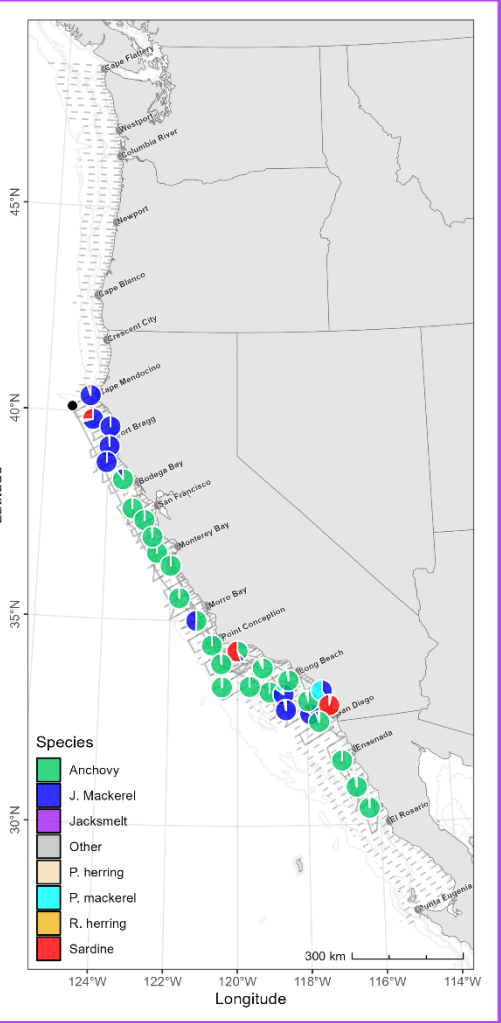
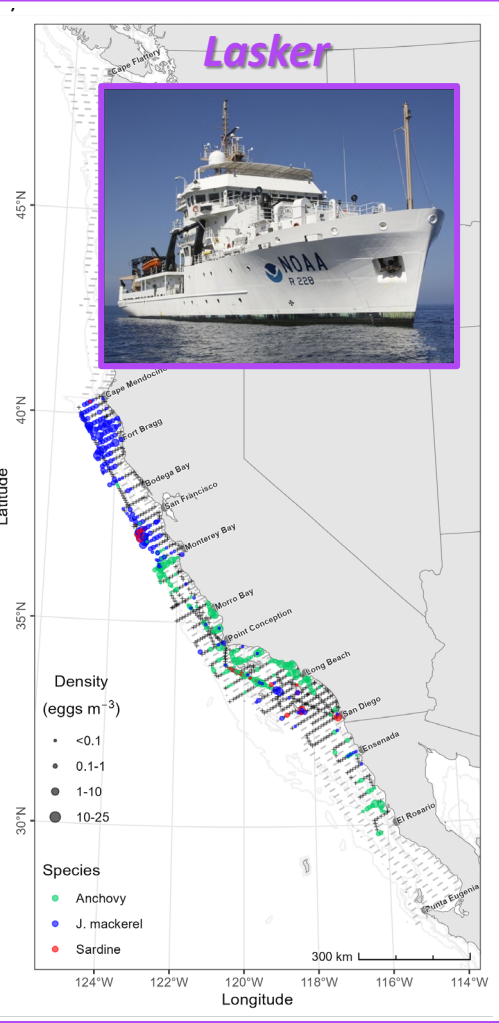
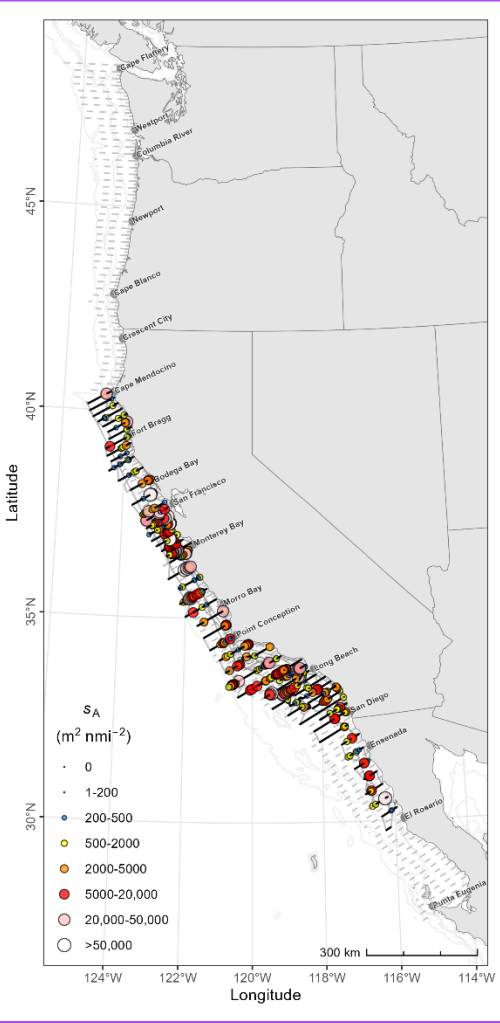
Acoustic Backscatter

Egg Density

Trawl Proportion (kg)

Acoustic Backscatter

Seine Proportion (kg)

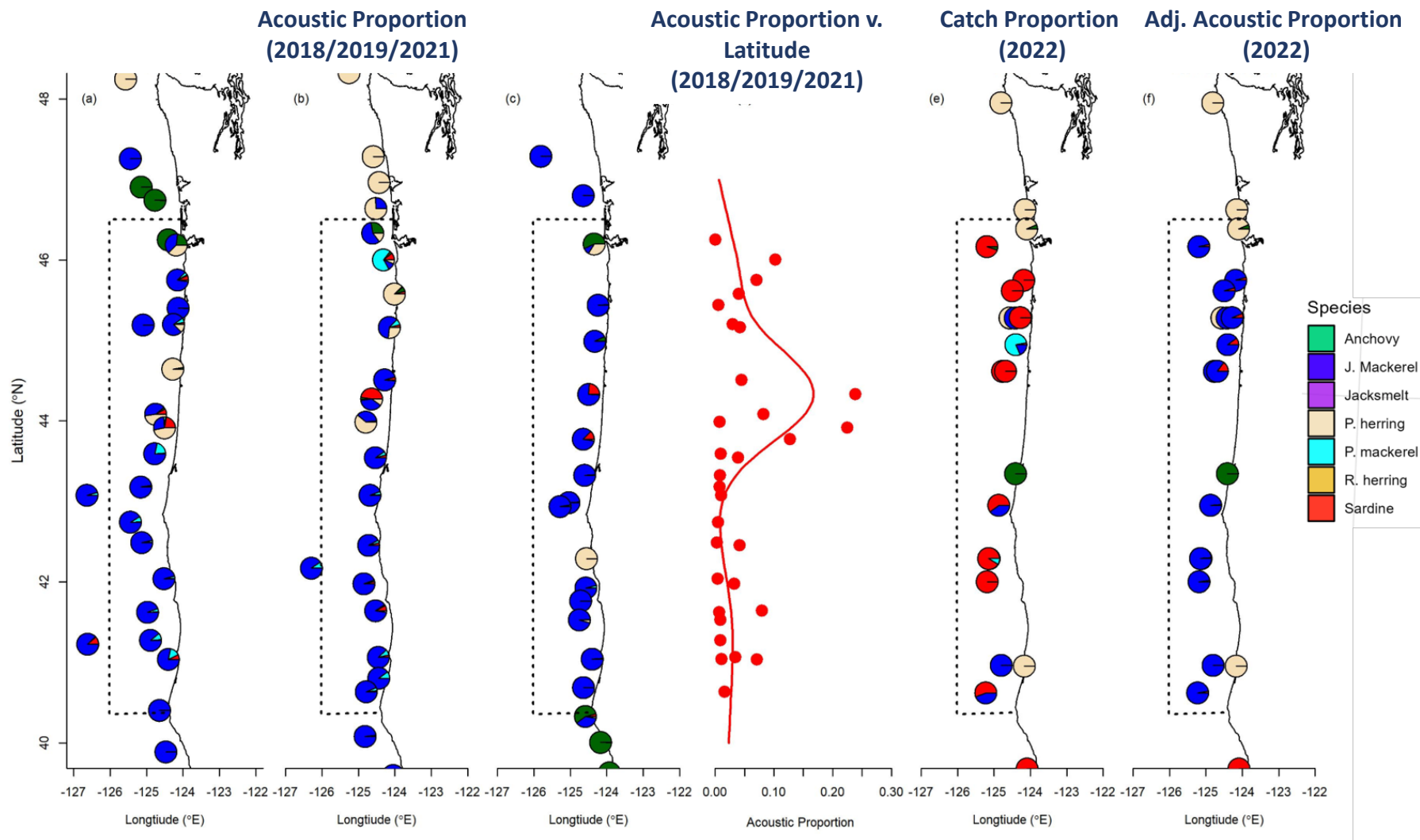


Adjustment of species proportions off WA/OR

- P. Sardine were consistently captured along with Jack Mackerel in this region during recent surveys
- A model describing the acoustic proportion of P. Sardine in trawl catches vs. latitude from 2018-2021 was used to estimate the proportion of P. Sardine in seine samples in 2022

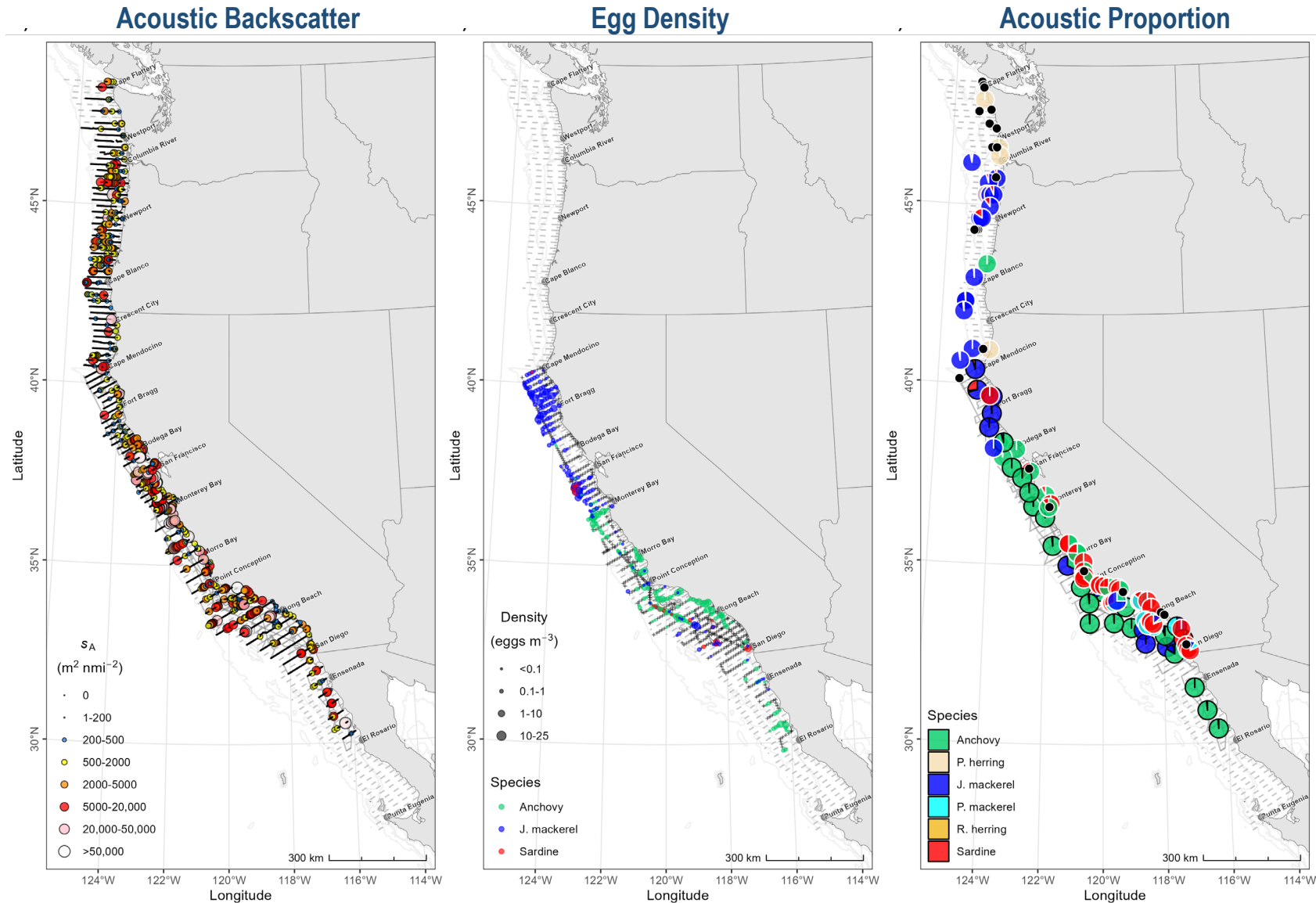
[GAM: acoustic proportion of sardine ~ smooth function (Latitude)]

- For 2022, the remaining proportion was assumed to be composed of Jack Mackerel
- Adjusted proportions were used to estimate biomass



[GAM: acoustic proportion of sardine ~ smooth function (Latitude)]

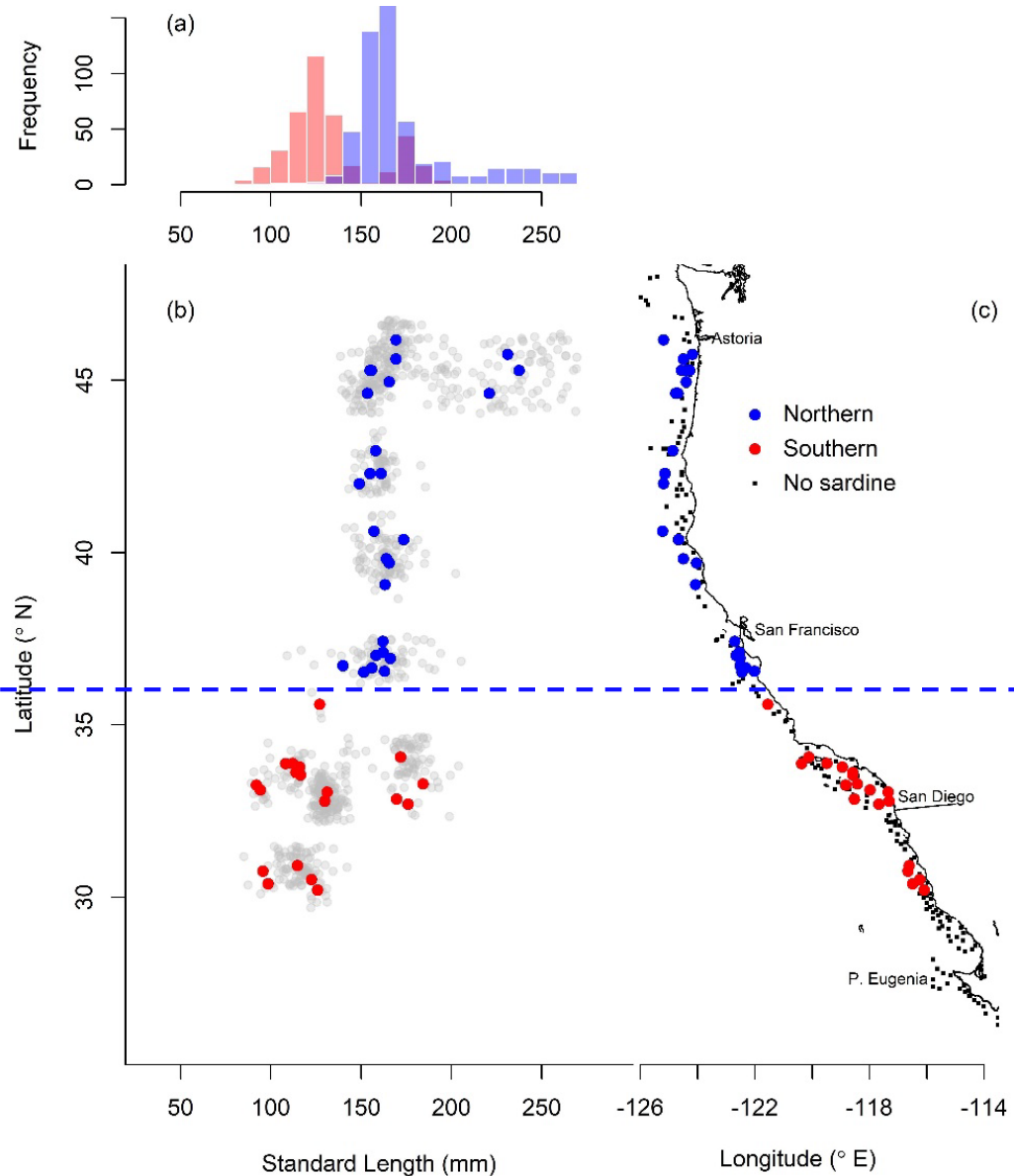
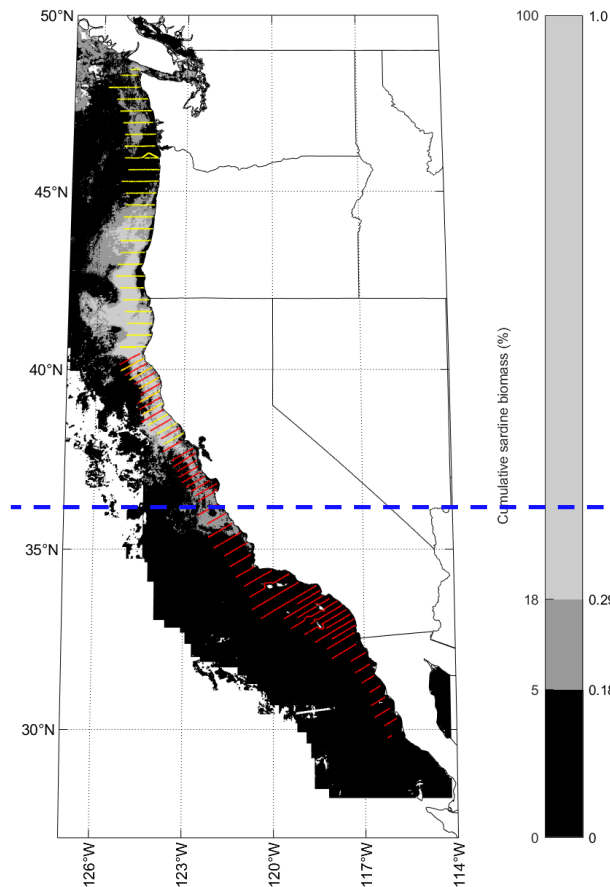
Backscatter, Eggs, and Acoustic Proportion in Net Samples



Assignment of P. Sardine Biomass to N/S Stock

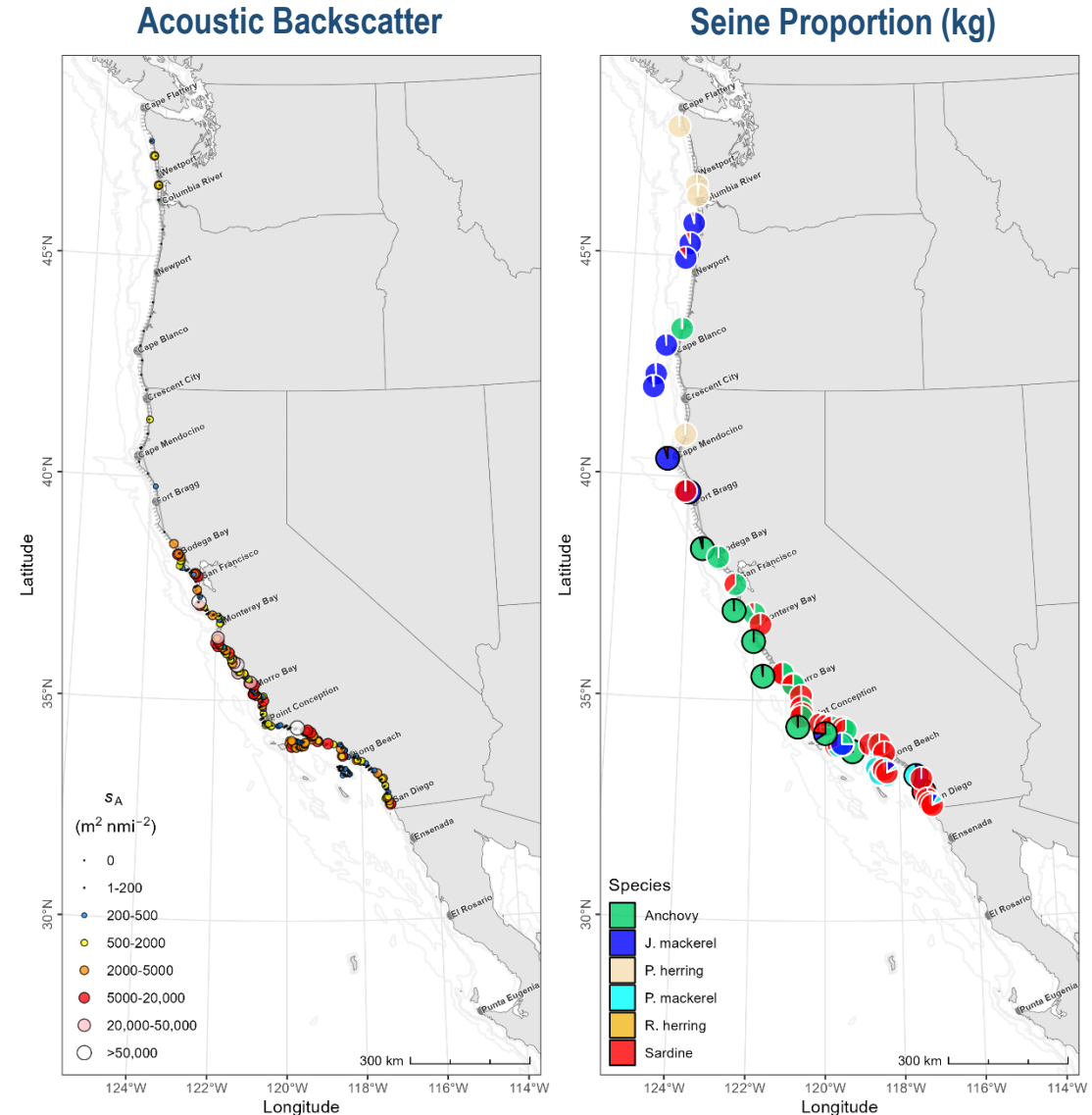
- Revised habitat-model, averaged in areas $\pm 2^\circ$ latitude and longitude, centered around the daytime location of each vessel throughout
- Trawl clusters in areas with habitat probability < 0.18 assigned to southern stock
- In 2022, this habitat break corresponded with Big Sur, CA
- Individual (gray) and mean (blue) lengths of P. Sardine in each trawl cluster appear different north and south of this latitude

Composite Potential Habitat



Nearshore biomass estimation off WA/OR

- Typical nearshore sampling (5 nmi-long transects spaced 5-nmi apart) did not occur off WA and OR
- *Lisa Marie* sampled Core transects between Cape Flattery and Bodega Bay, but extended to ~5 m depth
- Acoustic intervals shallower than the 20-m isobath were extracted from the core transects
- Catches from the nearest purse seine set or trawl haul were used to apportion backscatter
- Nearshore biomass estimates using the typical method



All CPS | Summary (Core + Nearshore)

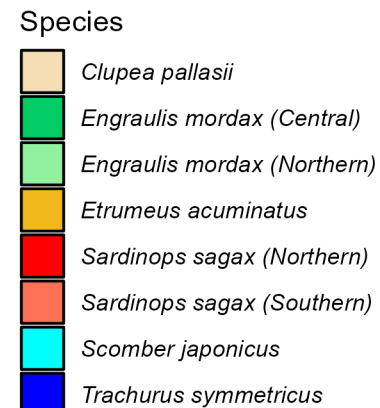
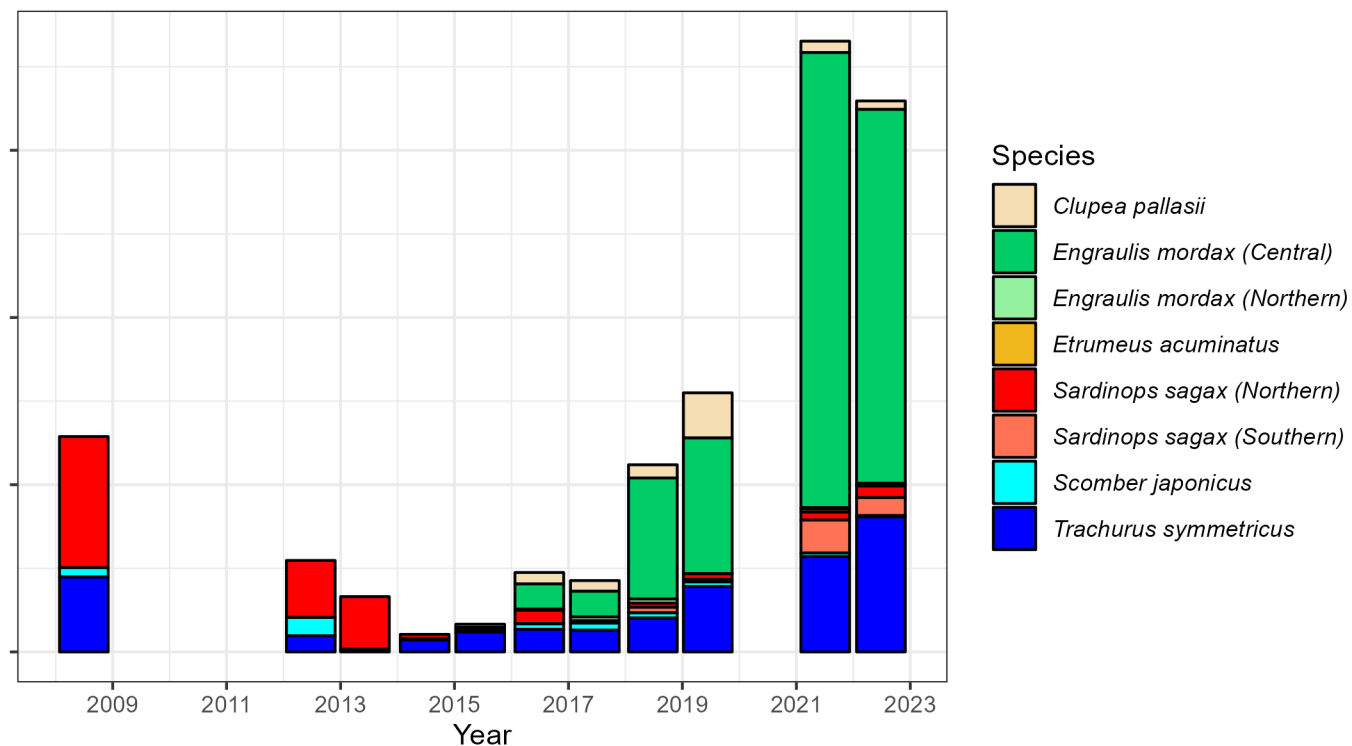
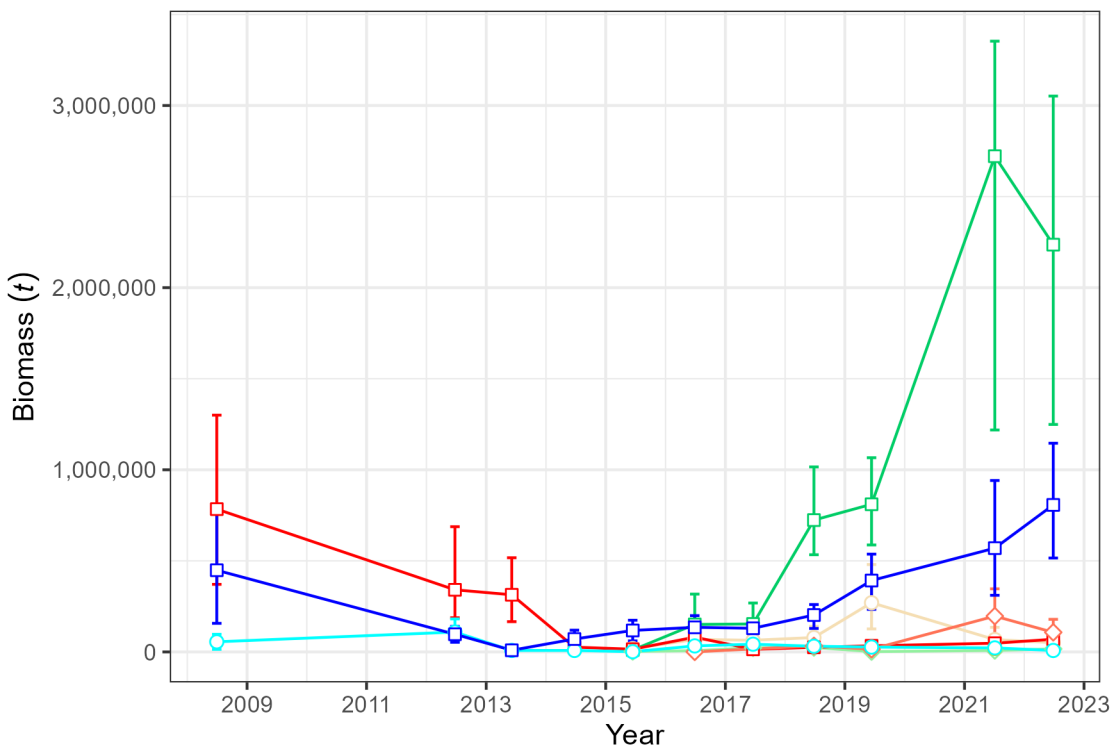
			Stratum			Trawl		Biomass			
Species	Stock	Region	Area	Transects	Distance	Clusters	Individuals	Mean	CI (Lower)	CI (Upper)	CV
<i>Clupea pallasii</i>	All	All	12,478	36	1,153	9	1,411	50,718	14,460	99,700	41
<i>Engraulis mordax</i>	Central	All	32,017	124	2,060	47	668,229	2,235,996	1,248,956	3,051,863	20
	Northern	All	9,887	23	1,014	4	17	16,432	5,646	27,680	34
<i>Sardinops sagax</i>	Northern	All	27,078	90	2,716	32	2,130	69,506	30,484	99,021	21
	Southern	All	21,111	106	1,241	50	9,549	107,468	47,994	178,947	23
<i>Scomber japonicus</i>	All	All	23,950	91	1,470	35	610	7,968	3,741	12,662	22
<i>Trachurus symmetricus</i>	All	All	52,664	165	4,207	53	2,404	807,090	515,560	1,145,812	20

All CPS | Community Biomass Time Series

- The biomass of the northern stock of Pacific Sardine (69,506 t) was a 46% increase in biomass of 47,721 t estimated in summer 2021 (Stierhoff et al. 2023)
- The biomass of the central stock of Northern Anchovy, which had been growing exponentially since 2015, decreased ~20% from the 2,721,689 t estimated in summer 2021 (Stierhoff et al., 2023)
- The southern stock of Pacific Sardine were found mostly north of the U.S.-Mexico border and in the nearshore region (nearshore not sampled in Mexico)

Individual biomasses

Cumulative biomasses



Stierhoff, K. L., et al. 2023. *Distribution, biomass, and demographics of coastal pelagic fishes in the California Current Ecosystem during summer 2021 based on acoustic-trawl sampling*. U.S. Dep. Commer., NOAA Tech. Memo., NMFS-SWFSC-676: 86 pp.

Questions?