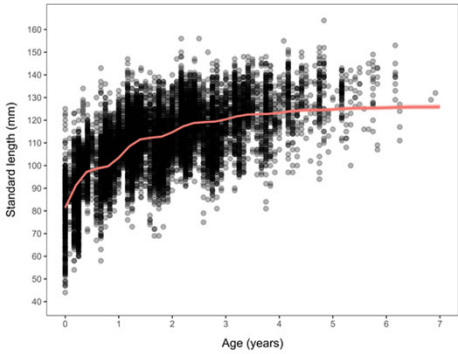


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Southwest Fisheries Science Center Coastal Pelagic Species Research Update



Presenter

Annie Yau, Fisheries Resources Division Director



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Outline: Research Updates

- Assessments
- Surveys
- Population structure
- Life history
- Genetics
- FUTURE SEAS



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CPS Assessment Schedule

April 2025:

- Pacific Sardine update assessment
- Pacific mackerel catch-only update

2026:

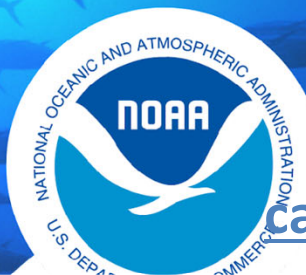
- Methods review: Integrated West Coast Pelagics Survey

2027:

- Pacific sardine benchmark assessment
- Pacific mackerel update assessment

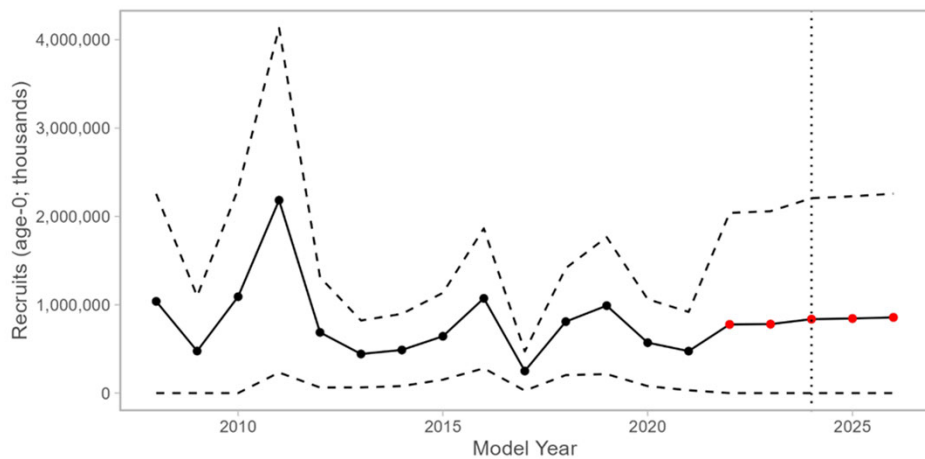
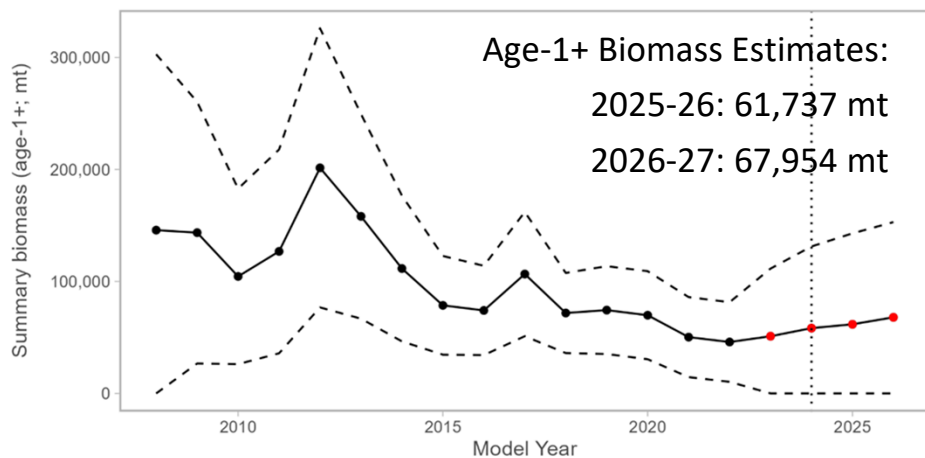


Assessment Results



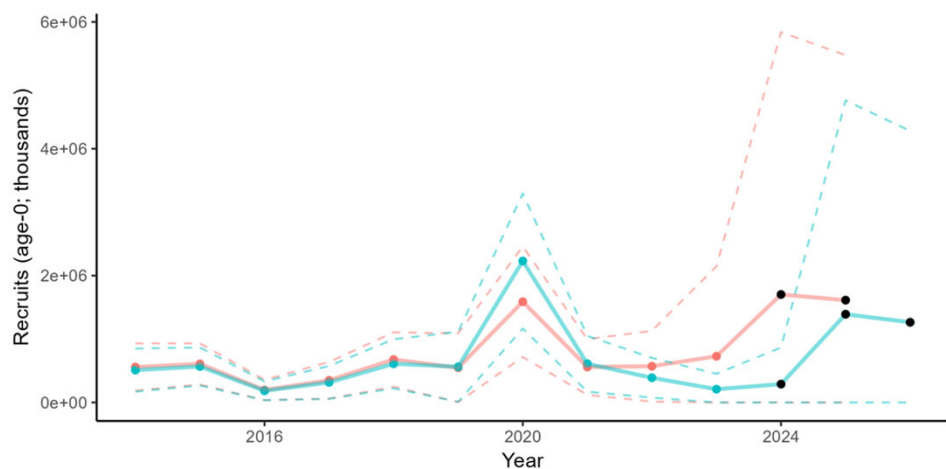
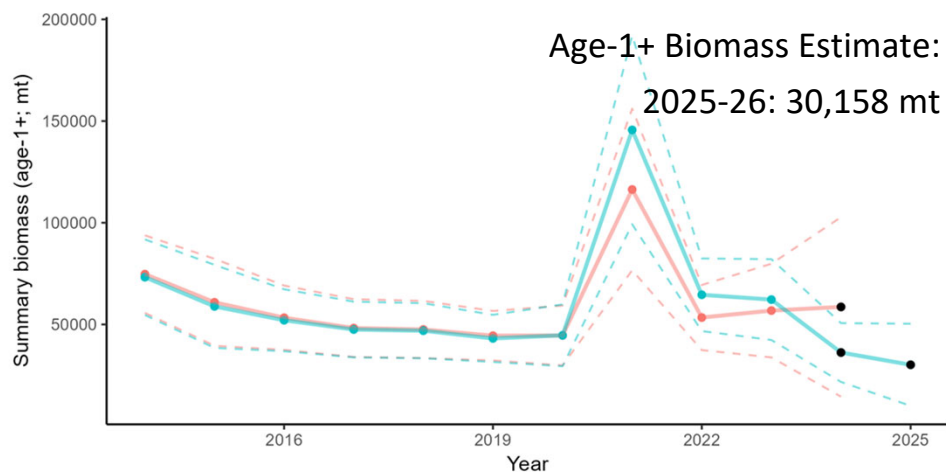
Pacific mackerel

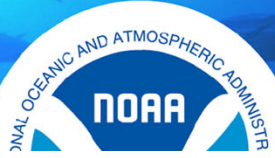
Catch-only update assessment



Pacific sardine

update assessment



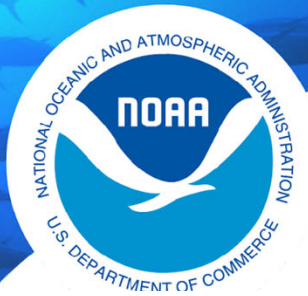


CPS Recruitment and the Environment

- Pacific sardine and CalCOFI Sea Surface Temperature (SST)
 - We extended time series from the 2013 workshop for
 - age-2+ spawners per recruit
 - CalCOFI SST
 - Spawners per recruit and CalCOFI SST are still significantly correlated
 - Less so than the last time the analysis was run in 2013
- Pacific sardine and northern anchovy recruitment drivers
 - A recruitment index being developed for Pacific sardine and northern anchovy based on ocean, ecosystem, and biological variables
 - Preliminary results suggest these may be important for recruitment:
 - Timing of upwelling season
 - Local spawning habitat
 - Zooplankton forage
 - Ocean currents in Southern California Bight

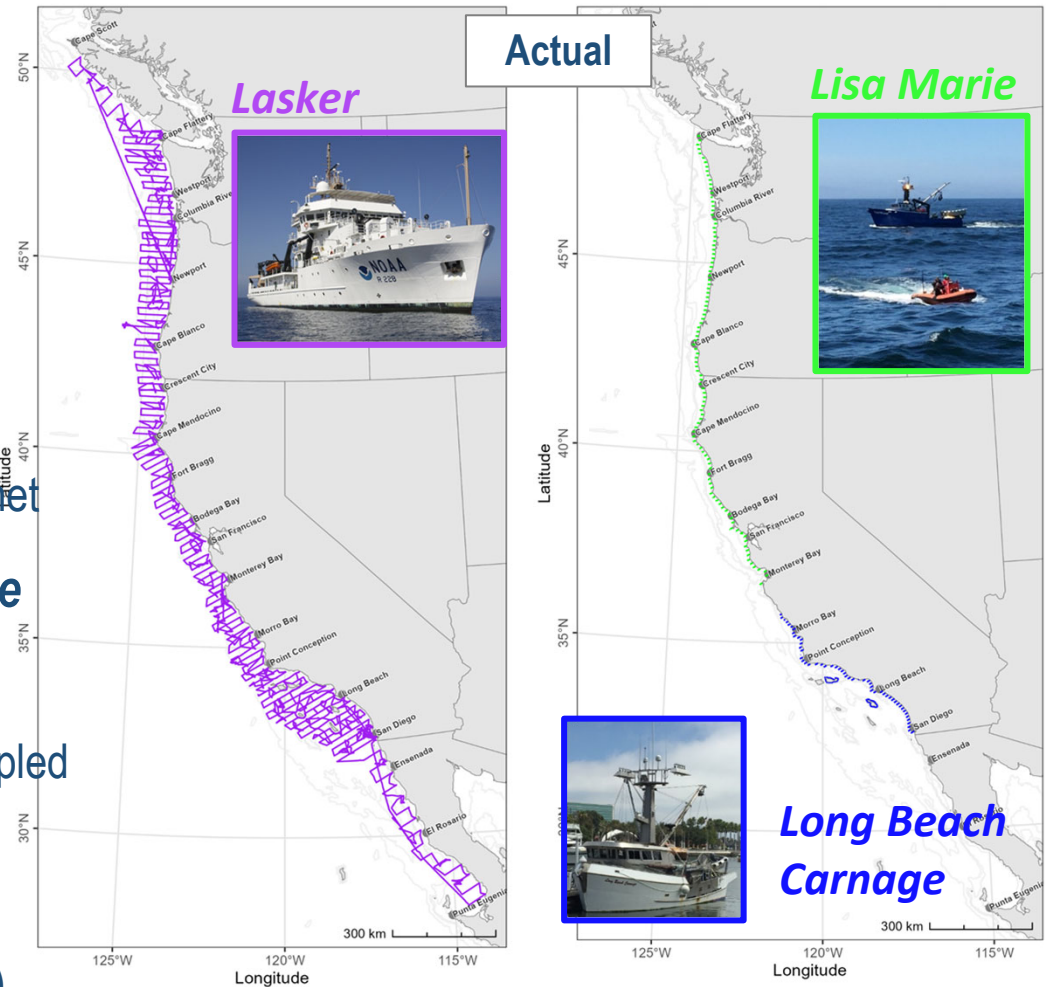
Survey Updates

CPS Survey Summer 2024 results



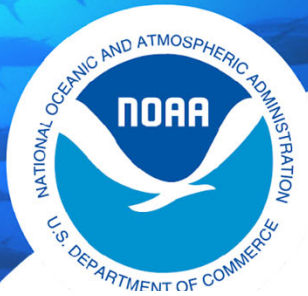
Entire planned area was surveyed except for ~10 nearshore transects.

- NOAA vessel **Lasker** (80 of 85 DAS executed):
 - Baja CA to Vancouver Island
 - Included final Multi-Function Trawl net gear trials (5 DAS)
- Industry vessel **Long Beach Carnage** (14 of 23 DAS for sampling):
 - San Diego to Big Sur
 - 10 transects up to Monterey unsampled due to weather and schedules
- Industry vessel **Lisa Marie** (22 of 38 DAS for sampling):
 - Monterey to Cape Flattery (15 DAS)
 - Trawl-seine comparison (7 DAS)



Survey Updates

CPS Survey Summer 2024 results



(LEFT) Acoustic backscatter (s_A) attributed to CPS from the core and nearshore survey areas

(RIGHT) CPS species proportions in nighttime trawl clusters (core; black outline) and daytime purse-seine sets (nearshore; white outlines)

Core:

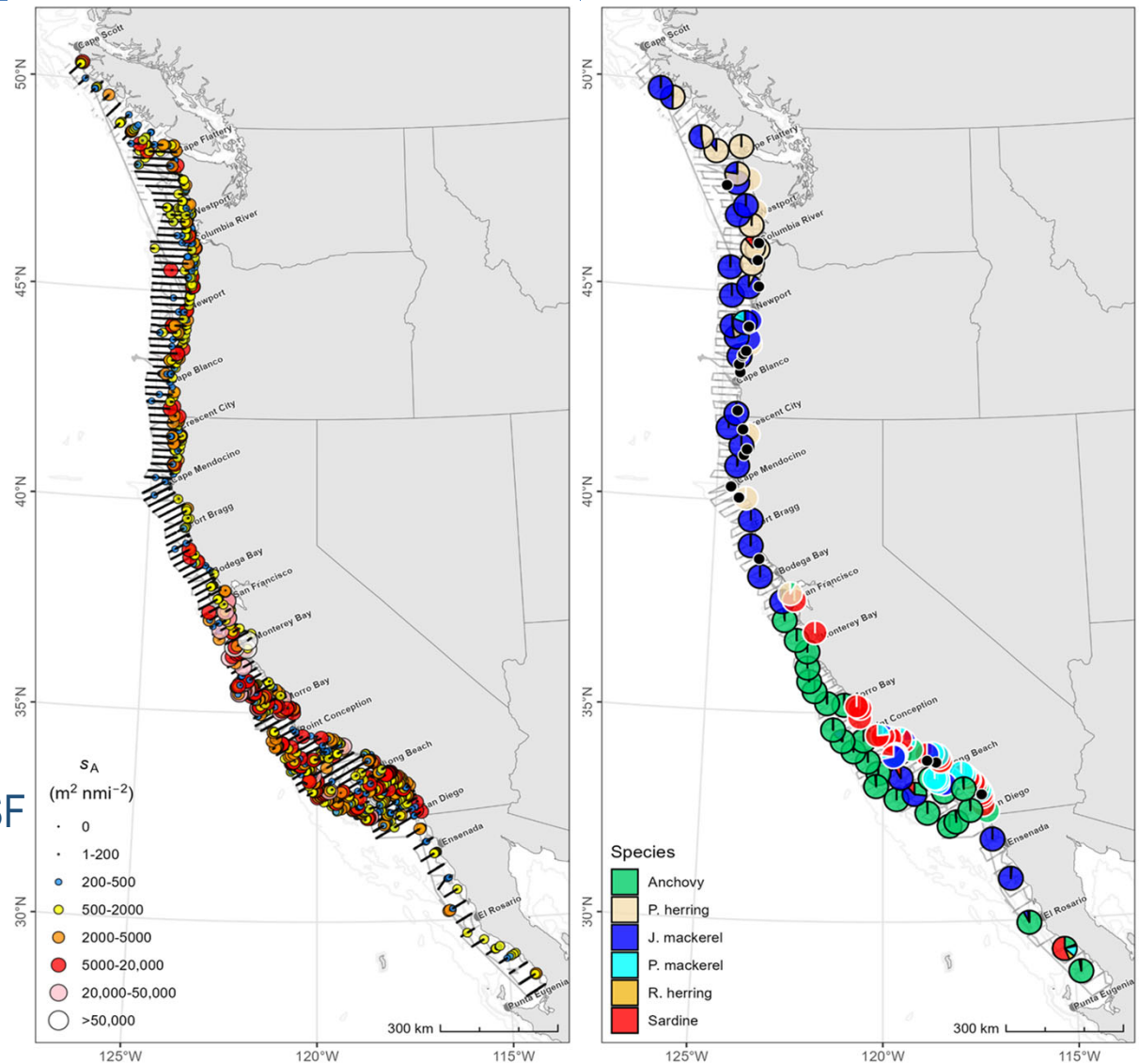
N anchovy south of SF

Jack Mackerel and P herring north of SF

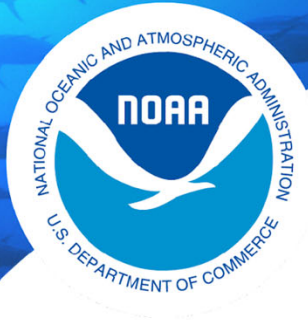
Nearshore:

P sardine and P mackerel south of SF

Few CPS mostly P herring north of SF



Survey Updates



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CPS Survey Summer 2024 results

All CPS | Summary (Core + Nearshore)

Species	Stock	Region	Biomass				
			Mean (t)	CI (Lower, 95%)	CI (Upper, 95%)	CV	
P. herring	<i>Clupea pallasii</i>	All	All	83,967	37,948	109,602	18
N. anchovy	<i>Engraulis mordax</i>	Central	All	689,785	328,528	796,114	17
		Northern	All	164	21	289	37
Round herring	<i>Etrumeus acuminatus</i>	All	All	1,837	276	3,952	42
P. sardine	<i>Sardinops sagax</i>	Northern	All	77,703	21,733	156,470	45
		Southern	All	47,566	32,395	96,233	25
P. mackerel	<i>Scomber japonicus</i>	All	All	11,129	4,950	19,241	24
Jack mackerel	<i>Trachurus symmetricus</i>	All	All	698,736	446,095	804,716	11

Survey Updates



2025 Integrated West Coast Pelagics Survey

Northwest and Southwest Fisheries Science Centers

A robust fisheries-independent integrated survey that supports sustainable fisheries for Pacific hake and coastal pelagics, increases ecosystem data collection, and maintains the survey schedule.

- Jan 2025: Planning workshop, La Jolla
 - Coordination of acoustic-trawl and eDNA / environmental sampling from single vessel
- Feb 2025: Multifunction Trawl net (MFT) system testing by DFO Canada off R/V Franklin
- Mar 2025: Final MFT system testing on *Shimada*
- Draft tech memo with industry on Multi-function Trawl net development



Sunset aboard the *Shimada*, March 2025

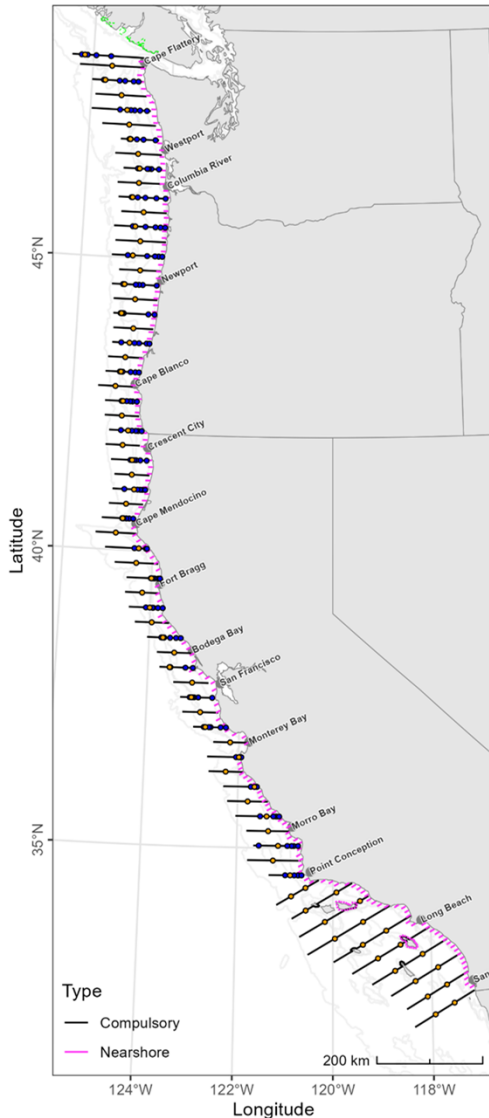


The crew of the *Franklin* hauls back the MFT, Feb 2025

Photo: John Polh

Survey Updates

2025 Integrated West Coast Pelagics Survey

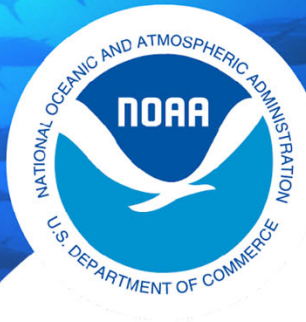


Northwest and Southwest Fisheries Science Centers

A robust fisheries-independent integrated survey that supports sustainable fisheries for Pacific hake and coastal pelagics, increases ecosystem data collection, and maintains the survey schedule.

Planned:

- June 11 - Sep 14,
99 Days At Sea (DAS) on *Shimada*
 - 5 DAS transit / staging
 - 81 DAS surveying
 - 13 DAS research / gear trials
- Will use new Multifunction Trawl net system
- Acoustics (5 freq), 24-hr trawling (midwater & surface) and environmental sampling/eDNA
- Nearshore sampling from industry vessels
- Coordinated Canada DFO sampling for hake

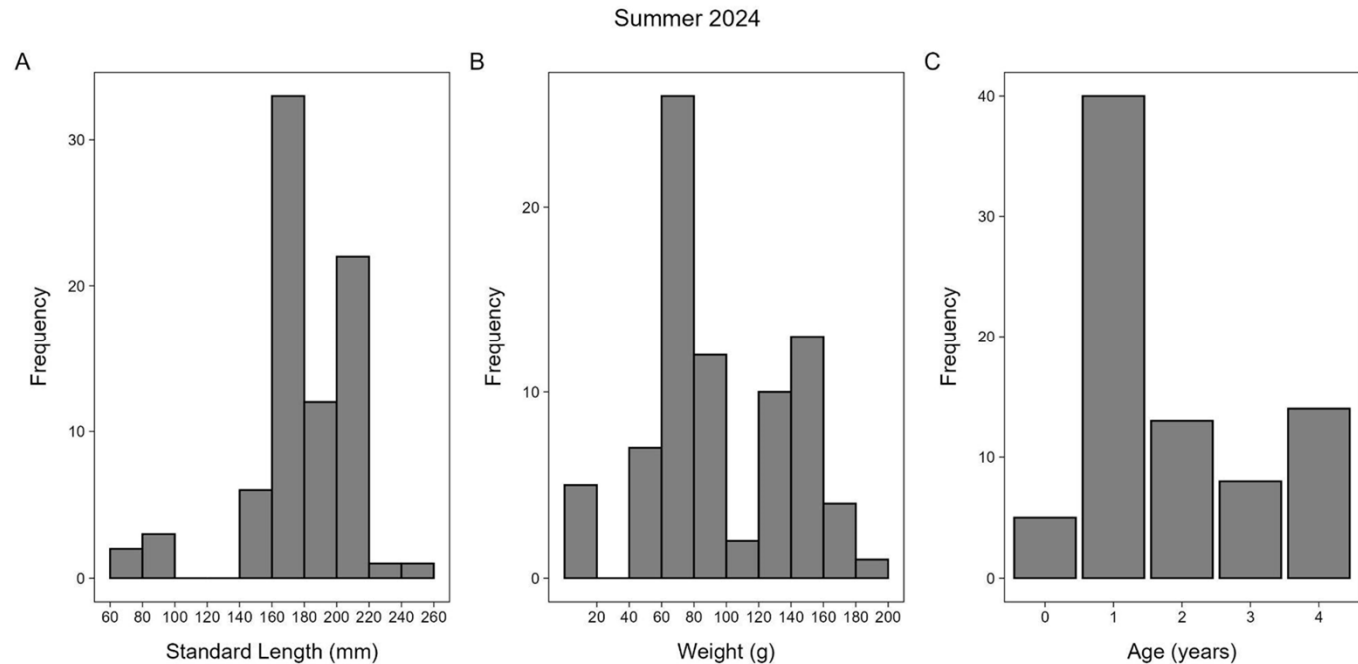


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Life History Research

2025 Pacific Sardine Update Assessment

- All sampled sardine from 2024 CPS survey identified as northern stock were aged; data provided to assessment



Life History Research

Ongoing Research on CPS



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- **CPS survey design**

Evaluation of revised habitat model for Pacific sardine (Erisman et al., in progress)

- **Ageing sample sizes & methodologies**

Evaluating post-survey otolith subsampling strategies for a small bodied, fast-growing pelagic fish for inclusion in stock assessment (Schwartzkopf et al., in revision)

Ageing methodology of managed and assessed coastal pelagic species off the northeastern Pacific Coast (Dorval et al., in internal review)

Evaluating the accuracy and precision of FT-NIRS ages estimated for two short-lived coastal pelagic species (CPS), Pacific sardine and Pacific mackerel (Dorval and Schwartzkopf, in internal review)

- **Variability in sardine age and growth**

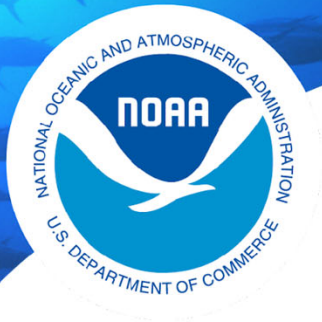
Variability in age and growth of Pacific Sardine in US waters during the recent period of low population biomass, 2012-2021 (James et al., in prep)

- **Growth, recruitment, climate, stocks**

Relationships between somatic growth, recruitment, climate, and stocks using otolith biochronologies (James & Erisman, in progress)

Life History Research

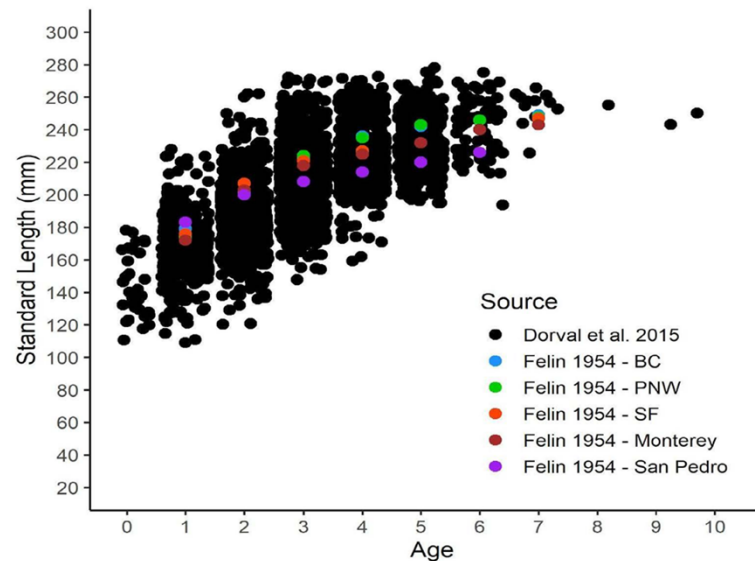
Population Structure - Published Research



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1. Systematic review of somatic growth patterns in relation to population structure for Pacific sardine along the Pacific coast ([Erisman et al. 2025; NOAA Tech Memo](#))
1. The subpopulation problem in Pacific sardine, revisited ([Craig et al. 2025; NOAA Tech Memo](#))



Ongoing Genetics Research: Population Structure in Pacific sardine



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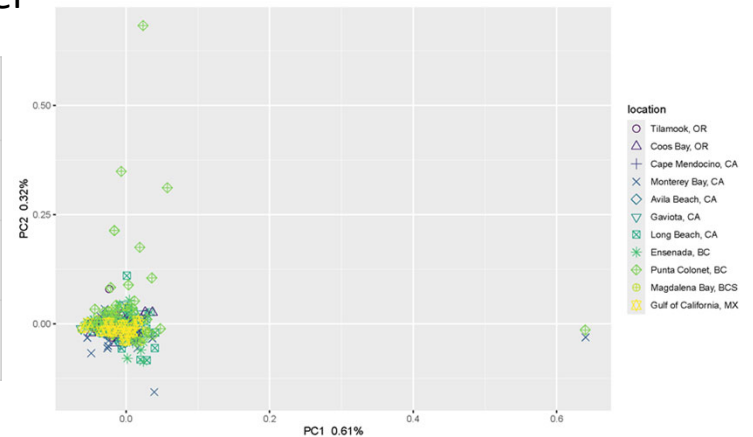
Whole genome sequencing of Pacific sardine

- 317 individuals from Oregon to the Gulf of California
- 6,905,971 single nucleotide polymorphisms (“characters” to compare)
- Preliminary results show no signal of differences:
 - In overall population
 - If local adaptation was occurring
 - When samples are grouped by sub-populations as determined by the potential habitat model



	NSP	SSP	GOC
NSP	-	0.942	0.97
SSP	0.003	-	0.953
GOC	0.006	0.006	-

F_{ST} (below diagonal) and P-value (above diagonal)



PCA showing clustering of individuals by sampling location

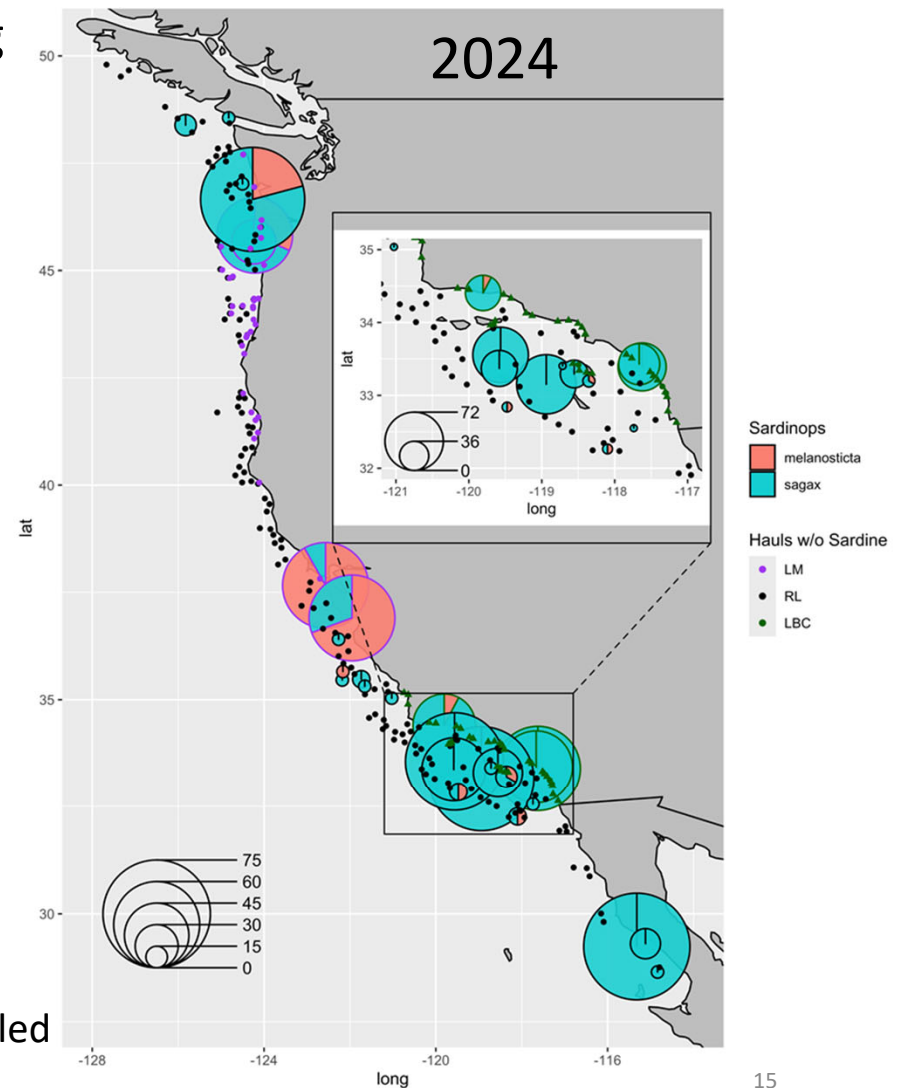


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Genetics Research: Japanese sardine

Samples collected during trawling of summer CPS surveys.
No synoptic collecting has occurred yet.

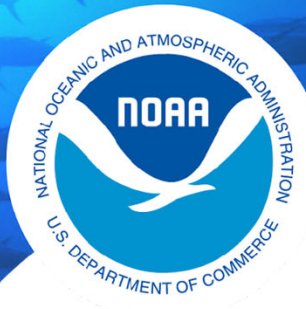
Year	# Analyzed	# Pacific Sardine	# Japanese Sardine	% Japanese Sardine
2024	613	501	112	18.27
2023	825	491	334	40.48
2022	172	100	72	41.86
2021	81	81	0	0
2019	198	198	0	0
2018	131	131	0	0
2017	269	269	0	0
2016	622	622	0	0
2015	175	175	0	0
2014	211	211	0	0
2013	892	892	0	0



[NOAA-TM-NMFS-SWFSC-717](#)

*% individuals sampled

FUTURE SEAS Update



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University scientists collaborating with NOAA

Publications:

- [Liu et al. \(2025\)](#) “Climate Change Influences via Species Distribution Shifts and Century-Scale Warming in an End-To-End California Current Ecosystem Model”
- Highlighted in [Appendix E of Ecosystem Status Report](#) presented at March 2025 PFMC meeting
- [Muhling et al. \(2025\)](#) “Marine Heatwaves and Climate-Driven Warming Impact Availability of Sardine Subpopulations to Northeast Pacific Fishing Ports”

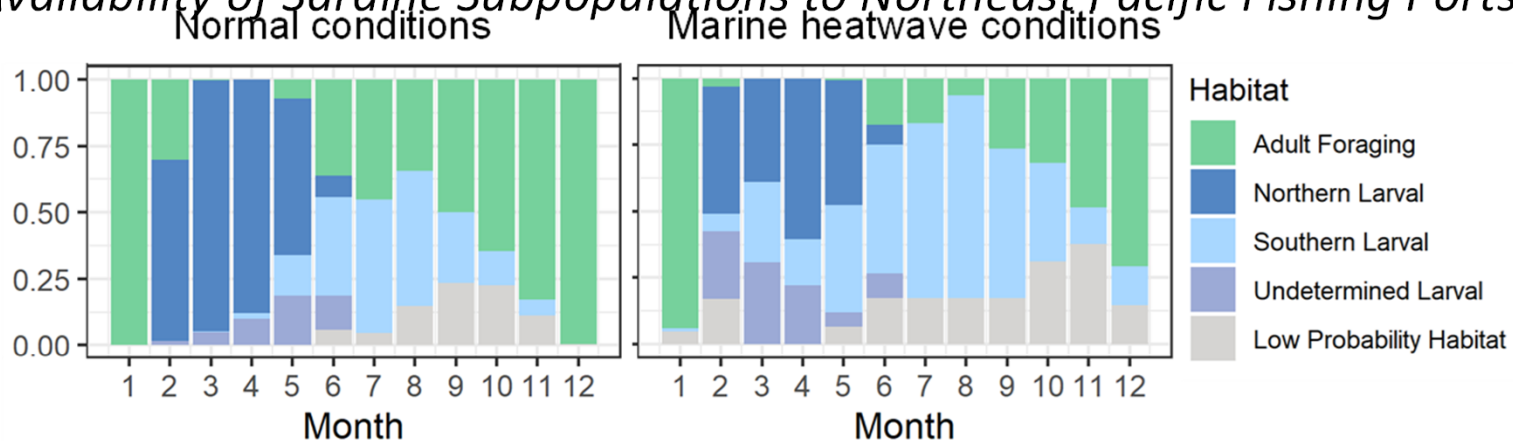


Figure shows simulated changes in sardine habitat within 60 nm of San Pedro during normal vs. marine heatwave conditions

A photograph of a sunset over the ocean. The sun is low on the horizon, creating a bright orange and yellow glow that reflects on the water. A person is silhouetted on a balcony on the left side of the frame, looking out at the sea. The sky is a mix of orange, yellow, and blue. The word "Questions?" is written in black text in the upper right quadrant of the image.

Questions?