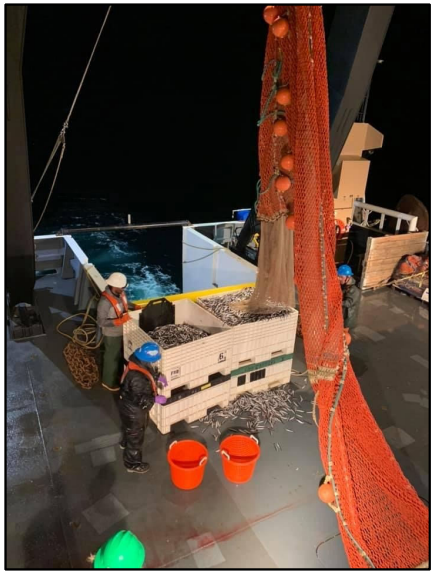
NMFS report: Coastal Pelagic Species Research Update and Priorities



Kristen Koch and Dale Sweetnam
Southwest Fisheries Science Center

Presentation Outline

- Survey Updates
- CPS Assessment Schedule
- Priority Improvements to CPS Assessments
- New CPS Research Projects

Photo by NOAA Fisheries

Survey updates

- **Spring CPS survey**
  Mar 20 – Apr 13, 25
  DAS on the FSV
  Reuben Lasker

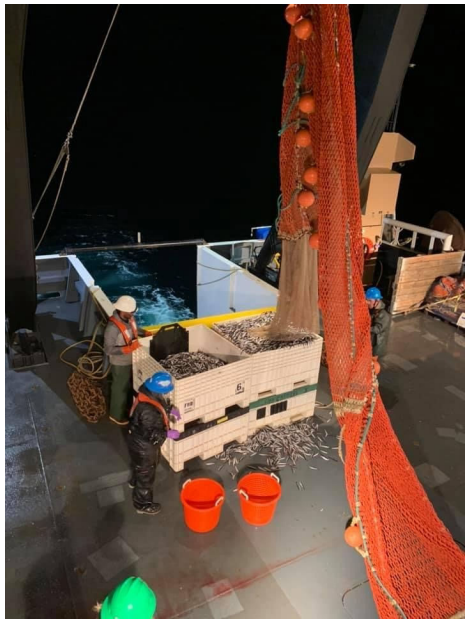


Photo by NOAA Fisheries

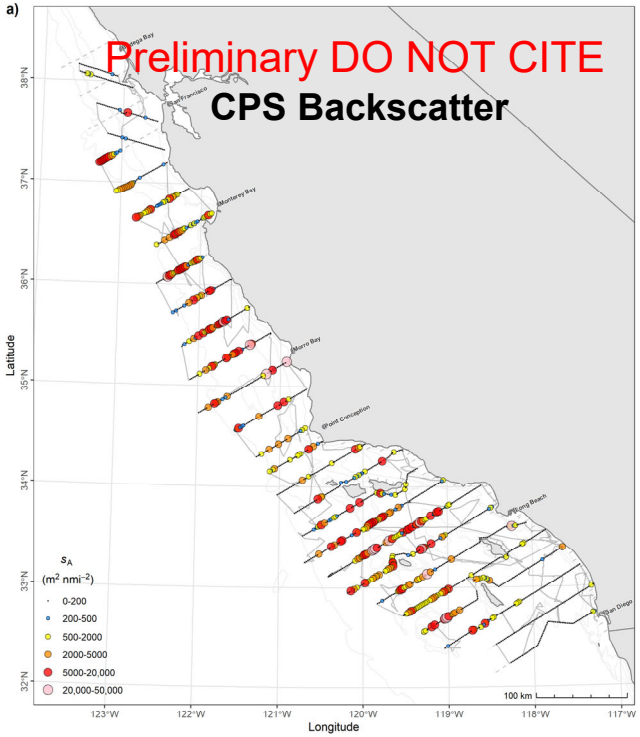
Industry vessel, Long Beach Carnage, sampled the nearshore in the SCB

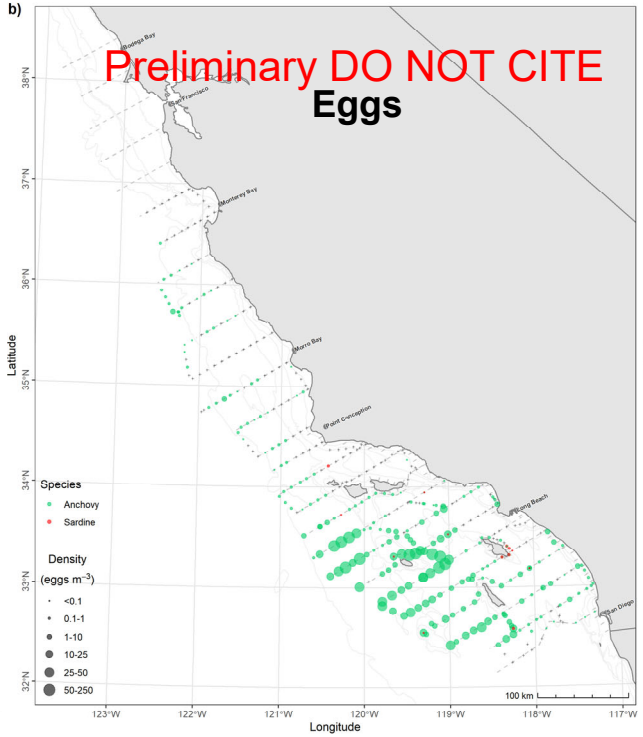
Large numbers of Northern Anchovy and pyrosomes with a smattering of sardines

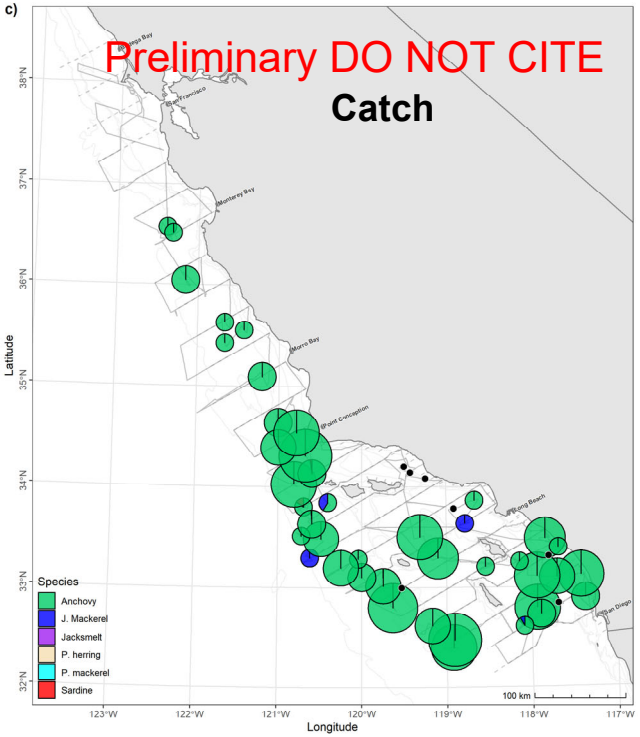
Photo by Owyn Snodgrass

Spring 2021 CPS Survey

Photo by Brad Erisman







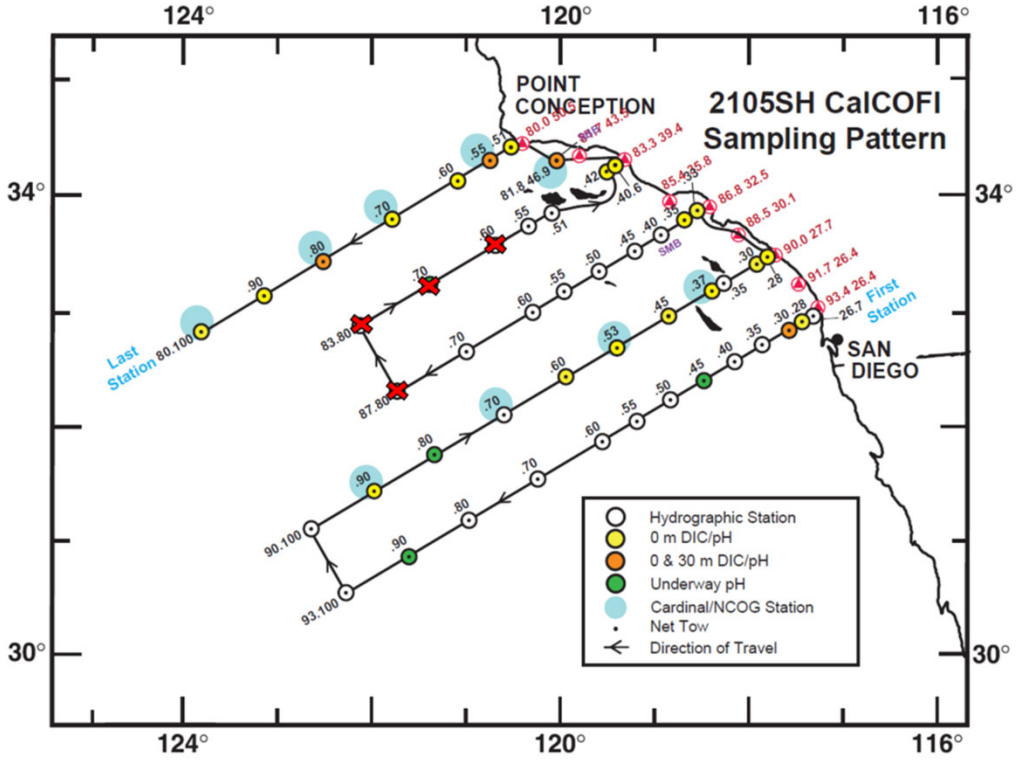
Survey updates

- **Spring CalCOFI**

  May 4-14, 2021, 10 DAS on the NOAA FSV Shimada

  Completed 44 out of 48 planned stations

Photos by NOAA Fisheries



Survey updates

- **Summer CPS survey**

  Jul 2 - Oct 15, 86 DAS on the FSV Reuben Lasker
  Still awaiting permit from Mexico

  Drawing on different parts of SWFSC and WCRO, as well as volunteers and scientists from Mexico (pending permit approval) to staff the survey

  Nearshore sampling by industry vessels off WA/OR/NorCal and SoCal

  Saildrones will supplement acoustic transects

- **Summer CalCOFI**

  July 16-31, 2021 on the UNOLS vessel RV Sally Ride

- **Fall CalCOFI**

  Oct 31-Nov 15, 2021 on the UNOLS vessel RV Sally Ride

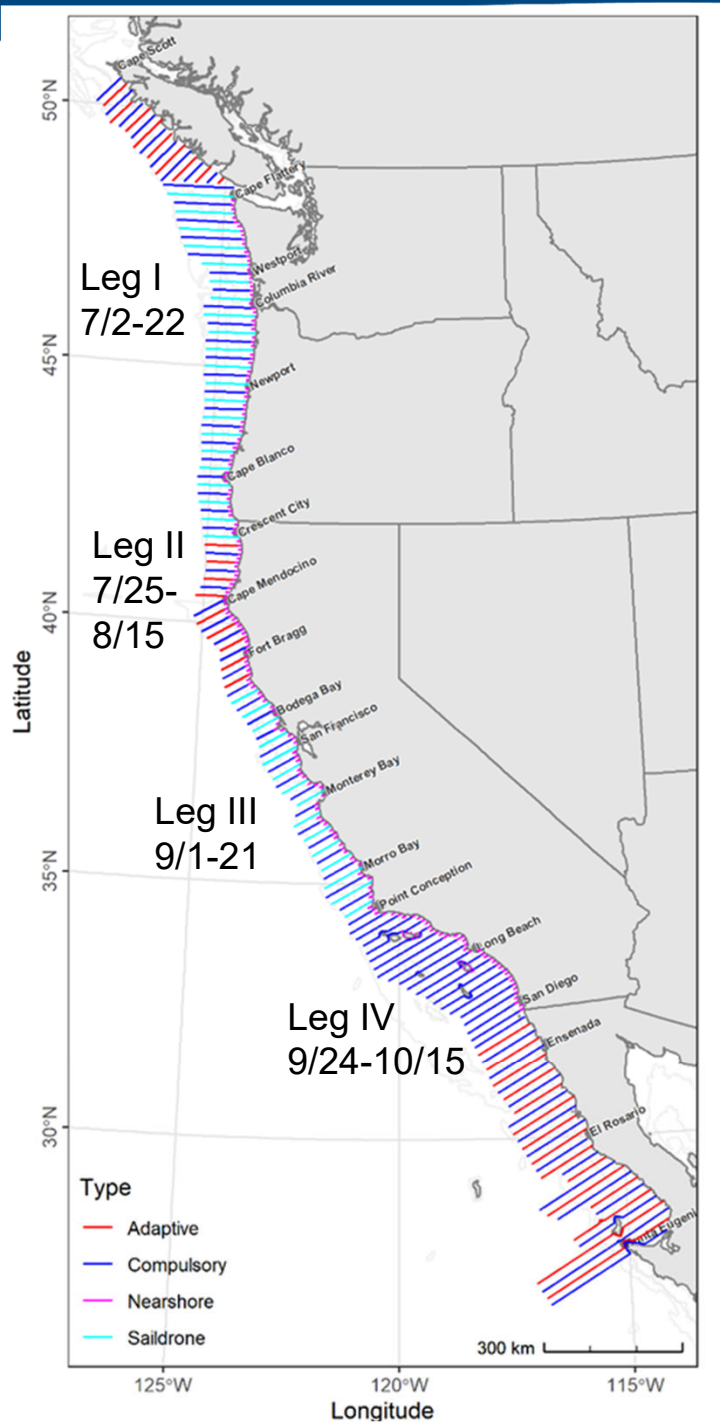
Summer 2021 CCE Survey

- FSV *Reuben Lasker*
- 86 Days at Sea
- 4 Legs, 3.5 Months
- FV *Lisa Marie*

  off WA, OR, & N. CA
- FV *Long Beach Carnage* off C. and S. CA
- 5 Saildrones

  in anchovy areas
- Leg IV: to Pt. Eugenia

  Mexico Collaboration



CPS assessment schedule

- Pacific mackerel:
  - Catch-only projection (June 2021)
  - Next Benchmark (June 2023)
- Central subpopulation of northern anchovy:
  - New benchmark assessment
  - STAR panel (Dec 7-10, 2021)
  - Presentation to Council (TBD; March or April 2022?)
- Northern subpopulation of sardine:
  - Update assessment (April 2022)
  - Next Benchmark (April 2023)

Priority Improvements to 2023 sardine benchmark

Near term:

- **STOCK STRUCTURE**
- **ATM SURVEYS**

Longer term:

- EMSY
- Other indices
- ATM surveys

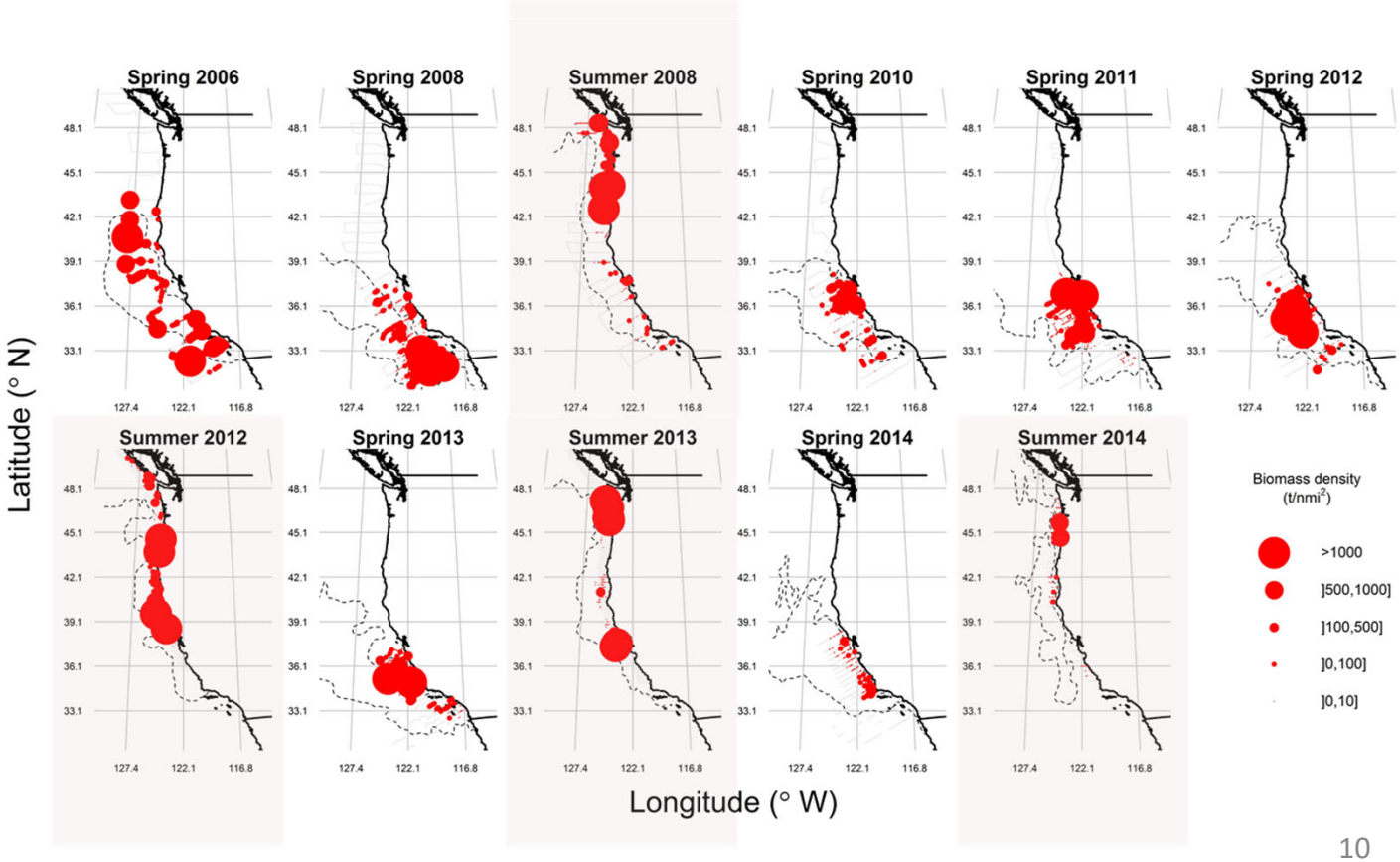
Workload allows progress on near term categories prior to next benchmark

All topics remain on our to-do list for longer term

Stock Structure

SWFSC routinely checks on ability of current habitat model to predict sardine stock distribution

- **Optimal+ Good Potential Habitat**
- **ATM NS Sardine Densities**



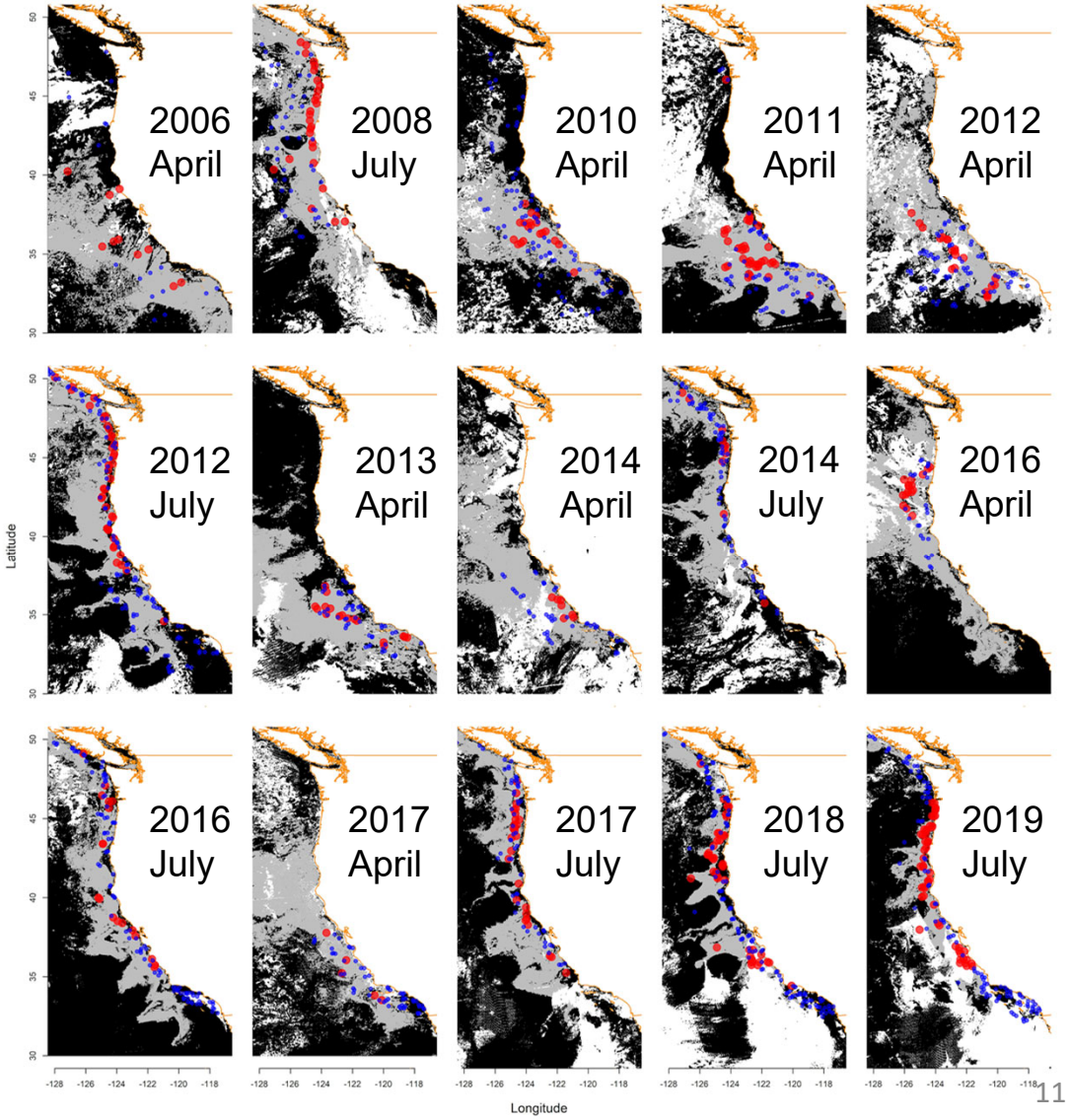
Stock Structure

Potential Habitat

- Optimal+Good
- Bad
-

NS Sardine (<17 ˚C)

- Positive catches
- Negative catches



Stock Structure

SWFSC will update the existing habitat model using new years of data from 2012 onward

- Satellite-derived SST
- Sardine egg distributions from CalCOFI and ATM surveys (note that few sardine eggs are encountered in new years of data, so predictive ability during low sardine abundance may be limited)
- Updated habitat model will be reviewed and incorporated into the 2023 benchmark assessment

Stock Structure

Genetics work on stock delineation

- Genome development and rangewide SNP study in process
  - anticipated completion end of FY22

The next benchmark model will also investigate ways to capture uncertainty about catch numbers due to uncertainty in stock structure delineation.

ATM Surveys

CIE Recommendations:

Completed

- ✓ Nearshore Extrapolations
- ✓ Nearshore Surveys
- ✓ Automated, comprehensive reporting on data collections, analyses, and estimates

In Progress

- ○ Study fish close to the sea-surface (SX90)
- ○ School statistics (numbers, sizes, spacings)
- ○ Explore effects of changes in dominant species on ecosystem and sampling
- ○ Study trawl selectivity

Future Work

- ❖ Monitor trawl performance

Automated Vizualization and Survey Report

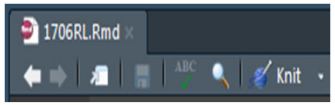
Data inputs

- CUFES
- Calibration / NASC
- U/CTD
- SCS
- ERDDAP
- Trawl

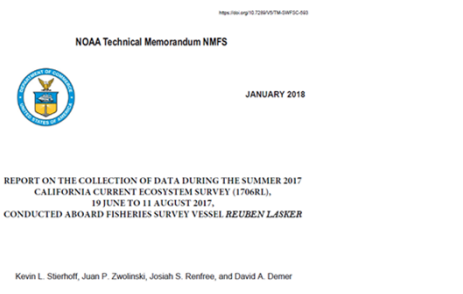
Processing code

user_input.R

survey_report.Rmd



Survey report



NOAA Technical Memorandum NMFS

JANUARY 2018

REPORT ON THE COLLECTION OF DATA DURING THE SUMMER 2017 CALIFORNIA CURRENT ECOSYSTEM SURVEY (1706RL), 19 JUNE TO 11 AUGUST 2017, CONDUCTED ABOARD FISHERIES SURVEY VESSEL *REUBEN LASKER*

Kevin L. Stierhoff, Juan P. Zwolinski, Josiah S. Renfree, and David A. Demer

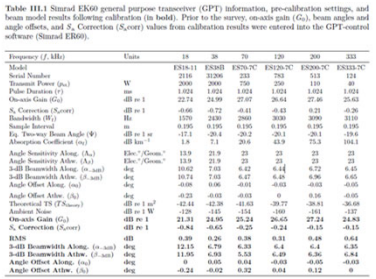


Table III.1 Simrad EK60 general purpose transceiver (GPT) information, pre-calibration settings, and beam model results following calibration (in bold). Prior to the survey, on-axis gain (G_o), beam angles and angle offsets, and S_a Correction ($S_a$corr) values from calibration results were entered into the GPT-control software (Simrad ER60).

Frequency (f, kHz)	Units	18	38	70	120	200	333
Model		ES18-11	ES38B	ES70-7C	ES120-7C	ES200-7C	ES333-7C
Serial Number		2116	31206	233	783	513	124
Transmit Power (p_{tx})	W	2000	2000	750	250	110	40
Pulse Duration (τ)	ms	1.024	1.024	1.024	1.024	1.024	1.024
On-axis Gain (G_o)	dB re 1	22.74	24.99	27.07	26.64	27.46	25.63
S_a Correction ($S_a$corr)	dB re 1	-0.66	-0.72	-0.41	-0.43	0.21	-0.26
Bandwidth (W_f)	Hz	1570	2430	2860	3030	3090	3110
Sample Interval	m	0.195	0.195	0.195	0.195	0.195	0.195
Eq. Two-way Beam Angle (Ψ)	dB re 1 sr	-17.1	-20.4	-20.2	-20.1	-20.1	-19.6
Absorption Coefficient (α_f)	dB km^{-1}	1.8	7.1	20.6	43.9	75.3	104.1
Angle Sensitivity Along. (A_a)	Elec.°/Geom.°	13.9	21.9	23	23	23	23
Angle Sensitivity Athw. (A_t)	Elec.°/Geom.°	13.9	21.9	23	23	23	23
3-dB Beamwidth Along. (θ_{-3dB})	deg	10.62	7.03	6.42	6.44	6.72	6.45
3-dB Beamwidth Athw. (β_{-3dB})	deg	10.74	7.03	6.47	6.48	6.96	6.65
Angle Offset Along. (α_a)	deg	-0.08	0.06	-0.01	-0.03	-0.03	-0.05
Angle Offset Athw. (β_a)	deg	-0.23	-0.03	-0.03	0	0.16	-0.05
Theoretical TS (TS_{theor})	dB re 1 m^2	-42.44	-42.38	-41.63	-39.77	-38.81	-36.68
Ambient Noise	dB re 1 W	-128	-145	-154	-160	-161	-137
On-axis Gain (G_o)	dB re 1	21.31	24.95	25.24	26.45	27.24	24.83
S_a Correction ($S_a$corr)	dB re 1	-0.84	-0.65	-0.25	-0.24	-0.15	-0.15
RMS	dB	0.39	0.26	0.38	0.31	0.48	0.64
3-dB Beamwidth Along. (α_{-3dB})	deg	12.15	6.79	6.33	6.4	6.4	6.35
3-dB Beamwidth Athw. (β_{-3dB})	deg	11.95	6.93	5.53	6.49	6.36	6.84
Angle Offset Along. (α_a)	deg	0	0.05	0.04	-0.03	-0.05	-0.03
Angle Offset Athw. (β_a)	deg	-0.24	-0.02	0.32	0.04	0.12	0

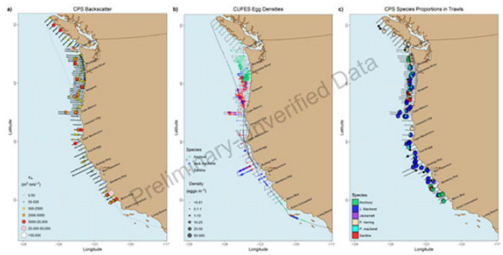
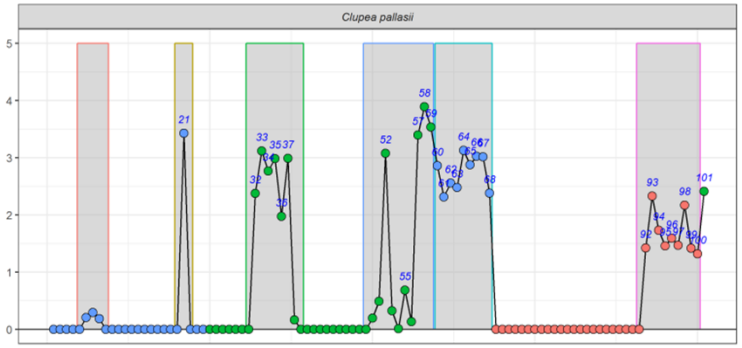


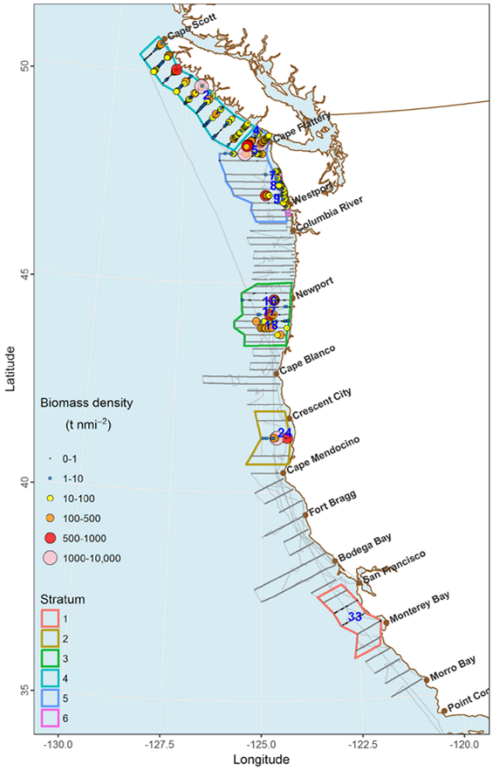
Figure III.7. Survey transects performed aboard *Lasker* overlaid with (a) the distribution of 38-kHz integrated backscattering coefficients (s_A, m^2 nmi^{-2}; averaged over 2000-m distance intervals and from 350 to 5-m deep) ascribed to CPS; (b) anchovy-, jack mackerel-, and sardine-egg densities (eggs m^{-2}) from the CUFES; and (c) proportions of CPS species in trawl clusters (black points indicate trawls with no CPS).

Automated Analysis, QA/QC and Biomass Report

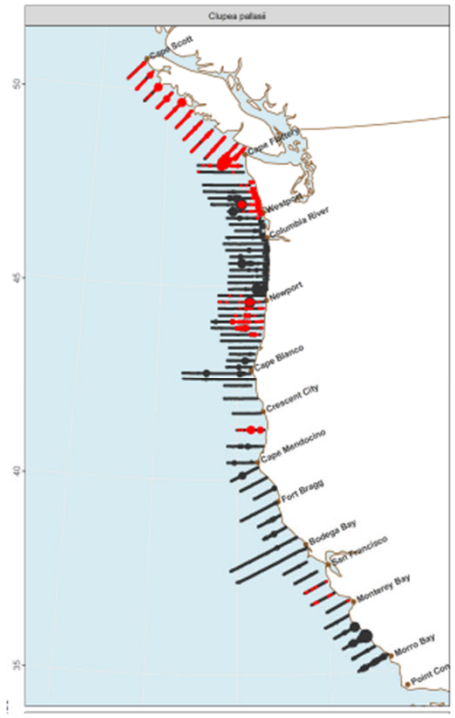
Automated post-stratification



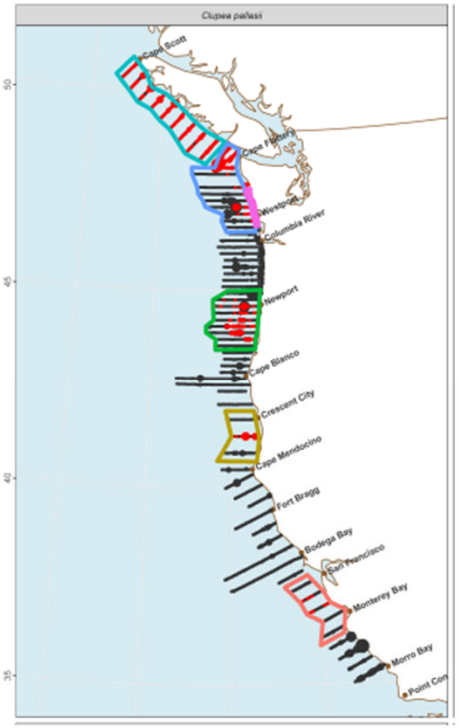
Post-stratified backscatter



Species-specific backscatter



Review of results



Automated Report

Kevin L. Stierhoff, Juan P. Zwolinski, and David A. Demer. 2019. Distribution, biomass, and demography of coastal pelagic fishes in the California Current Ecosystem during summer 2018 based on acoustic-trawl sampling. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-613

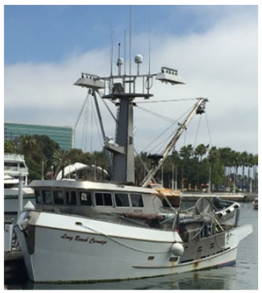
Summer 2019 CCE Survey

LASKER

W COAST

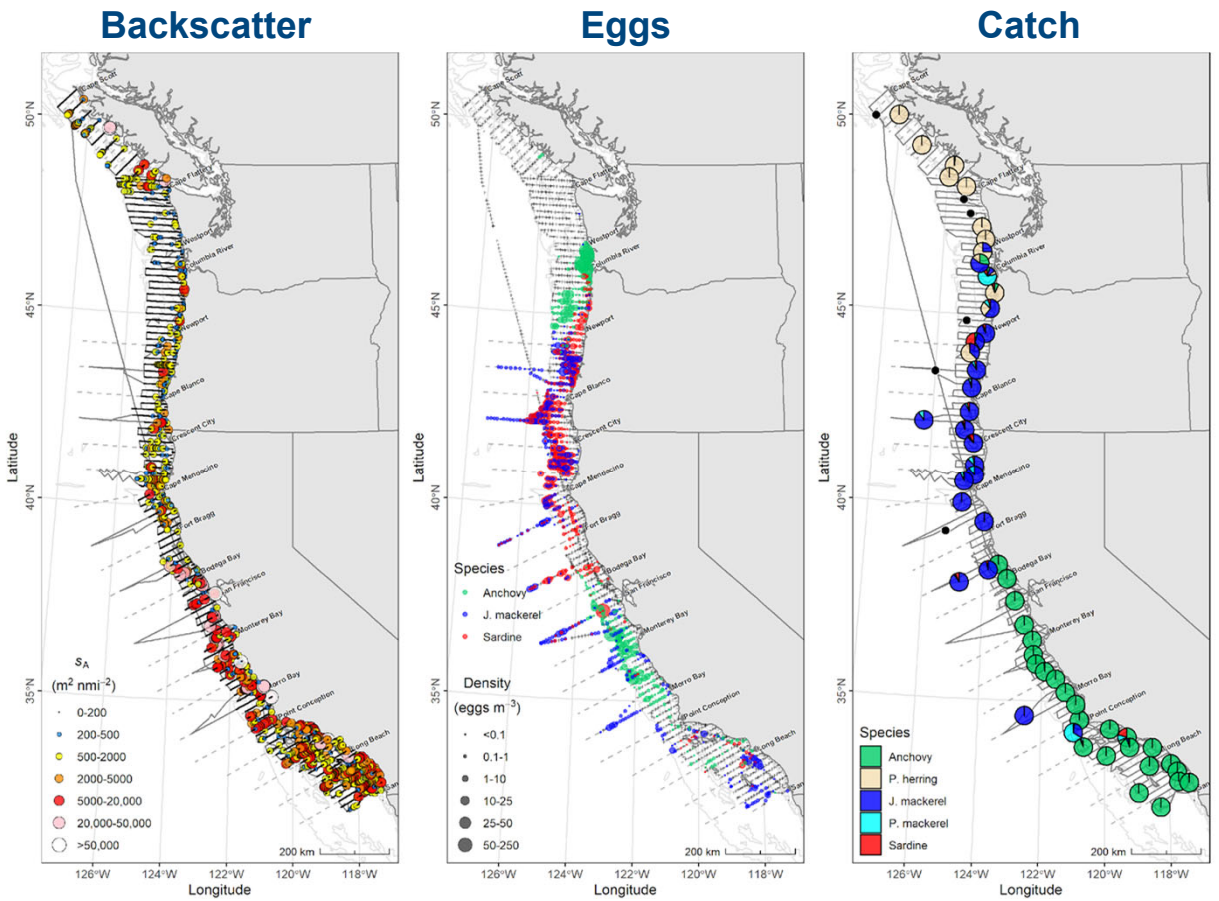
LISA MARIE

OR & WA



LB CARNAGE

So CA Bight



75 DAS, 4 Legs, FSV *Reuben Lasker*

NOAA FISHERIES

ATM Surveys

Efforts to improve the survey continue and take time, resources, and effort to investigate and implement. The survey only goes out 1-2 times a year, so progress on some efforts will be incremental.

Due in part to diminishing NOAA ship time, NMFS is exploring integration of NWFSC and SWFSC west coast surveys of hake and coastal pelagic species – this also takes time, effort, and resources.

Improvement attempts prior to 2023 sardine benchmark

Near term:

- STOCK STRUCTURE
- ATM SURVEYS

Longer term:

- **EMSY**
- **Other indices**
- **ATM surveys**

Workload allows progress on near term categories prior to next benchmark

All topics remain on our to-do list

New research project on CPS

Impact of climate and ecosystem change on the California Current forage complex and the fishing communities and predators it sustains

Three year project funded by NOAA Climate Program Office's Coastal and Ocean Climate Applications (COCA) Fisheries and Climate Program

Collaboration between SWFSC, NWFSC, PIFSC, UCSC, and CSIRO

3 postdocs have been hired - Felipe Quezada Escalona (economist), Pierre-Yves Hernvann (ecosystem modeler), Robert Wildermuth (population dynamics modeler)

New research project on CPS

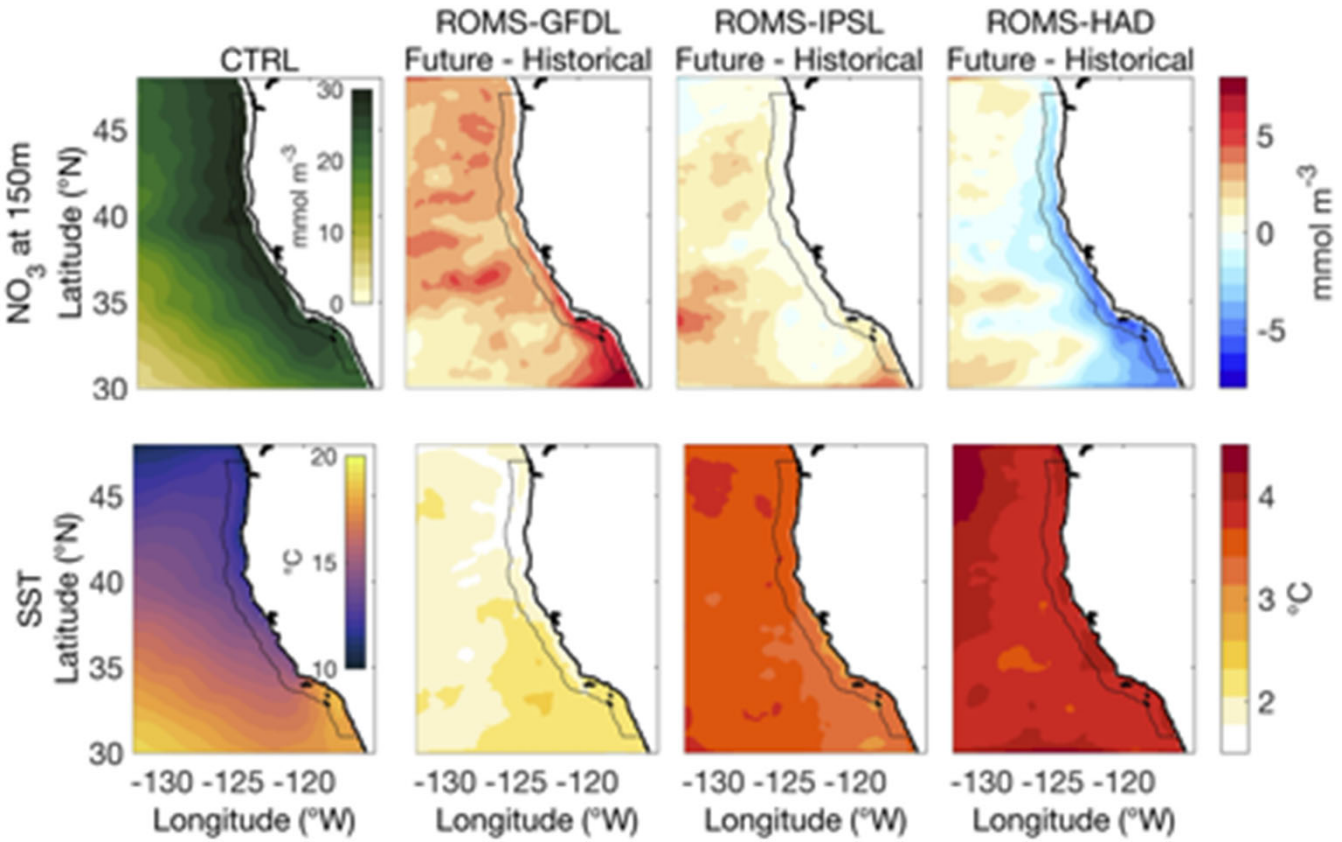
Project follows on the Future Seas Project which investigated downscaled climate projections in the CA current and impacts on regional fisheries including sardine.

Project aims:

1) assess the effects of long-term climate change on the forage fish assemblage of the CC and on the predators and fishing communities it sustains,
2) develop a climate-informed **ecosystem** management strategy evaluation (MSE) to assess performance of current and alternative CPS management strategies under a changing climate, shifting forage species composition, and varying predator populations.

New research project on CPS

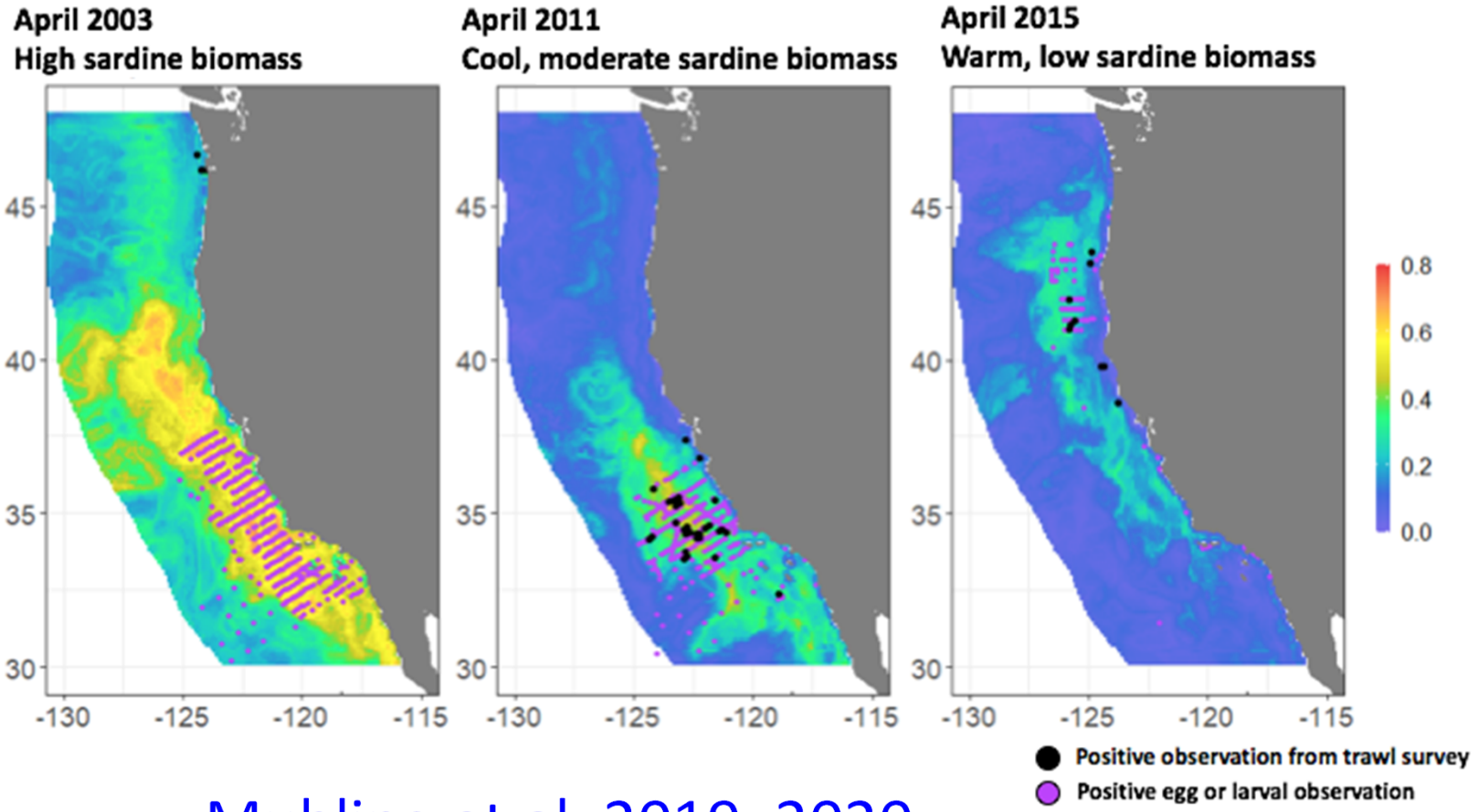
Leveraging downscaled climate projections produced during Future Seas



[Pozo Buil et al., 2021]

New research project on CPS

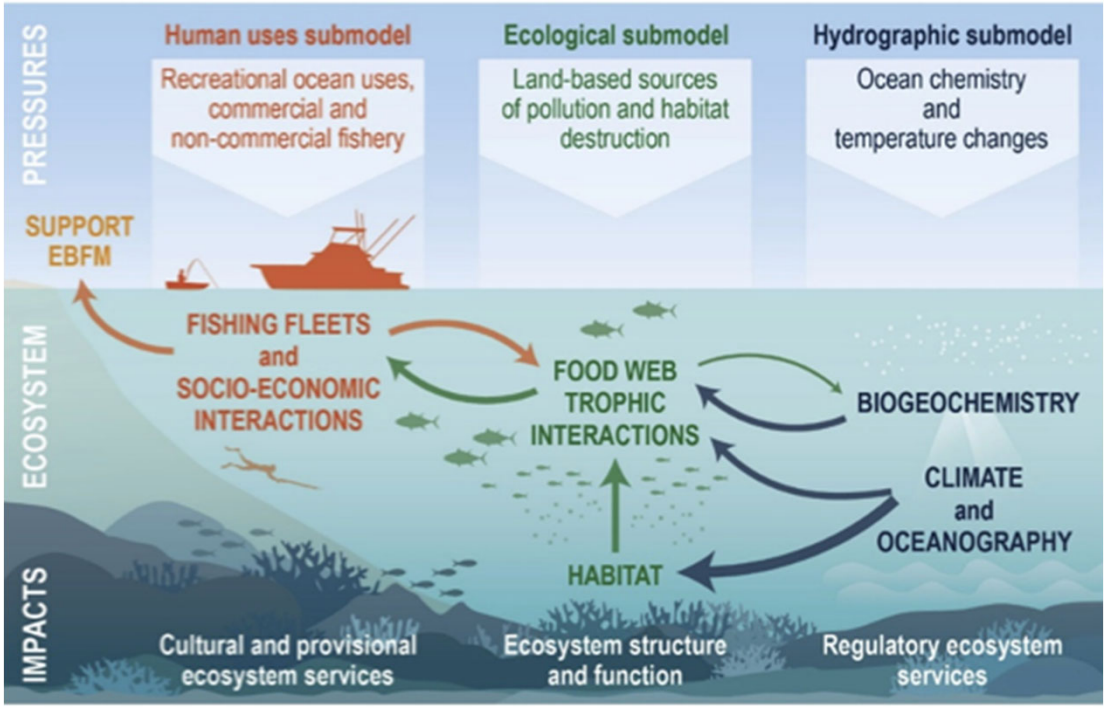
Leveraging species distribution models (SDMs) for forage species developed during Future Seas



Muhling et al. 2019, 2020

New research project on CPS

Future projections of species distributions and ocean conditions will feed into a multispecies population dynamics model and the end-to-end Atlantis ecosystem model for the California Current (Kaplan et al. 2017)



https://research.csiro.au/atlantis/

H.R. Pethybridge et al. 2019; E.A. Fulton et al. 2011

New research project on CPS

This project will:

- Investigate impacts of climate change and CPS management on connected species and fisheries (e.g. protected species and HMS)
- Assess impacts of climate change on CPS fishery participants and their portfolio
- Work with multispecies or ecosystem models; single species models are not the focus
- Reach out to the Climate and Communities Initiative Core Team, the Ecosystem Workgroup and other industry and Council persons and CPS advisory bodies to get input

New research project on CPS

This project is NOT intended to be a conventional single-species CPS MSE designed to test robustness of CPS management to assumptions and uncertainties in CPS stock assessments. It is a strategic look at how CPS fisheries and connected species and fisheries will fare under climate change.

Due to nature of funding source (NOAA climate office) and longer time scales involved in projections the focus is on assessing impacts of CPS management strategies and climate-driven changes in the forage assemblage on other ecosystem components and fishing communities


Questions?