The Role of Ocean Conditions on Longfin Smelt in the San Francisco Estuary

Frederick Feyrer U.S. Geological Survey

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Shawn Acuna Metropolitan Water District









Delta and Longfin Smelt: Is Extinction Inevitable? Symposium, March 29, 2016



Key Players

Metropolitan Water District

Dave Fullerton, Corey Phillis, Alison Collins, Shawn Acuna

<u>California Department of Fish and Wildlife</u>

Randy Baxter, CDFW

California Department of Water Resources

Ted Sommer

ICF International

Lenny Grimaldo

NOAA Fisheries

Jeff Harding, Sean Hayes

UC Davis

Jim Hobbs, Mandi Finger

US Geological Survey

Fred Feyrer













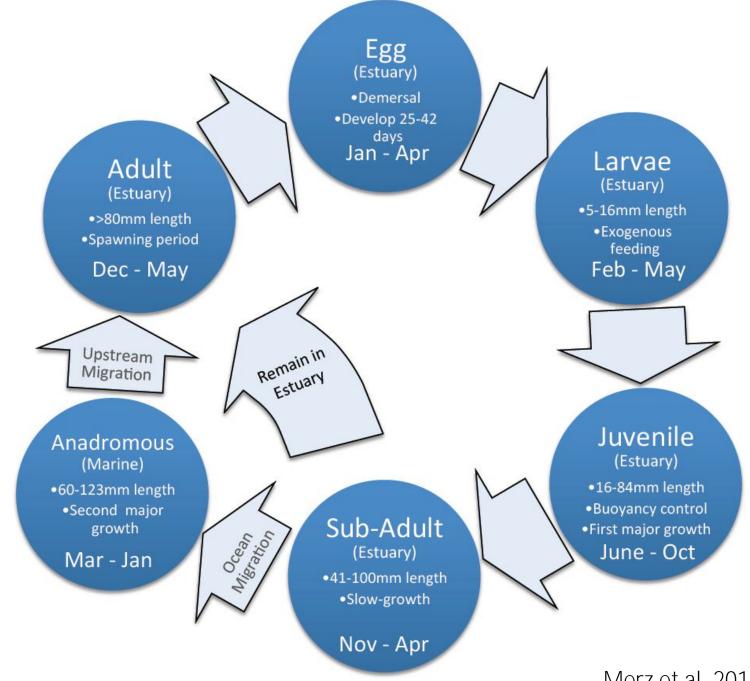




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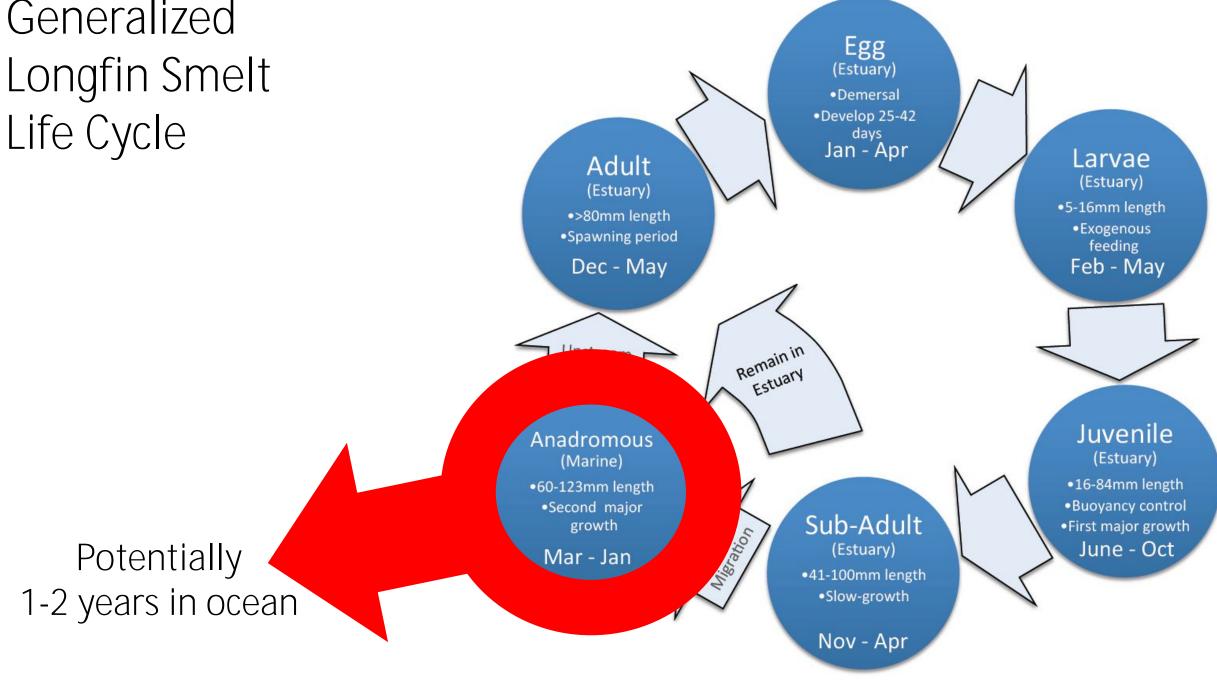
- 1. Ocean occupancy
- 2. Ecological processes
- 3. Research needs

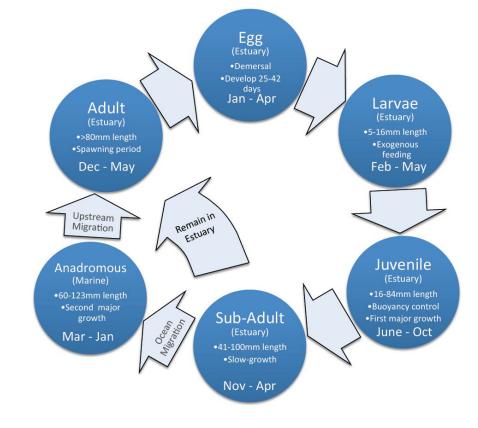


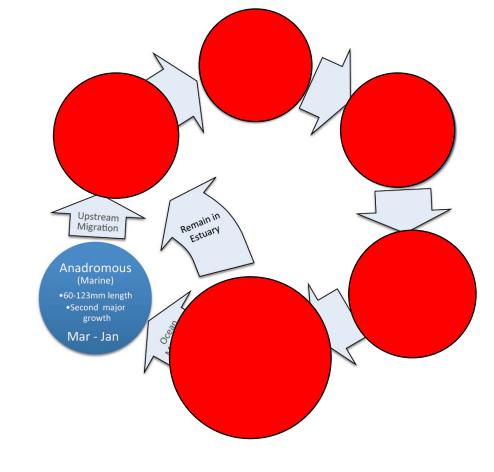


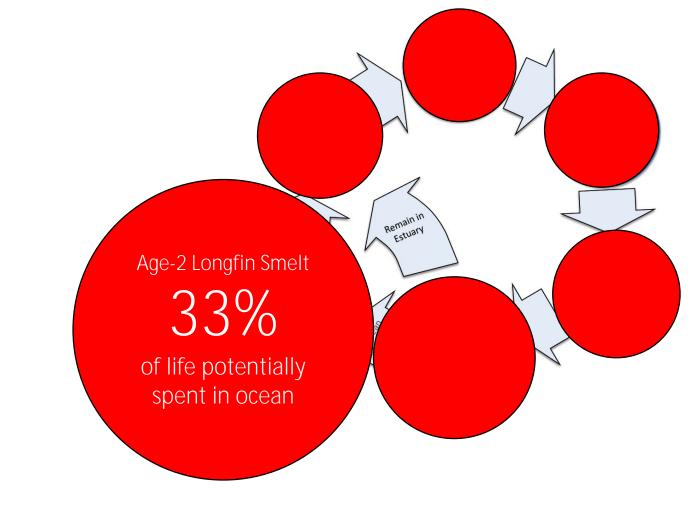
Merz et al. 2013

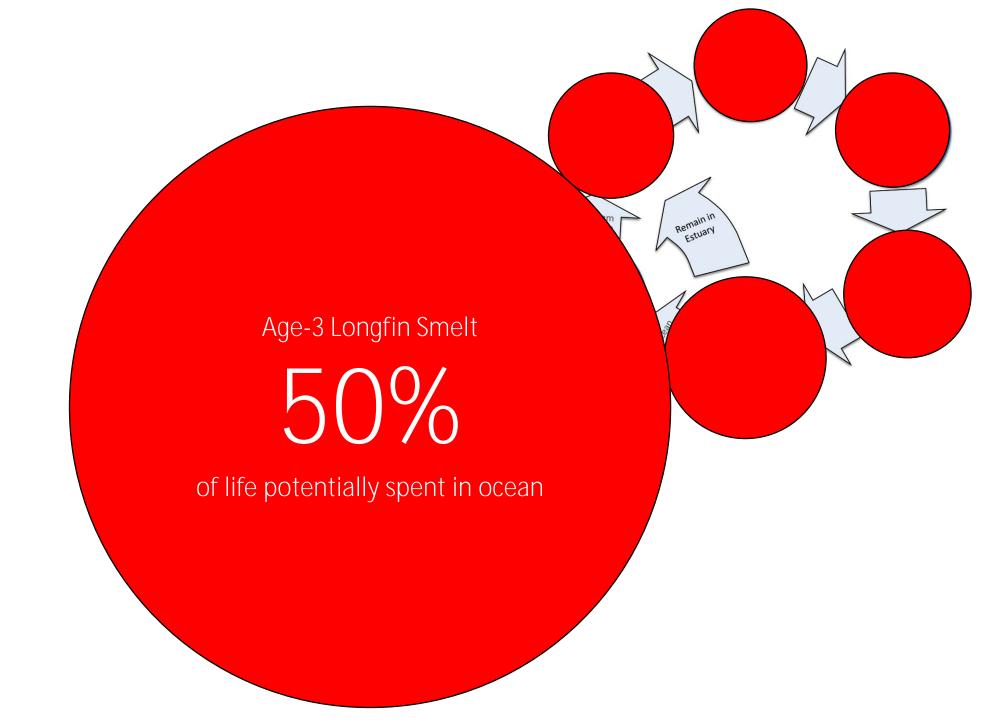
Generalized Life Cycle



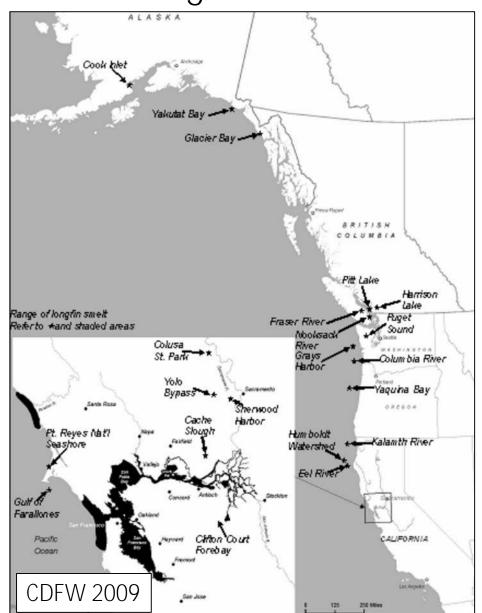




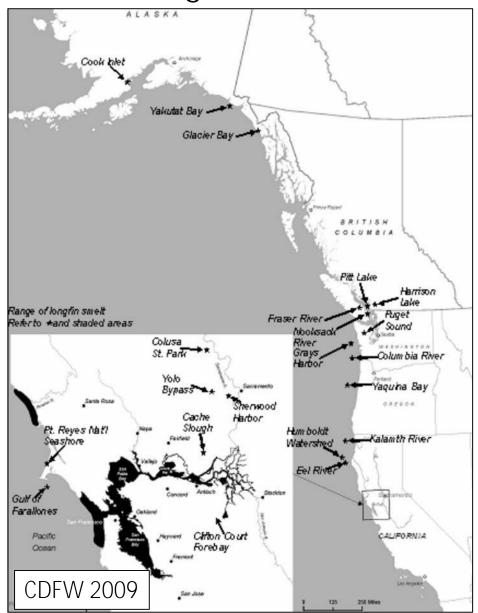




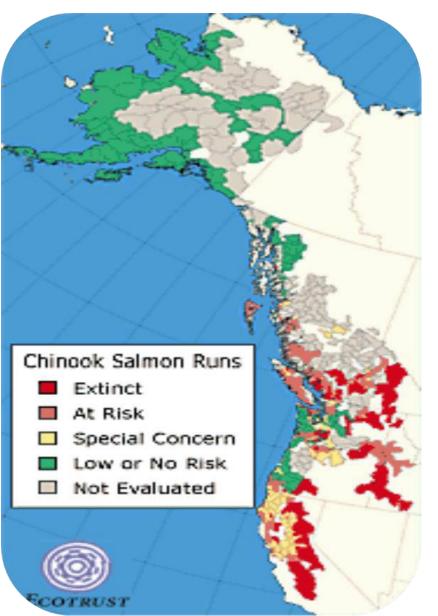
Longfin Smelt

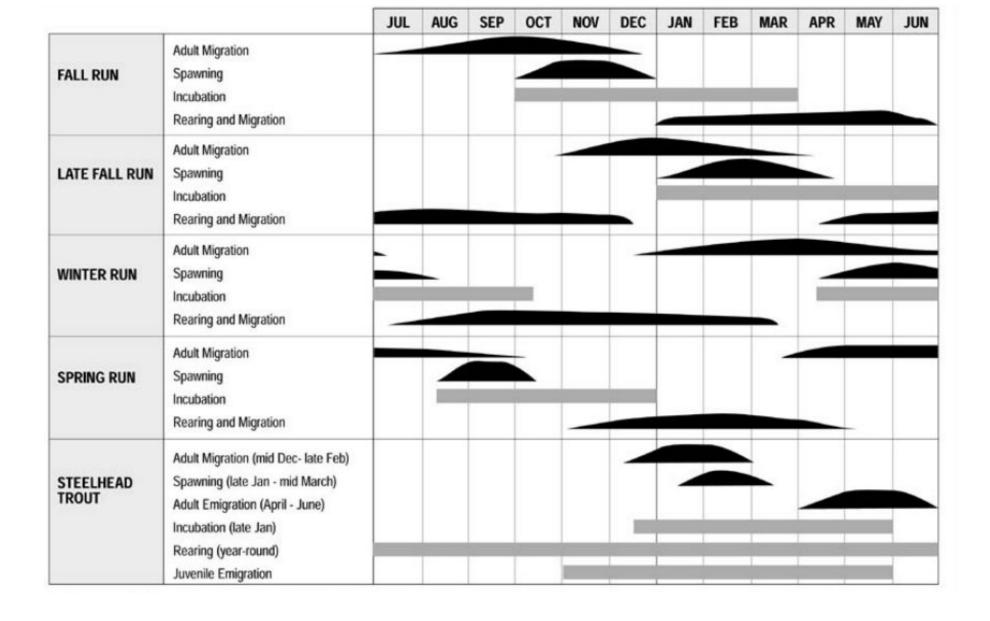


Longfin Smelt

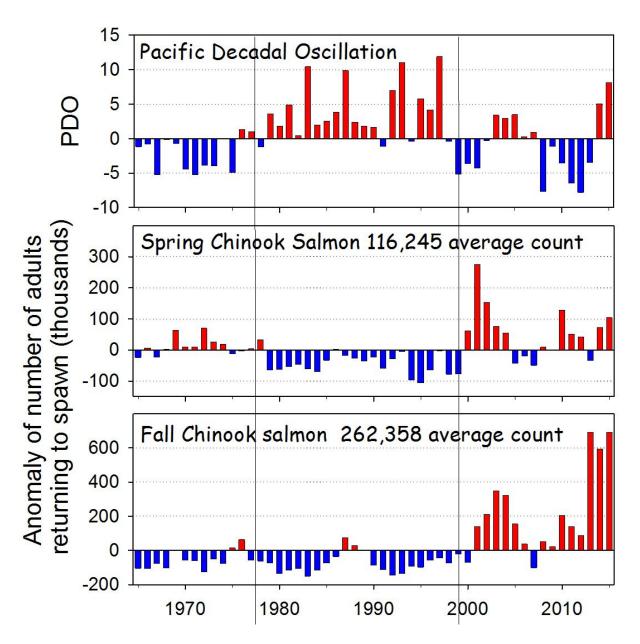


Chinook Salmon

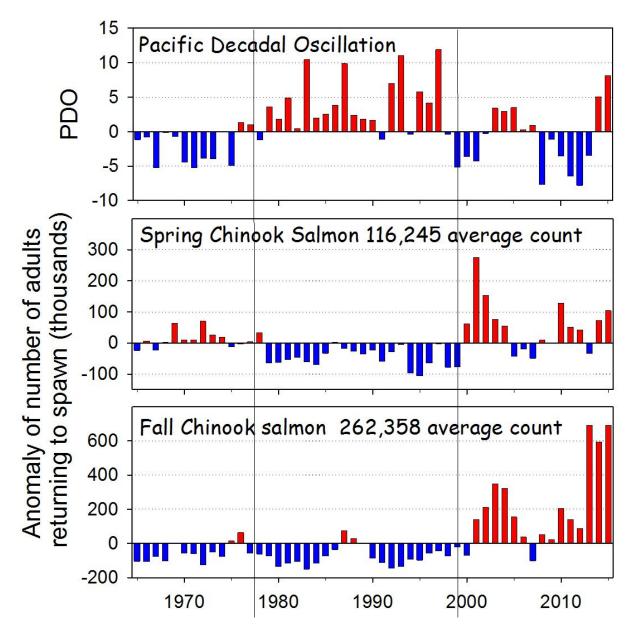




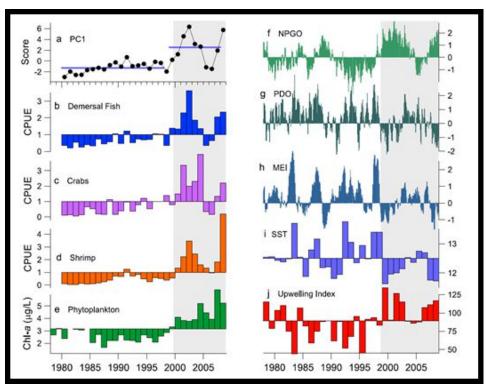
		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
FALL RUN	Adult Migration Spawning Incubation Rearing and Migration				4								
LATE FALL RUN	Adult Migration Spawning Incubation Rearing and Migration												
WINTER RUN	Adult Migration Spawning Incubation Rearing and Migration												
SPRING RUN	Adult Migration Spawning Incubation Rearing and Migration		4										
STEELHEAD TROUT	Adult Migration (mid Dec- late Feb) Spawning (late Jan - mid March) Adult Emigration (April - June) Incubation (late Jan) Rearing (year-round) Juvenile Emigration												
Longfin Smelt	Adult presence Spawning Larva present Juvenile rearing												



Credit: Nate Mantua, NOAA Fisheries



Credit: Nate Mantua, NOAA Fisheries



Cloern et al. 2010. *Geophys. Res. Lett.*, 37, L21602

Global Change Biology

Global Change Biology (2015), doi: 10.1111/gcb.12969

Estuarine fish communities respond to climate variability over both river and ocean basins

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Abstrac

Estuaries are dynamic environments at the land—sea interface that are strongly affected by interannual climate variability. Ocean—atmosphere processes propagate into estuaries from the sea, and atmospheric processes over land propagate into estuaries from watersheds. We examined the effects of these two separate climate-driven processes or pelagic and demersal fish community structure along the salinity gradient in the San Francisco Estuary, California USA. A 33-year data set (1980–2012) on pelagic and demersal fishes spanning the freshwater to marine regions of the estuary suggested the existence of five estuarine salinity fish guilds: limnetic (salinity = 0–1), oligohaline (salin

Generalized Egg Longfin Smelt (Estuary) Demersal Life Cycle •Develop 25-42 days Jan - Apr Larvae Adult (Estuary) (Estuary) •5-16mm length •>80mm length Exogenous Spawning period feeding Dec - May Feb - May Remain in Estuary Juvenile Anadromous (Estuary) (Marine) •16-84mm length •60-123mm length Buoyancy control Second major Sub-Adult Migration •First major growth growth June - Oct (Estuary) Mar - Jan

•41-100mm length •Slow-growth

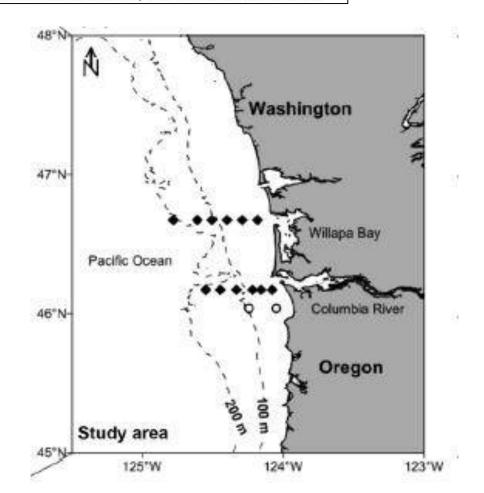
Nov - Apr

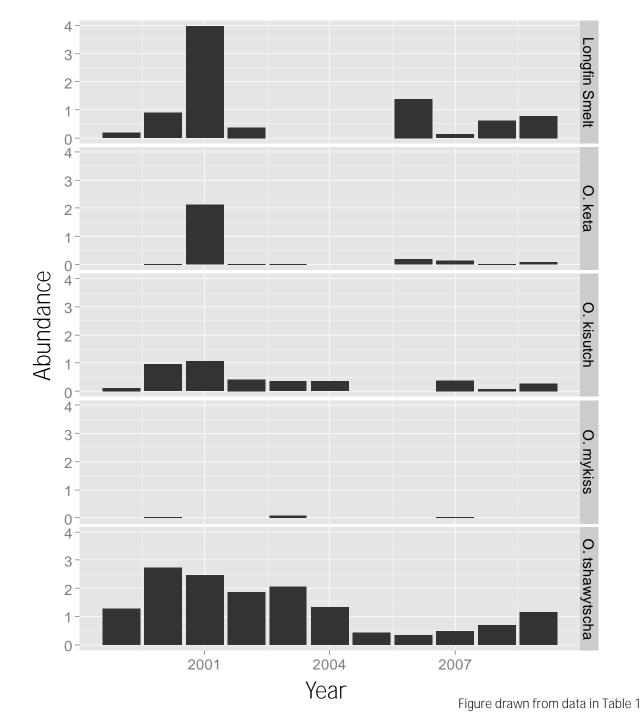


ICES Journal of Marine Science; doi:10.1093/icesjms/fst082

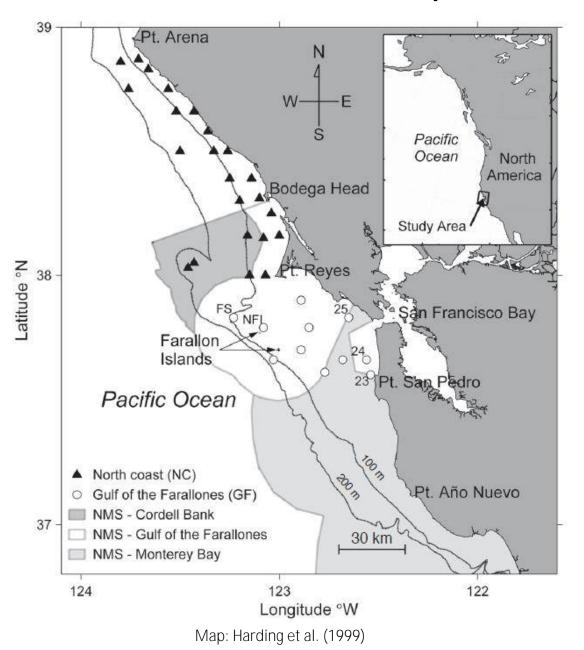
Biotic and abiotic factors influencing forage fish and pelagic nekton community in the Columbia River plume (USA) throughout the upwelling season 1999 – 2009

Marisa N. C. Litz^{1*}, Robert L. Emmett², Paul J. Bentley², Andrew M. Claiborne³, and Caren Barceló⁴

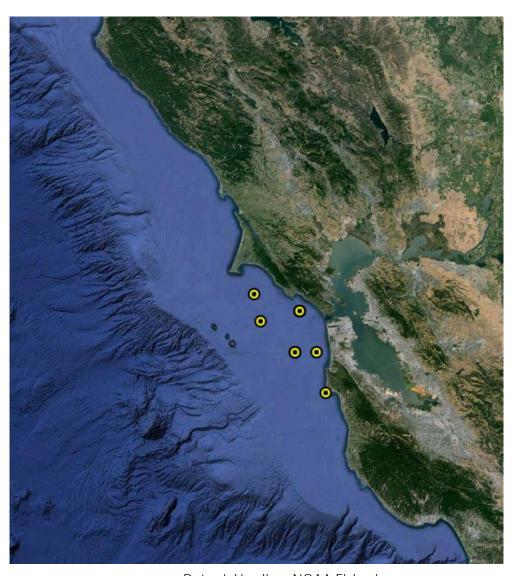




NOAA Fisheries Ocean Salmon Survey "Local" Sites

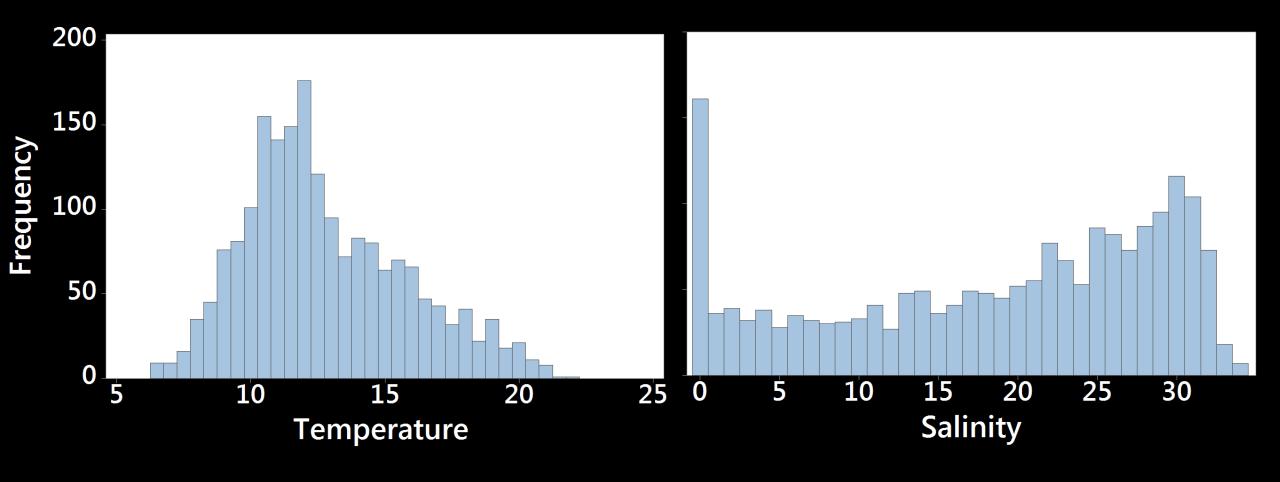


Longfin Smelt Observations, 1998-2015

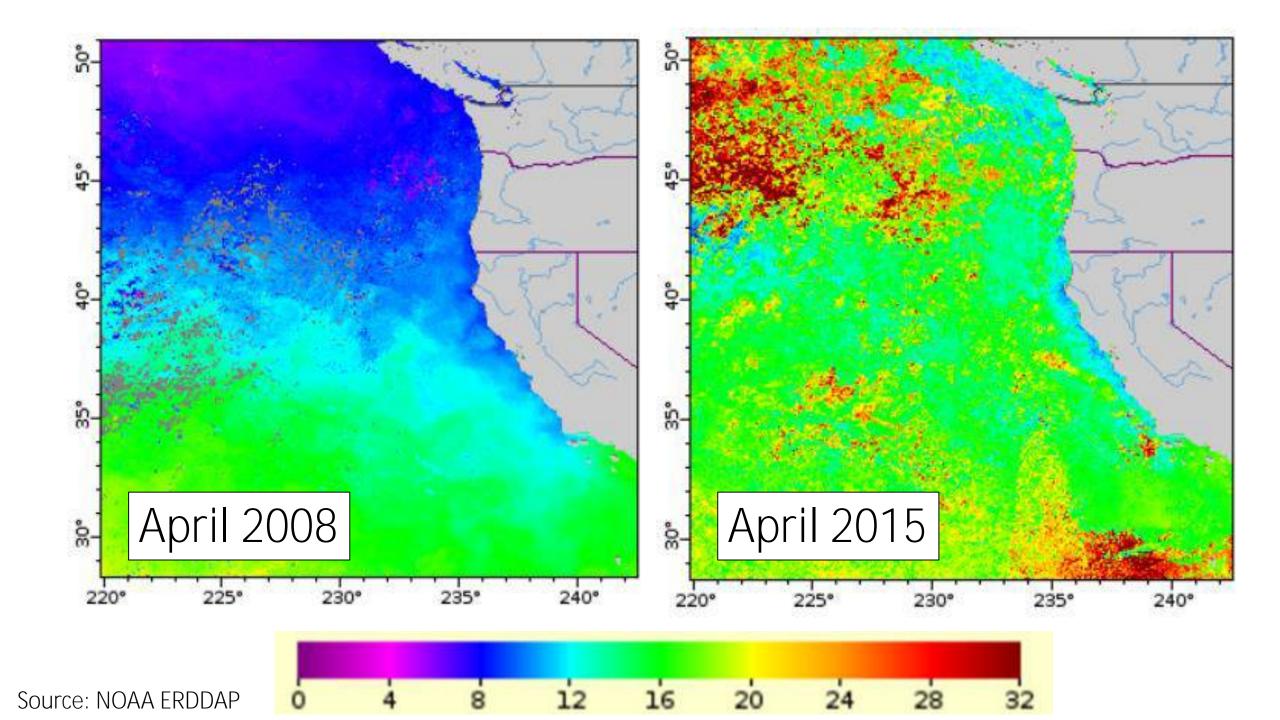


Data: J. Harding, NOAA Fisheries

Temperature and Salinity Range in San Francisco Estuary

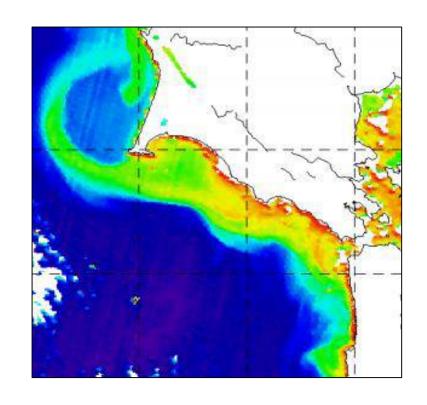


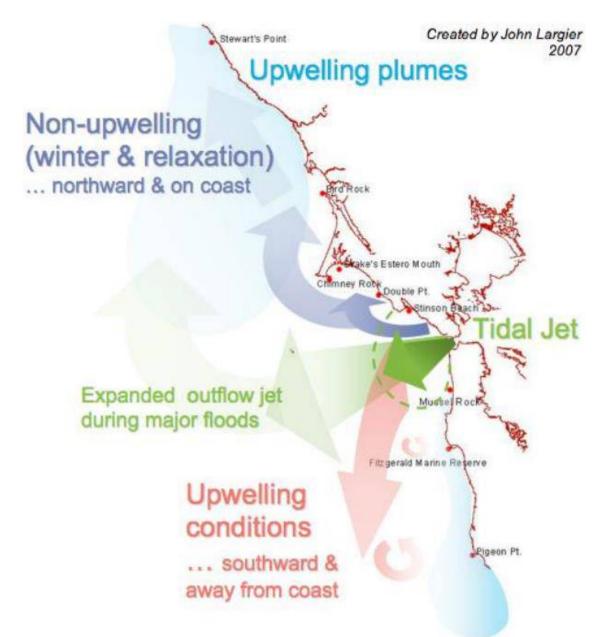
Source: CDFW Bay Study, Otter Trawl, Age-1+ Longfin Smelt, 1981-2012



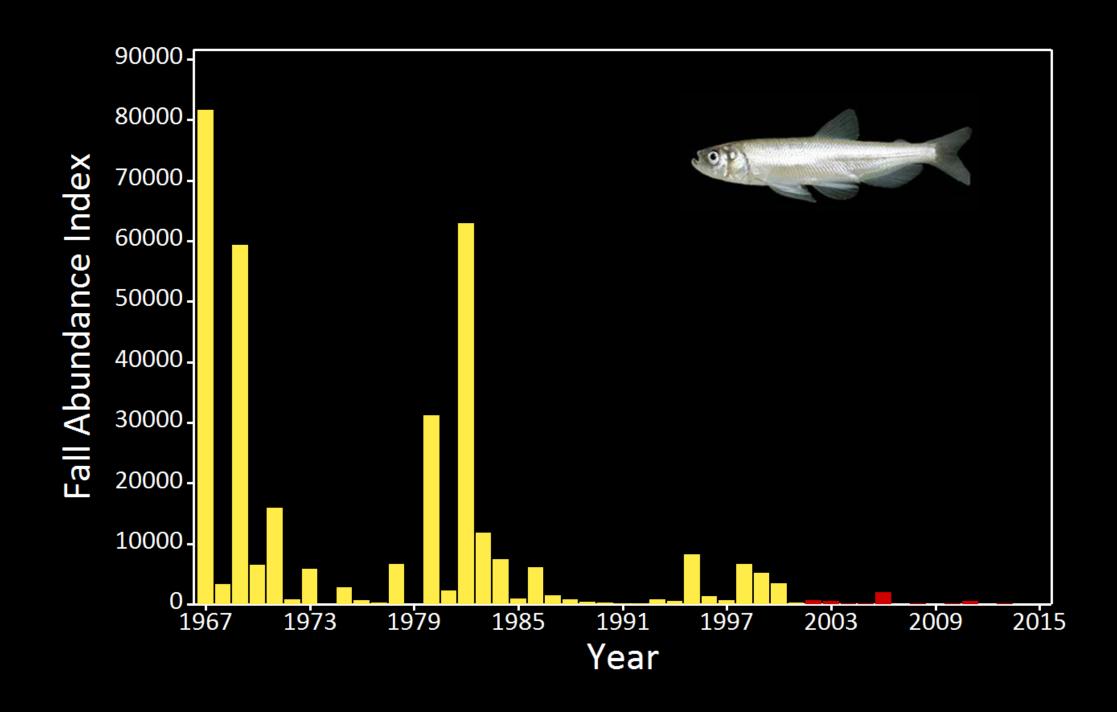
Interactions between upwelling and San Francisco Bay Plume

may drive local habitat conditions





Credit: John Largier, UC Davis





Longfin Smelt Coastal Research Program

Fundamental Science Needs:

- -Abundance and distribution
- -Stock composition
- -Feeding, growth, condition
- -Mortality

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 - Widely distributed and often locally abundant

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3. Research needs

- Fundamental research critically needed