Effects of variability in the Ensenada front on fish distributions off southern California, U.S.A.

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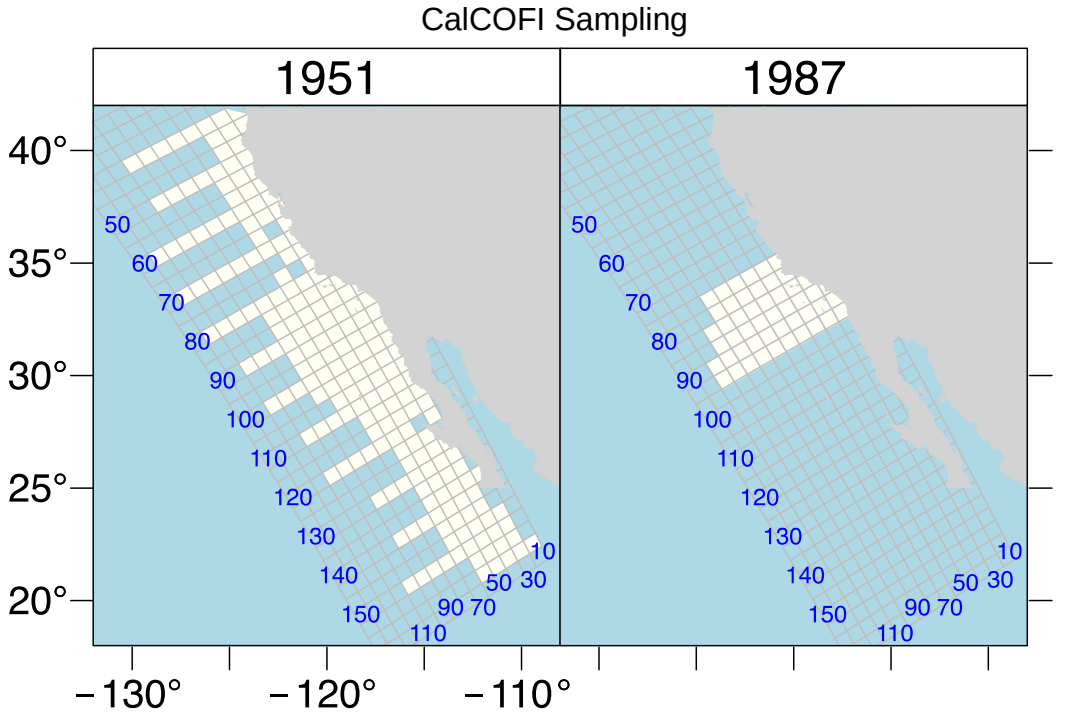
Purpose

Summarize recent and historical studies about fish distributions in relation to variability in the Ensenada front transition area, primarily using CalCOFI data

(California Cooperative Oceanic Fisheries Investigations Program)

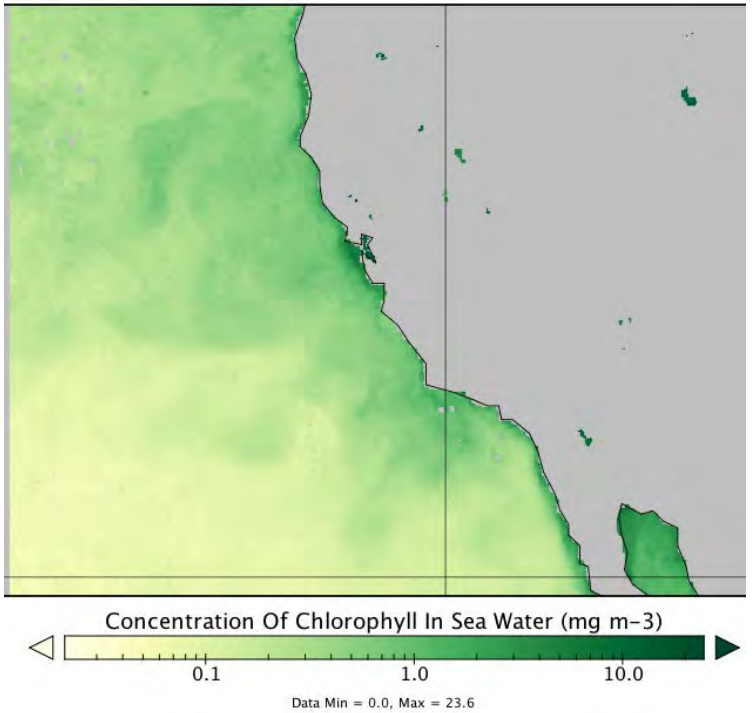


The Ensenada Front

A transition zone between:

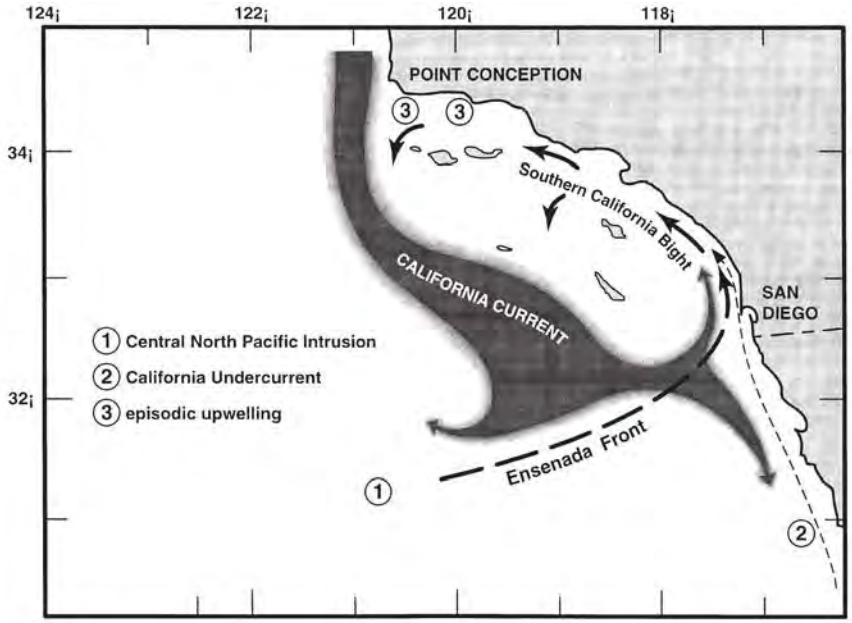
- More productive water to the north
- More oligotrophic water to the south

SeaWIFS Chlorophyll Data 3/15/2003



The Ensenada Front

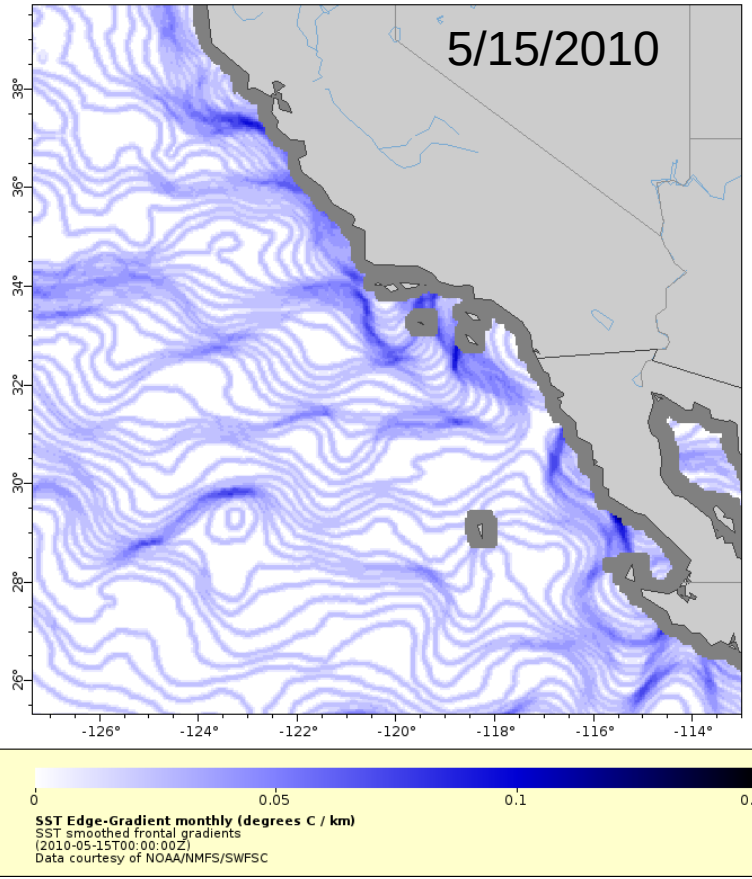
Schematic



The Ensenada Front

Reality:

Sometimes it is diffuse

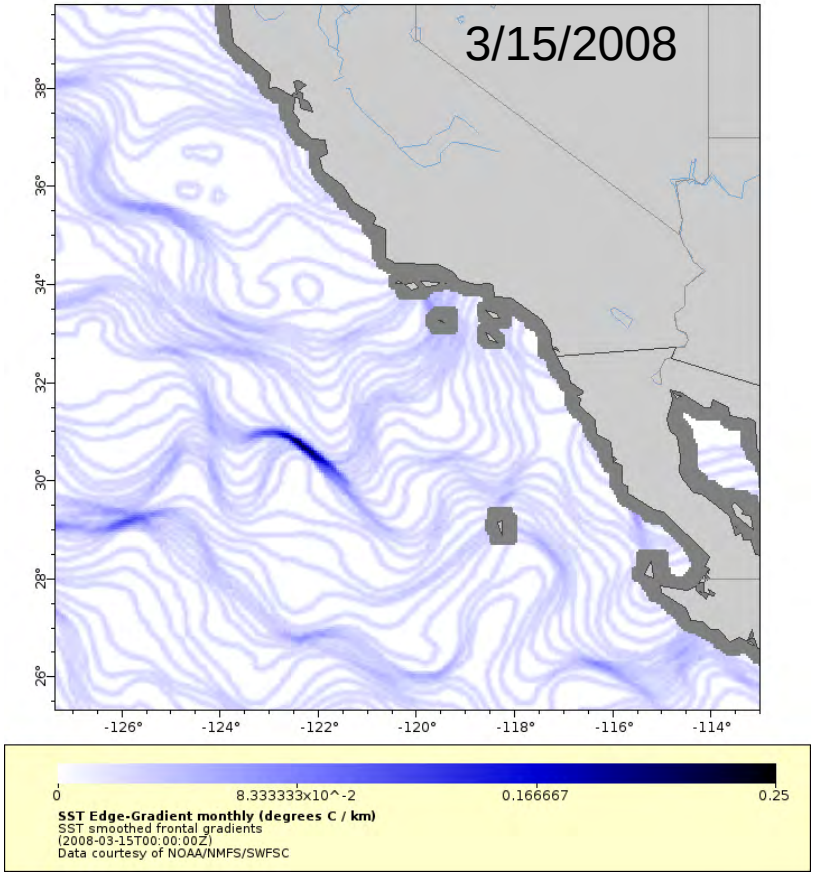


SST smoothed frontal gradients, Nieto et al.
https://oceanview.pfeg.noaa.gov/erddap/
NOAA/NMFS/SWFSC Dataset ID: FRD_SSTgradsmo

The Ensenada Front

Reality:

Sometimes it is oriented more North/South

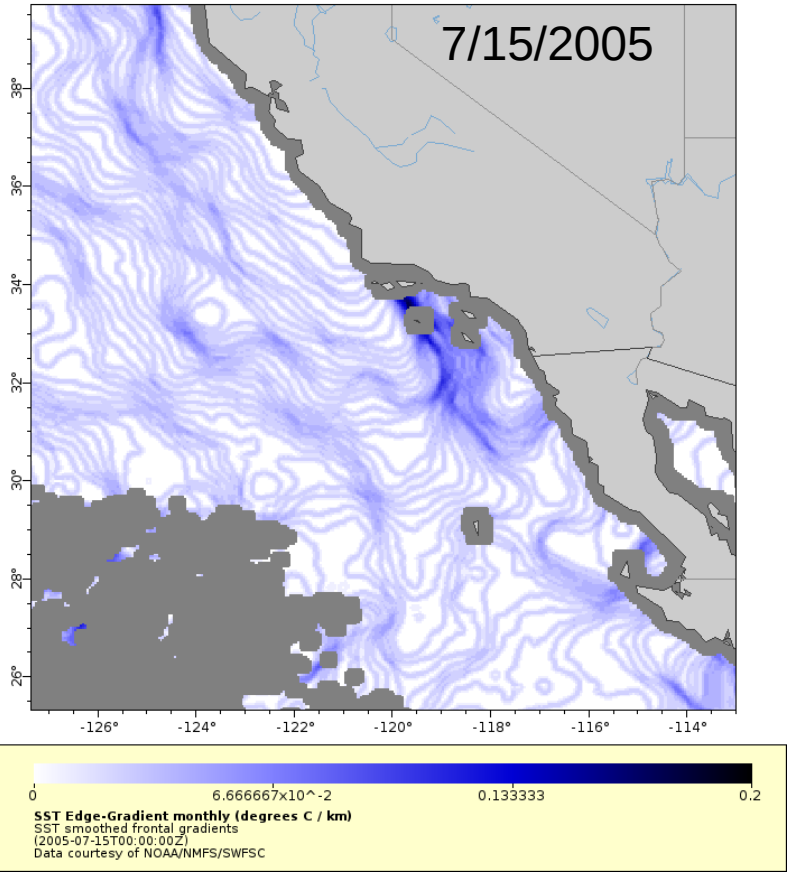


SST smoothed frontal gradients, Nieto et al.
https://oceanview.pfeg.noaa.gov/erddap/
NOAA/NMFS/SWFSC Dataset ID: FRD_SSTgradsmo

The Ensenada Front

Reality:

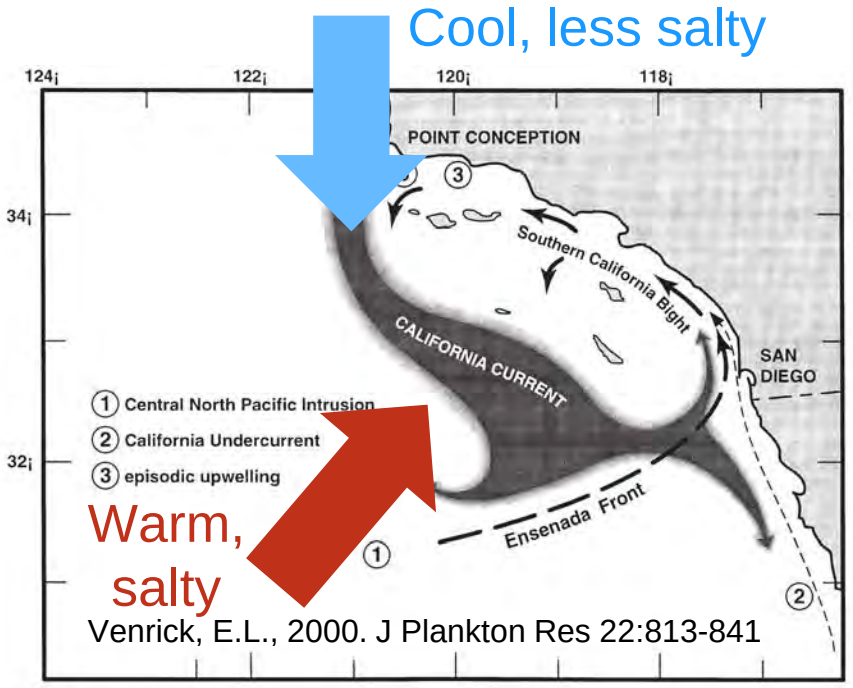
Sometimes it intrudes into the Southern California Bight



SST smoothed frontal gradients, Nieto et al.
https://oceanview.pfeg.noaa.gov/erddap/
NOAA/NMFS/SWFSC Dataset ID: FRD_SSTgradsmo

The Ensenada Front

The effect of variability in the transition zone is that the amount of cool versus warm water varies greatly off southern California, USA

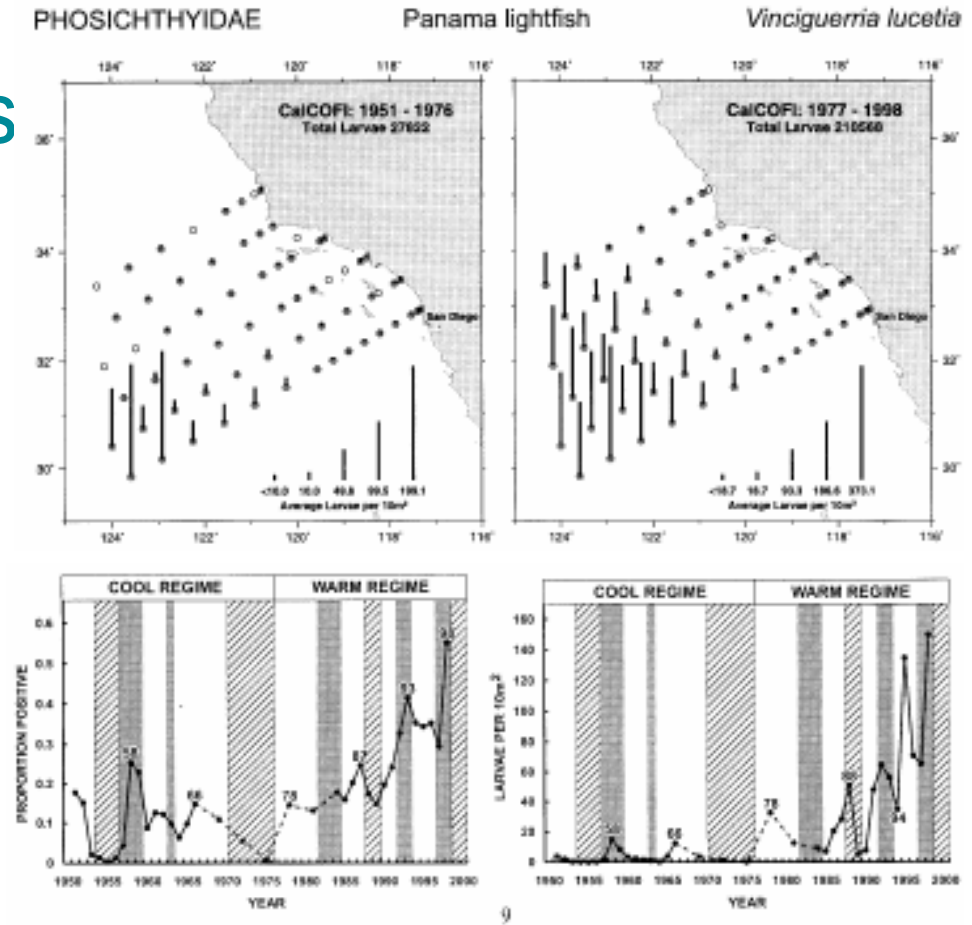


Venrick, E.L., 2000. J Plankton Res 22:813-841

Larval Fish Distributions

This has large effects on fish distributions

Panama lightfish,
Vinciguerria lucetia

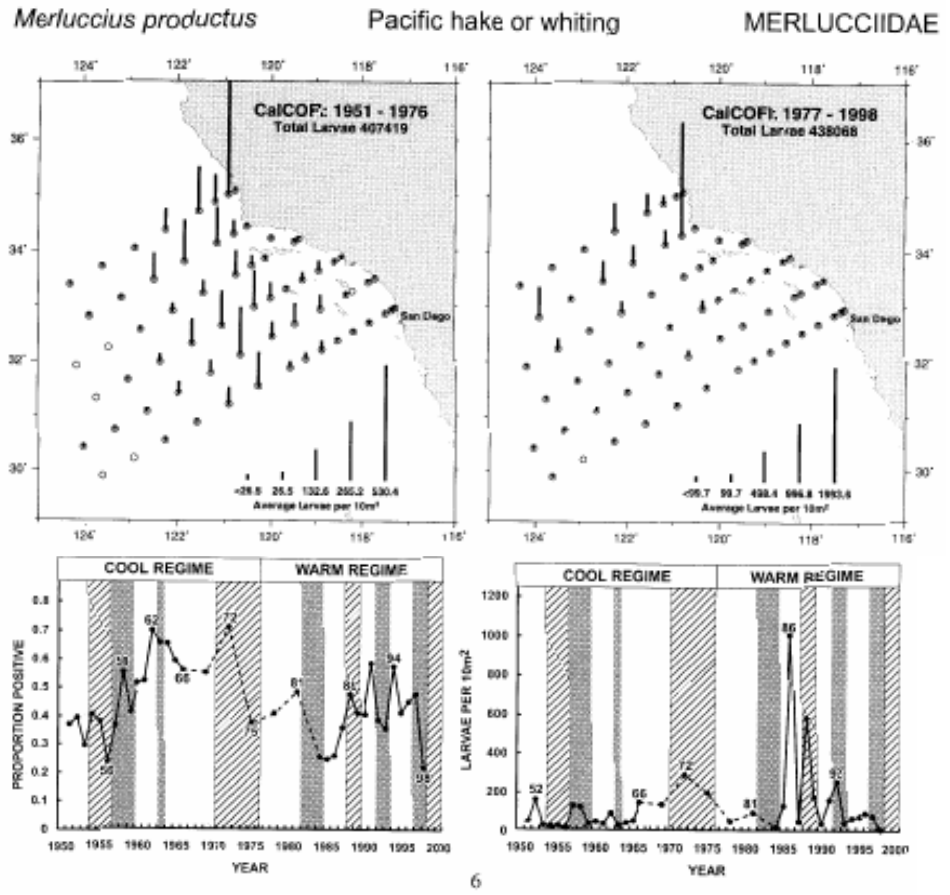


Moser et al. 2001. CalCOFI Atlas No. 34

Larval Fish Distributions

This has large effects on fish distributions

Pacific hake, *Merluccius productus*

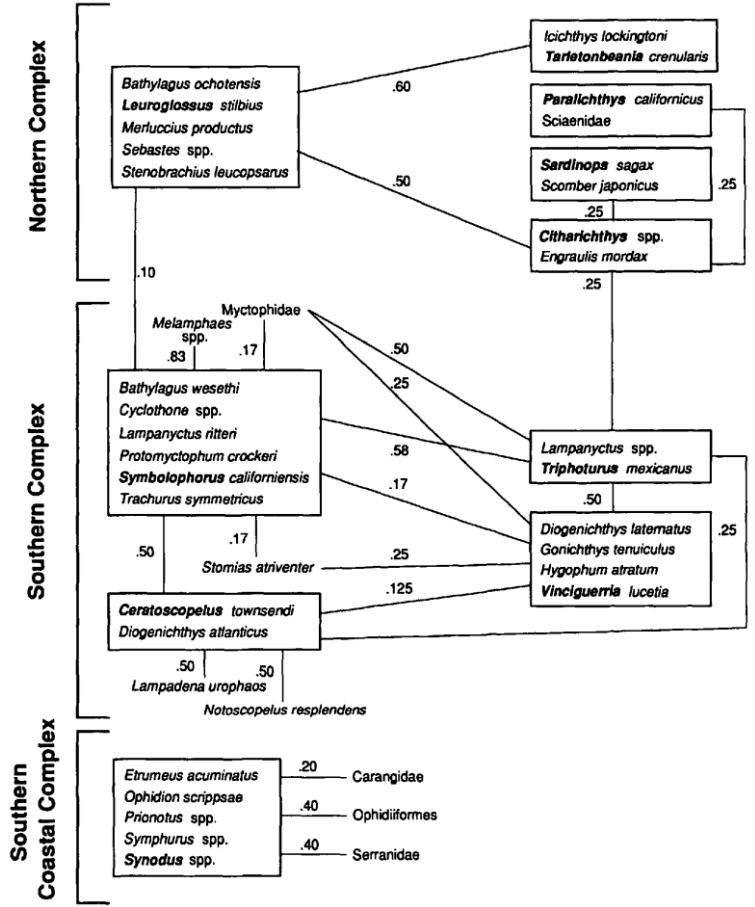


Moser et al. 2001. CalCOFI Atlas No. 34

Larval Fish Distributions

Distinct fish communities are associated with cooler/warmer water

Also See:
Hsieh et al. 2009. Glob Change Bio 15:2137:2152
Thompson et al. 2014. Mar Ecol Prog Ser 506:193-212



Moser G.M and Smith, P.E. 1993. Bull Mar Sci 53:645-691

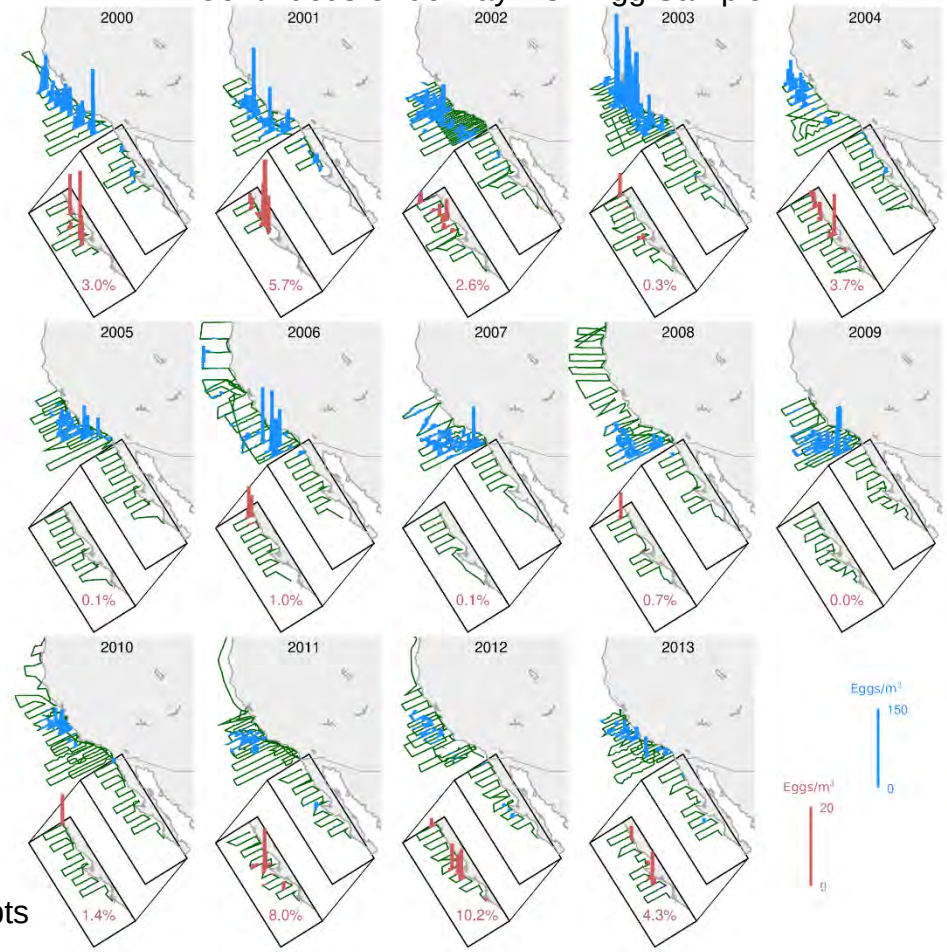
Commercially Exploited Fish

The transition zone may have important effects on Pacific sardine, *Sardinops sagax*

and Pacific mackerel, *Scomber japonicus* populations

Commercially Exploited Fish

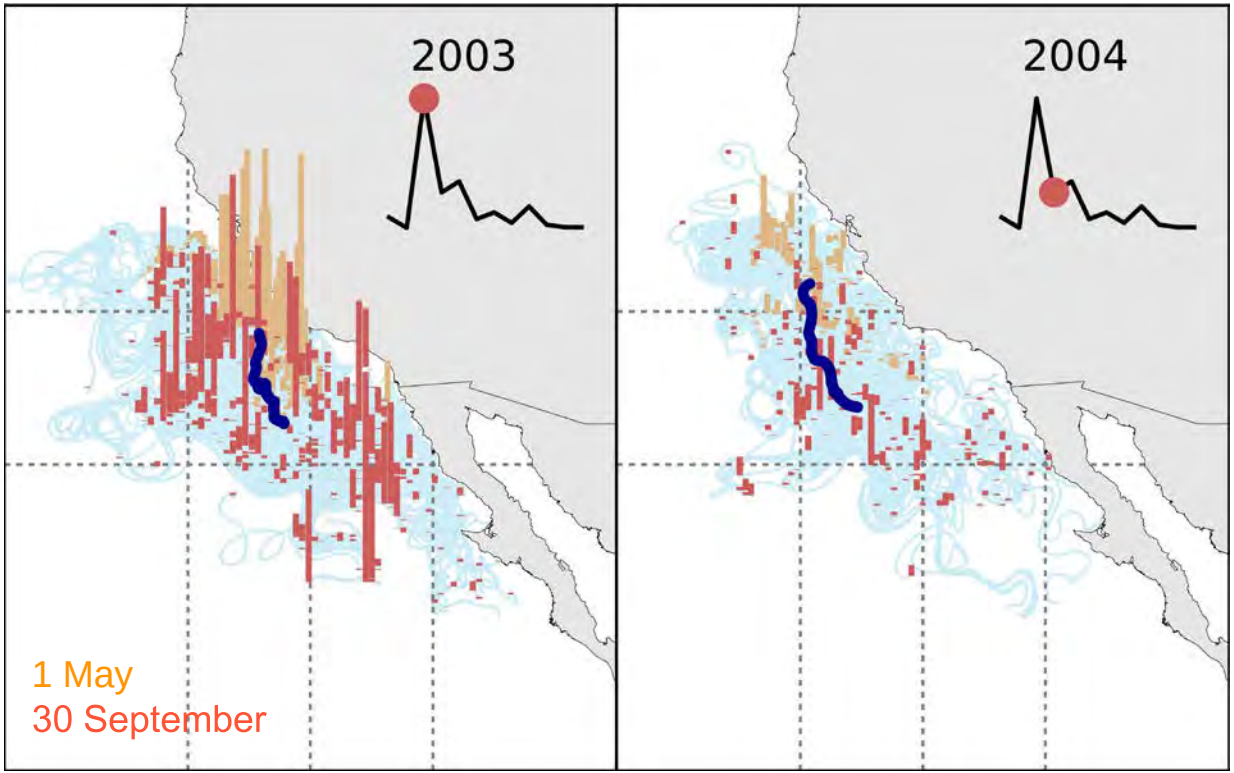
Pacific sardine from the northern subpopulation spawn primarily in the northern portion of the transition zone



Valencia-Gasti et al. In Press. CalCOFI Repts

Commercially Exploited Fish

However, circulation models suggest larvae cross the transition zone

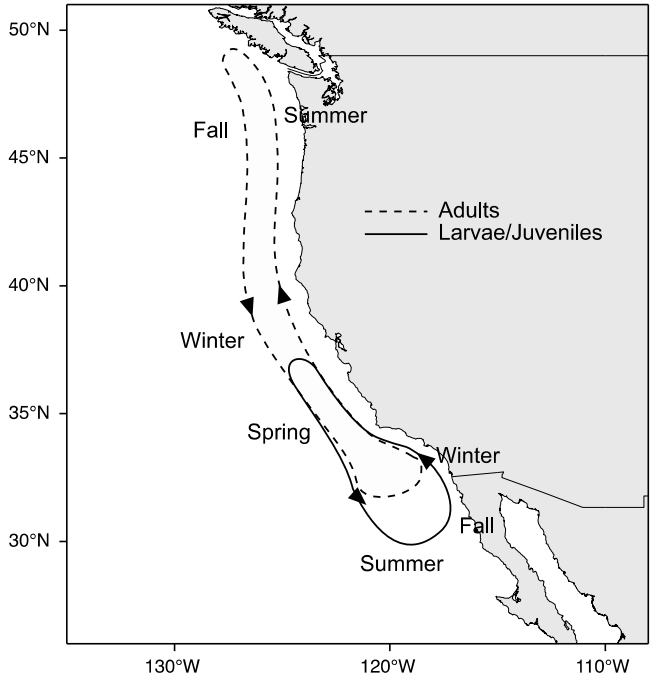


Weber et al. 2015. Deep-Sea Res I 100:127-139

Commercially Exploited Fish

We hypothesize they return northward across the transition zone in the nearshore

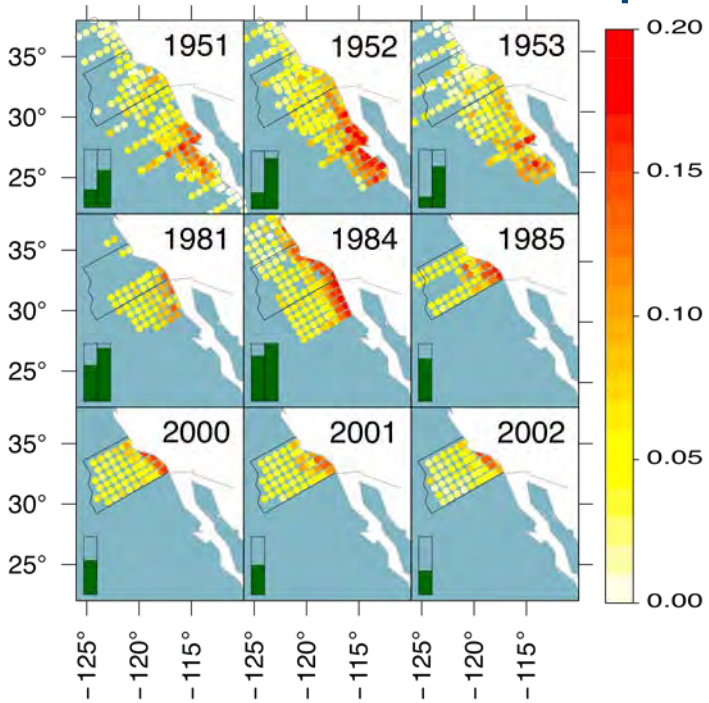
An opportunity to estimate recruitment?



Weber et al. 2015. Deep-Sea Res I 100:127-139

Commercially Exploited Fish

Pacific mackerel span the transition zone and exhibit great interannual variability

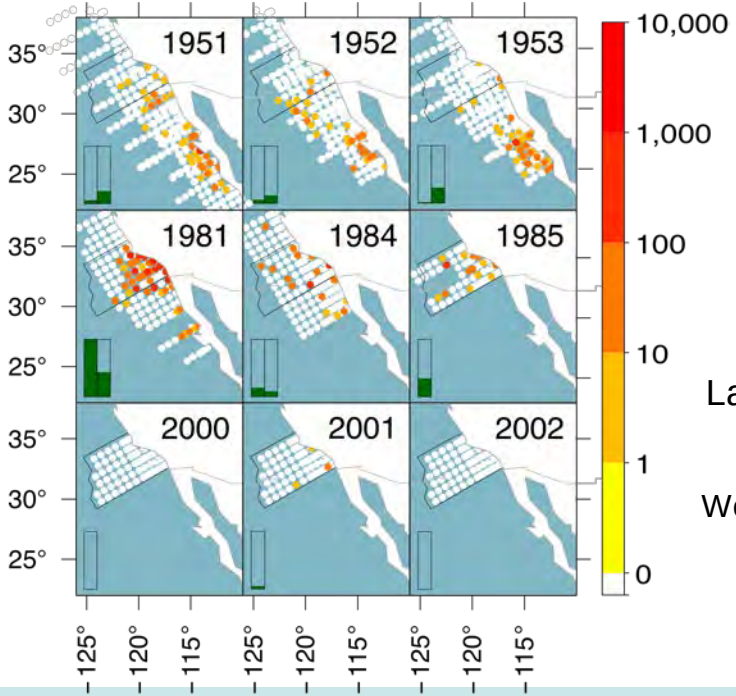


Predicted probability of capture
~ Habitat quality

Weber and McClatchie. 2012. Fish Bull 110:85-97

Commercially Exploited Fish

So combining data from the Mexican and U.S. EEZs is particularly important for understanding Pacific mackerel dynamics



Larval densities

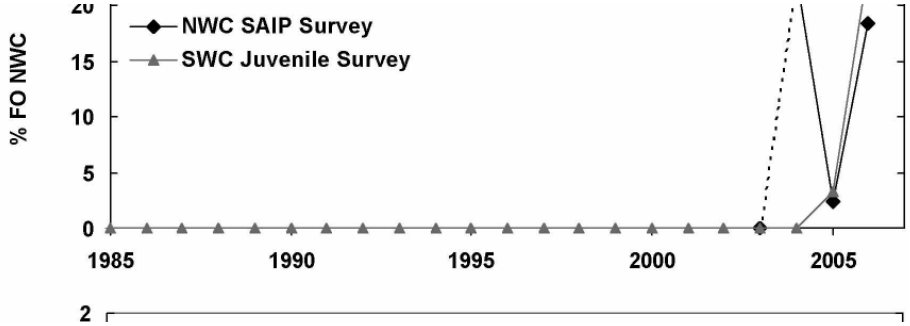
Weber and McClatchie. 2012. Fish Bull 110:85-97

Also see:
Lo et al. 2010. Ciencia Pesquera 18:59-75

Episodic Range Expansions

Pulses across the transition zone during some El Niño events result in large range changes for some species

Humboldt squid, *Dosidicus gigas*



Field et al. 2008. CalCOFI Rep 49:79-81

Episodic Range Expansions

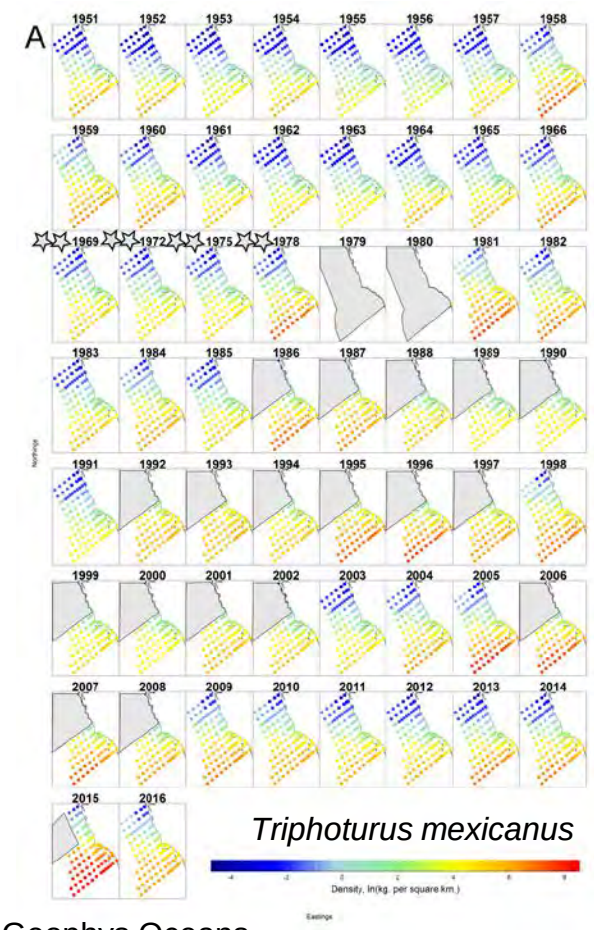
Pulses across the transition zone during some El Niño events result in large range changes for some species

Tuna crabs, *Galatheidae*
"marine heat wave" 2015

https://scripps.ucsd.edu/news/red-crabs-invade-san-diego-shores

Possible long-term trends

A long-term increase in abundance of warm-water meso-pelagic fish in the southern California Current may be occurring



McClatchie et al. In Review. J Geophys Oceans

Conclusions

- Variability in the Ensenada Front transition zone has large effects on the fish community off southern California, U.S.A.
- Decadal, interannual, and seasonal variability in the biology and environment of the transition zone are poorly documented
- Greater collaboration between Mexican and U.S. scientists is needed