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

Edward D. Weber and Sam McClatchie
NOAA Southwest Fisheries Science Center
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
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.
Larval Fish Distributions

This has large effects on fish distributions

Panama lightfish, *Vinciguerra 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:

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

Commercially Exploited Fish

However, circulation models suggest larvae cross the transition zone.
Commercially Exploited Fish

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

An opportunity to estimate recruitment?

Pacific mackerel span the transition zone and exhibit great interannual variability.

Commercially Exploited Fish

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

Larval densities


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*

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