Distribution of Pacific Sardine Spawning between U.S. and Mexico from 2000 to 2013

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Pacific sardine stocks and their seasonal movements based on commercial landings (Felix-Uraga et al. 2004)

Conceptual model of stock movements and their relationship to temperatures
Cumulative landings of the Pacific Sardine in the California Current System

MÉXICO

EUA

CANADA

Félix-Uraga 2015 (IN PRESS)
Landings of Temperate and Cool stocks in Ensenada and San Pedro fishery, 1981-2012

SAN PEDRO

428,947 t
64.4%

236,722 t
35.6%

ENSÉNADA

784,762 t
67.5%

377,938 t
32.5%

(Félix-Uraga 2015, IN PRESS)
Outline of presentation

❖ The Pacific sardine
  a. Commercial landings and stocks
  b. Seasonal spawning off Baja California
  c. Interannual variability of spawning off California and Baja California

❖ Question?

What is the proportions of spawning that occurred within waters of Mexican and U.S. Exclusive Economic Zones (EEZ)?
Sardina *Sardinops sagax*

Landings report by Ensenada fleet:
Stocks: Cool + Temperate

Period of declining landings in California
Seasonal pattern of sardine landings and sea surface temperature (SST)

Average SST (1997-2004)

Subarctic waters

Subtropical waters

Landings from Ensenada (1990-2015)
Changes in Ensenada landings from [1990-2015]

1er semester → Cool Stock
2do semester → Temperate Stock

Landings in the first Semester

Landings in the second semester

Line 1:1
Biological evidence for shift in stocks from landings

1). Length–weight relationship from monthly samples of landings at Ensenada, January through November 2002

April, 2002
2). Timing of reproduction of the different stocks

Outside of the fishing zone

Monthly sampling by the fleet
Cufes IMECOCAL (México)+CalCOFI (US)
Larvae in 2.5-4 days = advection is limited (<150 km)

Diam: 1.3–2.1 mm
Diam GA: 0.12-0.19 mm
3). The spawning habitats of the different stocks can be differentiated by salinity and temperature.
4). Distribution and abundance of spring spawning of sardine eggs in the CALCOFI and the IMECOCAL from 2000 through 2013
Conclusions

• Commercial captures in Ensenada port are dominated by temperate stock.
• The cool stock spawns primarily in the U.S waters.
• A fraction ranging from 0% to 10% of all eggs captured occurred in the Mexican waters, usually from Punta Eugenia north to the border.
• It is unknown whether the relatively large proportion of eggs captured in Mexican coastal waters during 2011 and 2012 was due to movement of sardines into Mexican waters or increased production in the coastal area off Bahia Magdalena.
• It is also probably the temperate stock spawning out of their peak season.
Thanks!