The spring spawning habitats of small pelagic fish in northwestern Mexico

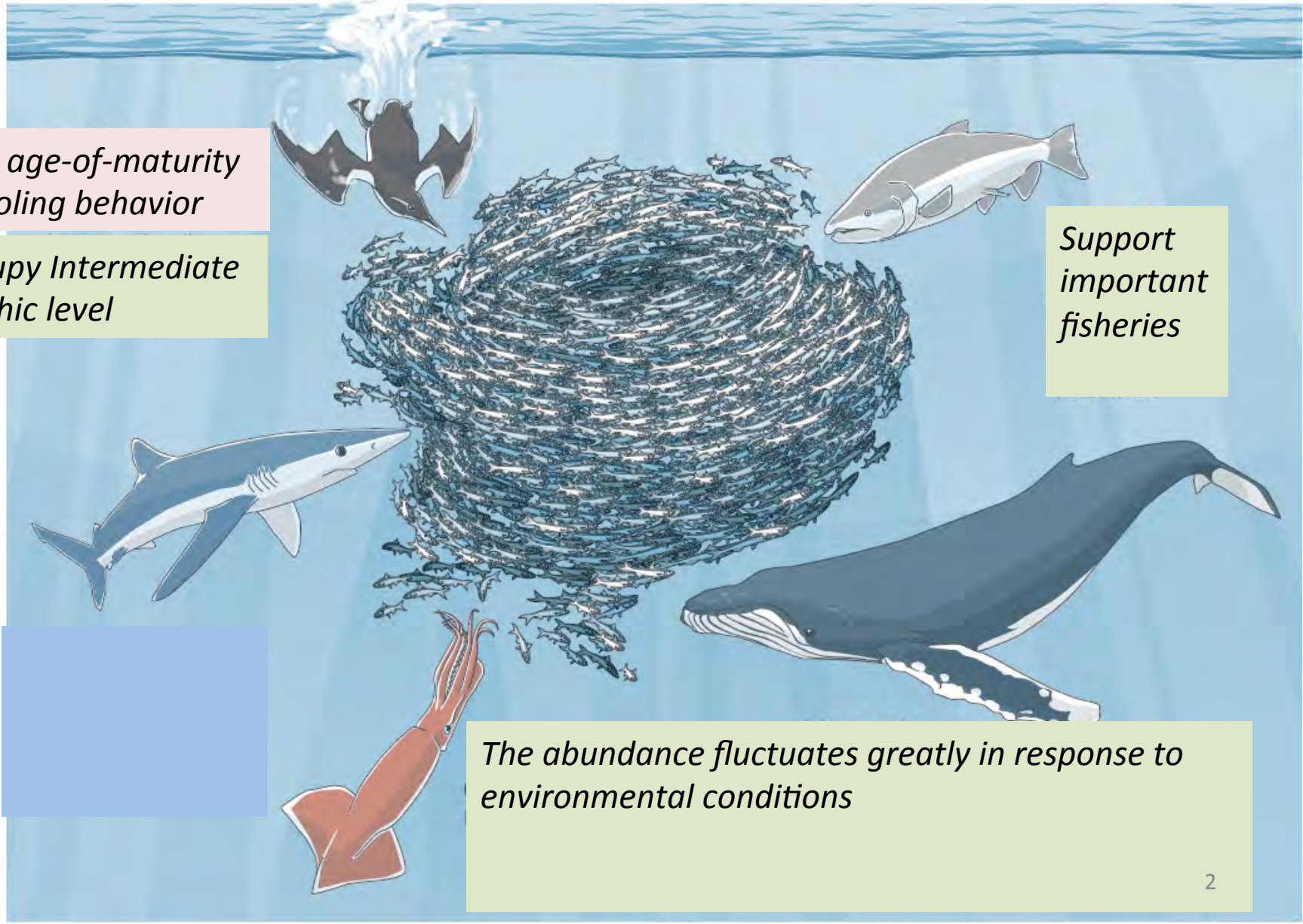
Jose A. Valencia and Timothy Baumgartner

Centro de Investigación Científica y Educación Superior de Ensenada, Ensenada, Mexico

E-mail: augusto.valencia@uabc.edu.mx

San Diego, C.A. – November 10, 2016

The small pelagic fishes are important for



Early age-of-maturity
Schooling behavior

Occupy Intermediate trophic level

Support important fisheries

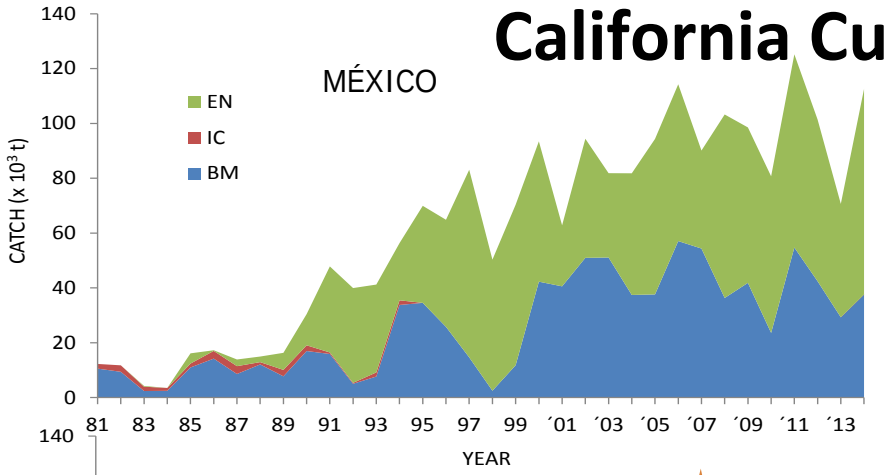
The abundance fluctuates greatly in response to environmental conditions

Outline *of presentation*

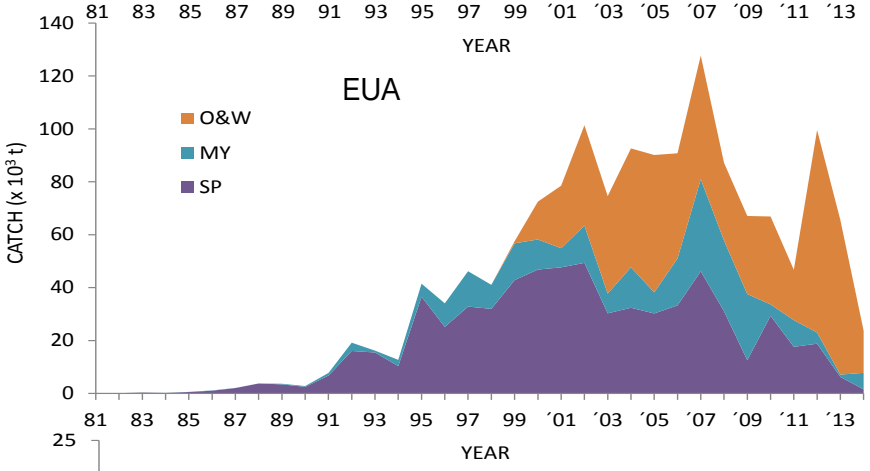
- **The Pacific sardine**
  a. Commercial landings and stocks
  b. Seasonal spawning off Baja California
  c. Interannual varibility of spawning off California and Baja California

- Efects of climate forcing on the spawning habitat of Pacific sardine, northern anchovy and Jack mackerel
  a. Interannual variability in wind stress
  b. Changes in distribution of spawning areas of the three species

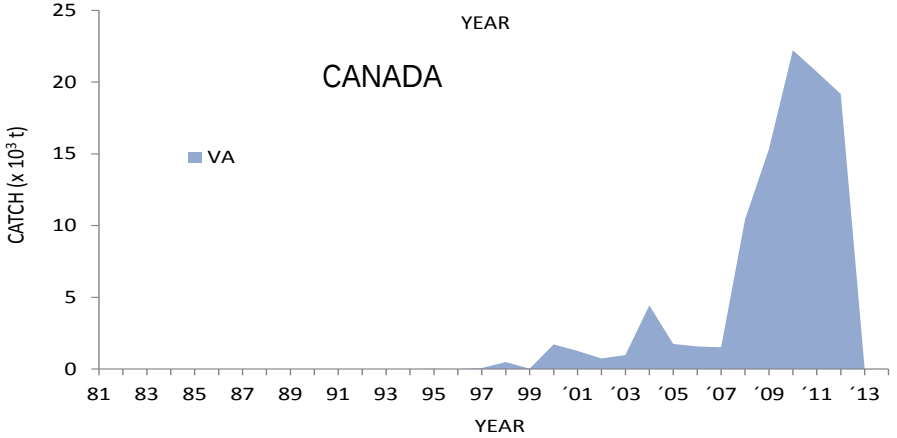
Cumulative landings of the Pacific Sardine in the California Current System



174,299 t

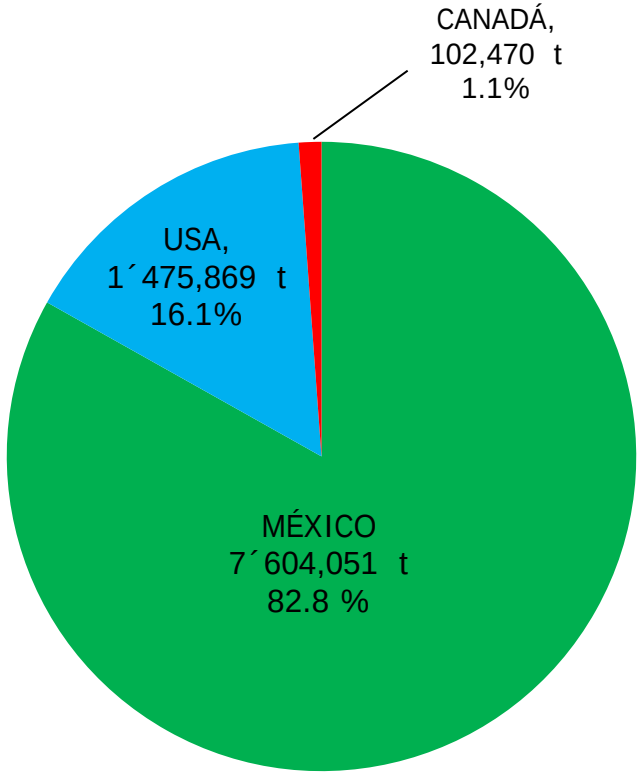


23,697 t



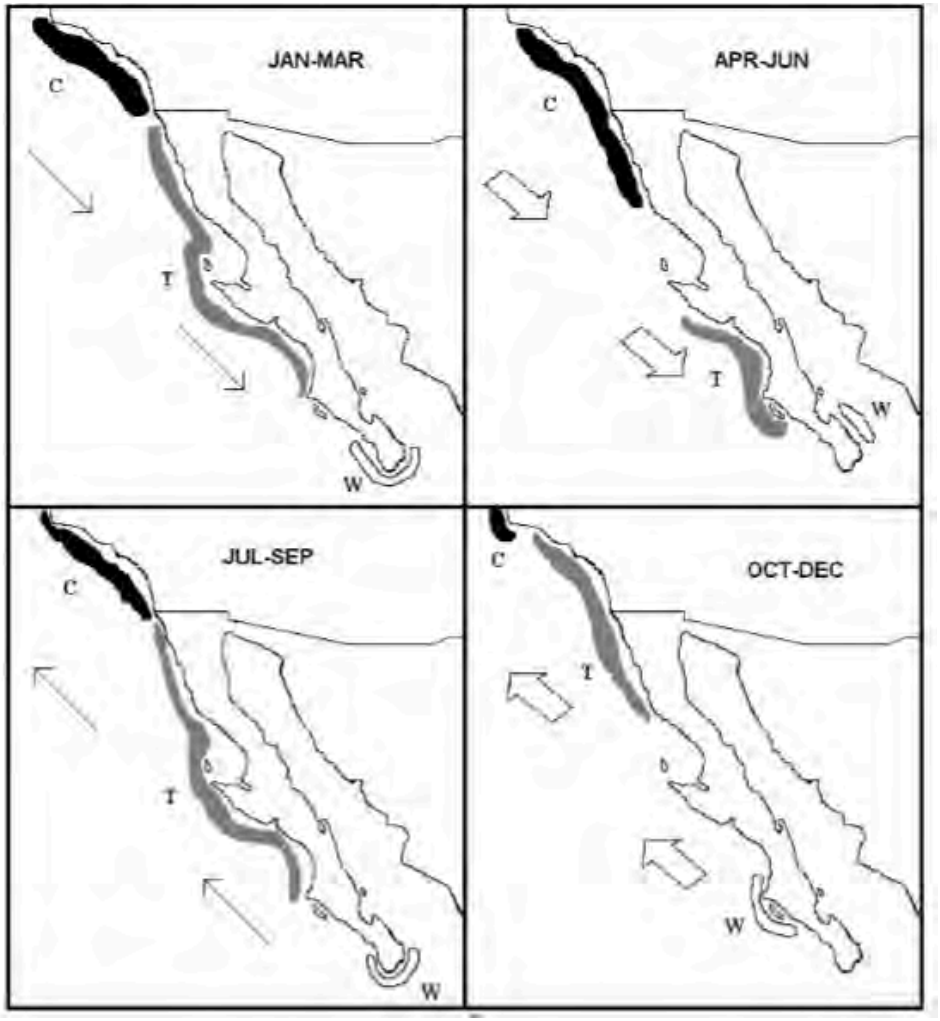
0,0 t

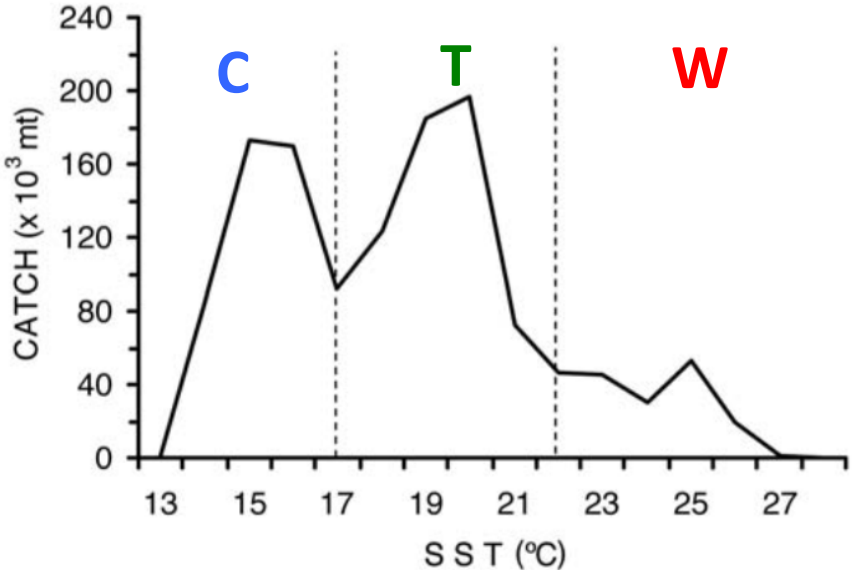
2014



Félix-Uraga 2015 (*IN PRESS*)

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



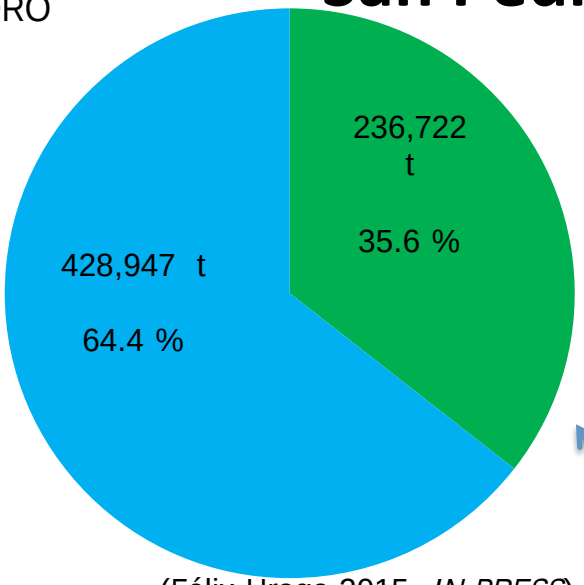


Conceptual model of stock movements and their relationship to temperatures

Fisheries-derived information is biased by the operational scale

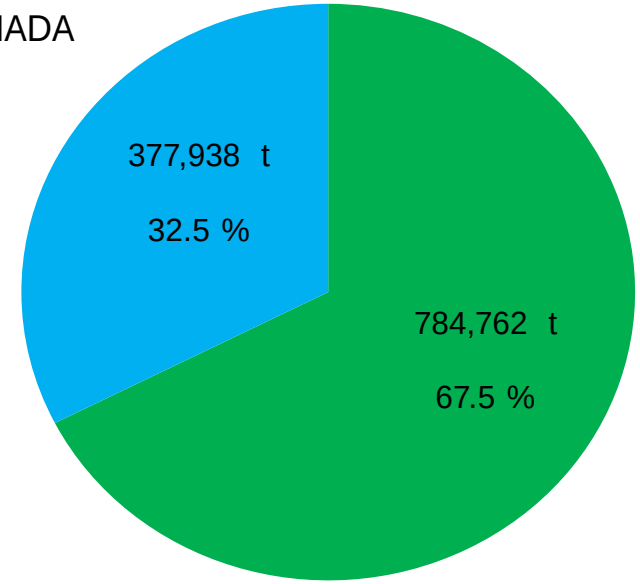
Landings of Temperate and Cool stocks in Ensenada and San Pedro fishery, 1981-2012

SAN PEDRO



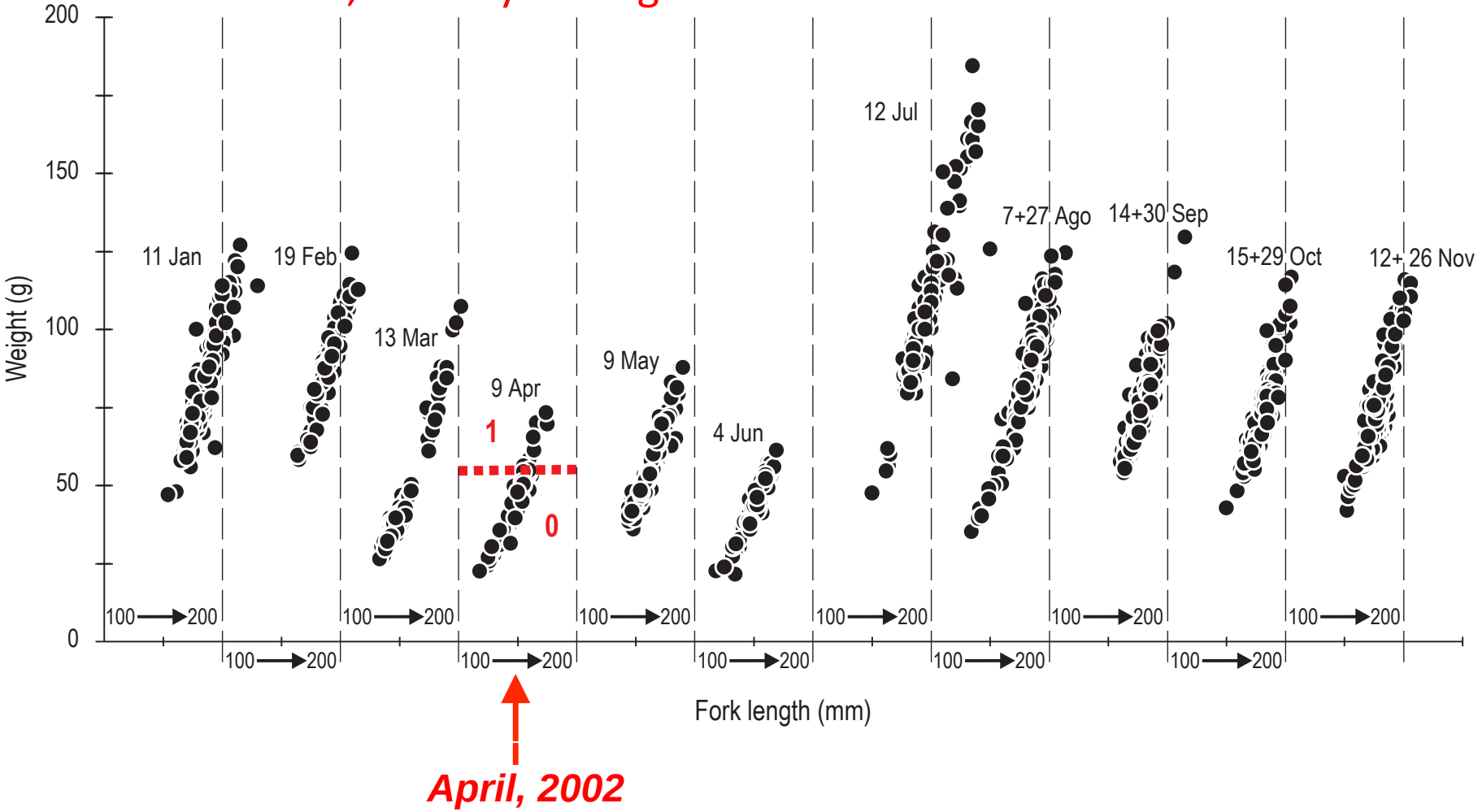
(Félix-Uraga 2015, *IN PRESS*)

ENSENADA

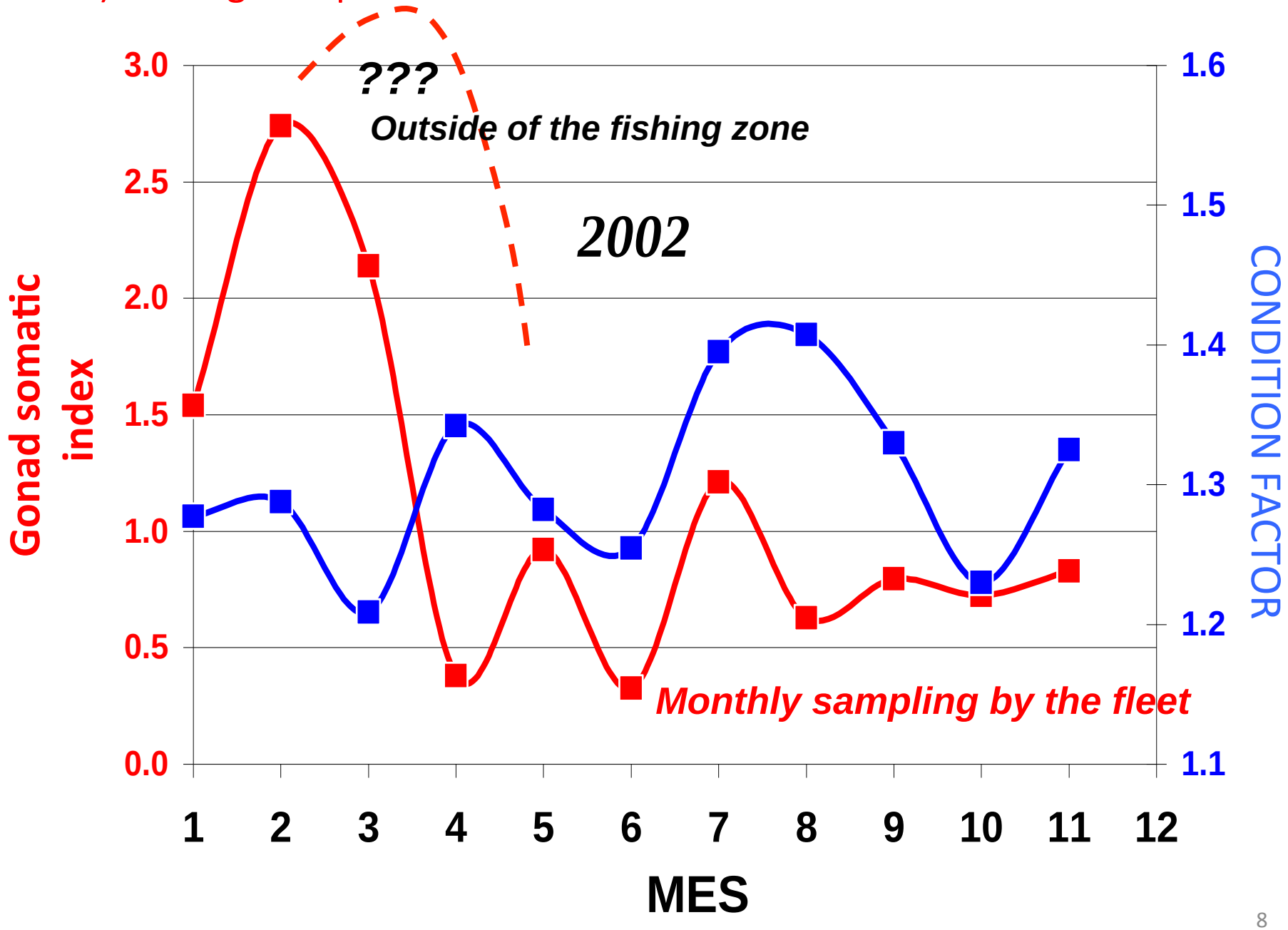


Biological evidence for shift in stocks from landings

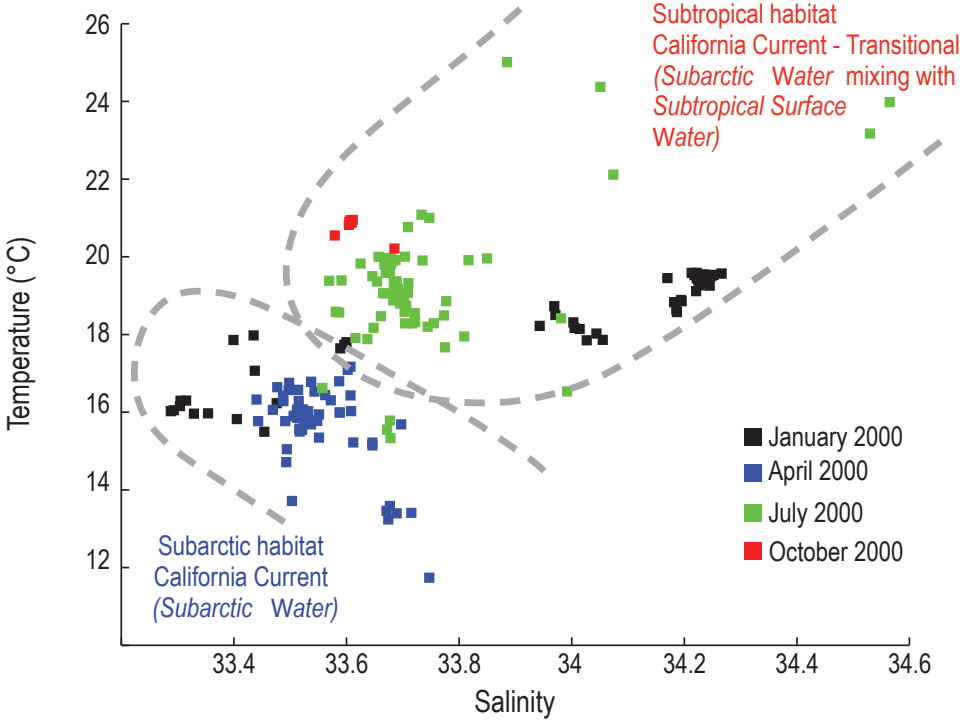
1). Length–weight relationship from monthly samples of landings at Ensenada, January through November 2002

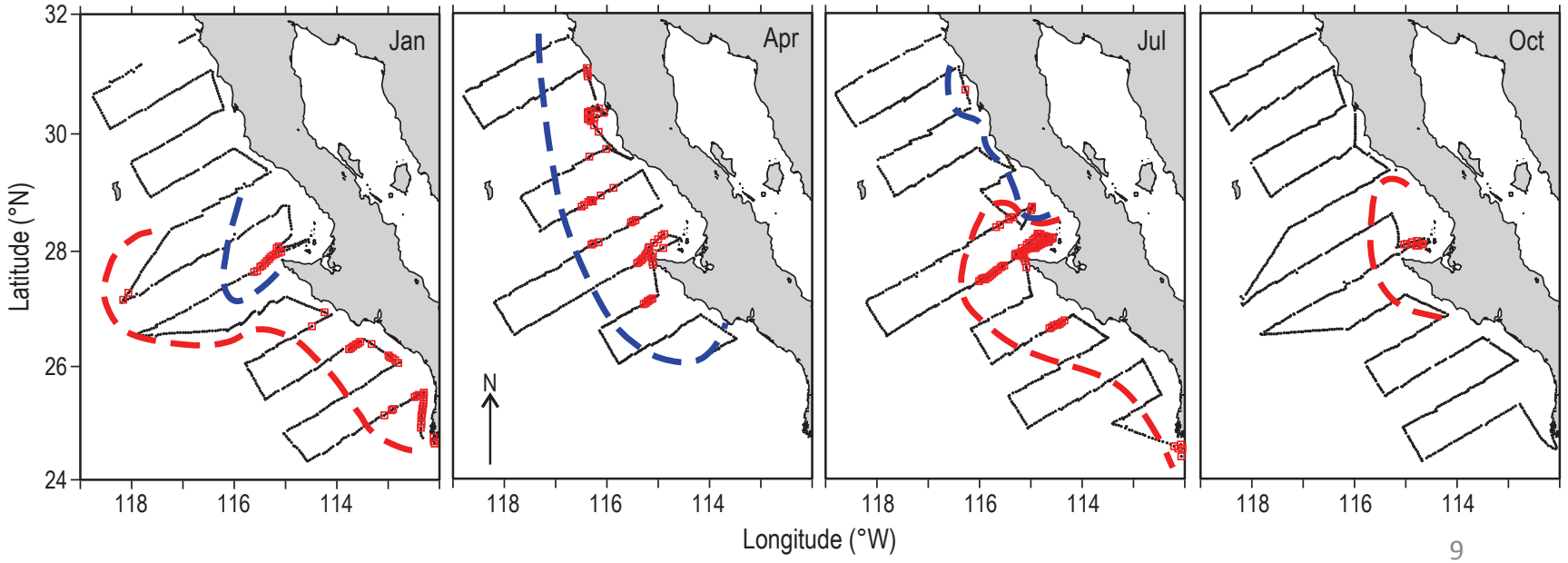


2). Timing of reproduction of the different stocks

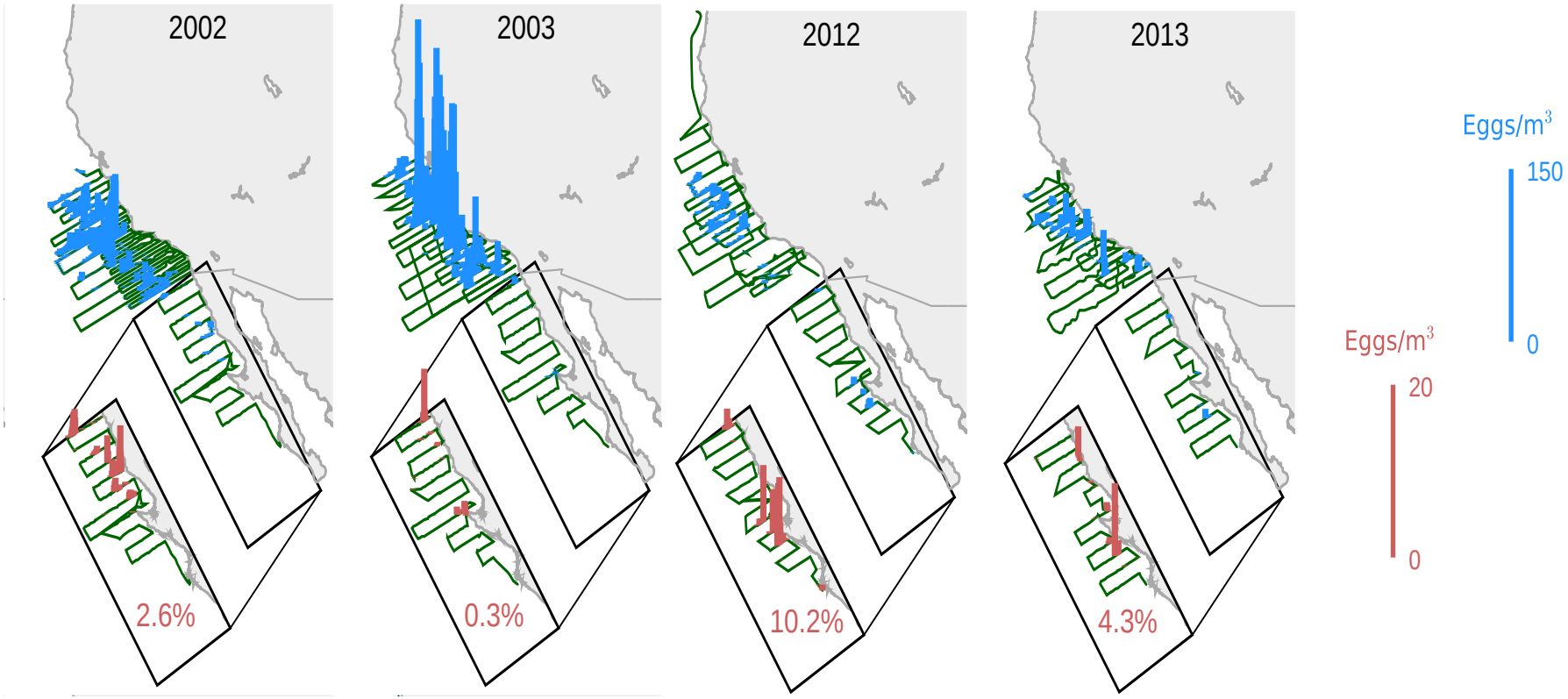


3). The spawning habitats of the different stocks can be differentiated by salinity and temperature.





Spring spawning distribution of Pacific sardine joint research programs: IMECOCAL (Mexico) and CalCOFI (US)

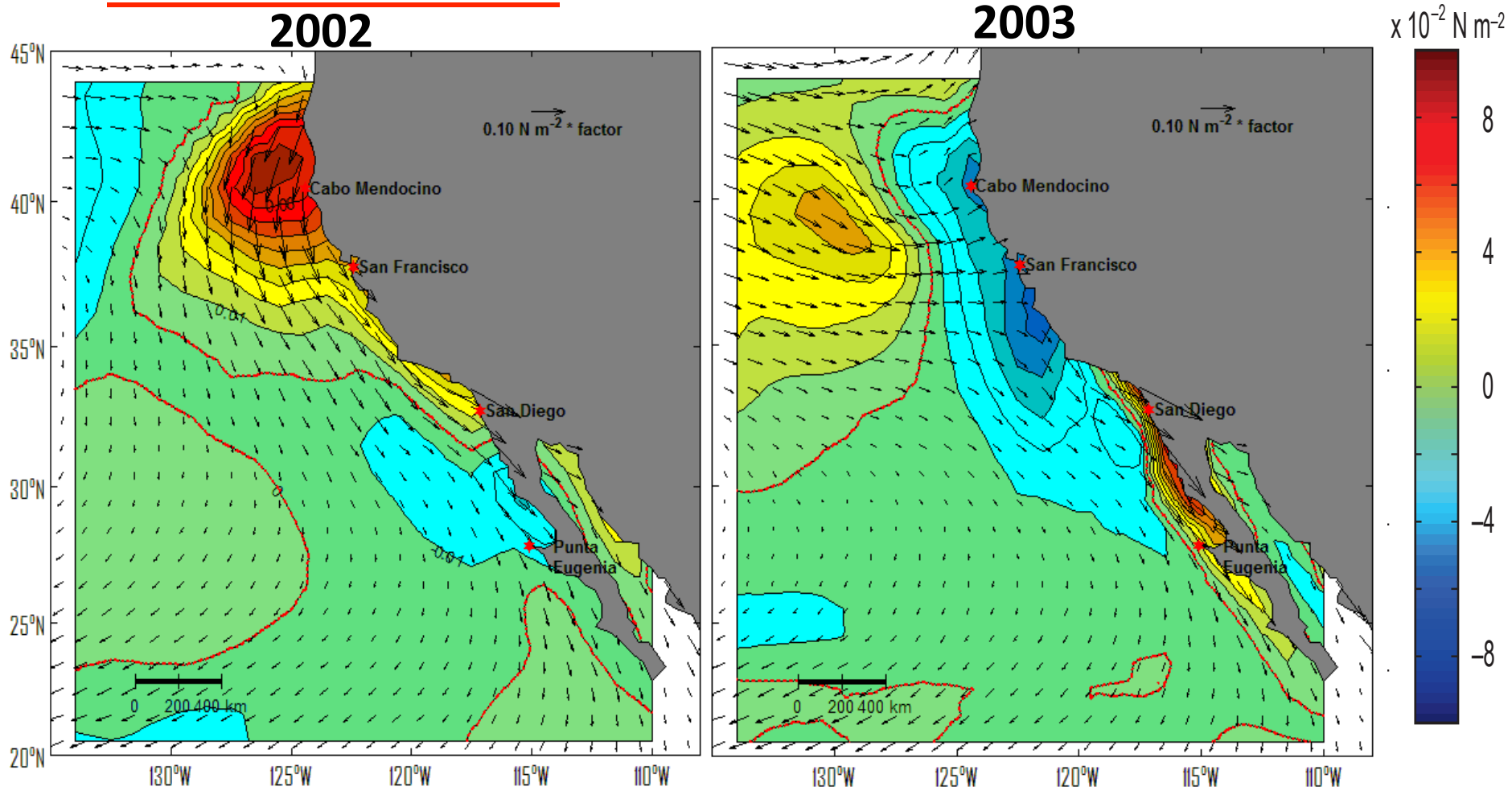


- Percentages are the percent of total spawning habitat in the IMECOCAL sampling area
- Baja California waters are marginal habitat for spawning sardines compared to region off California

Climate forcing on the spawning habitat by wind stress differences from 2000-2005 climatology:

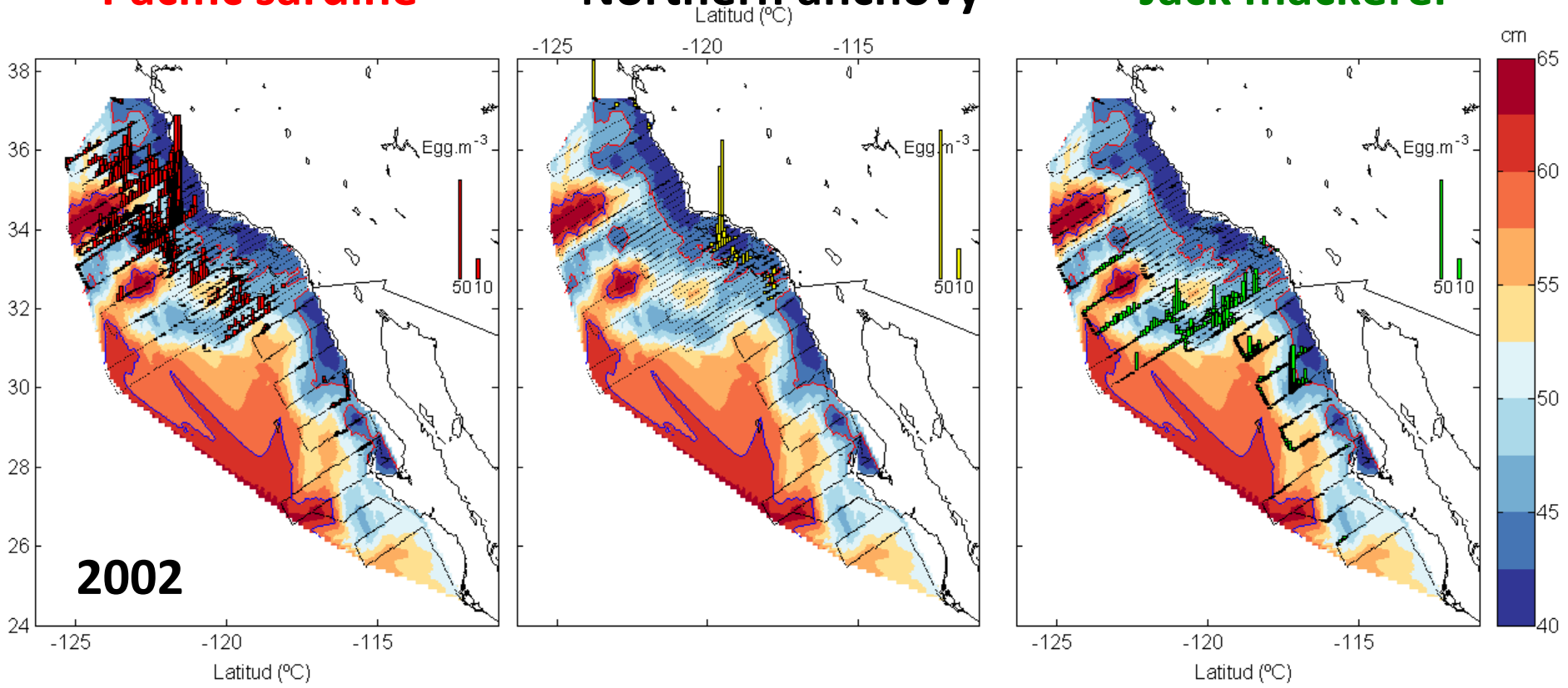
Blue: winds weakened

Red: winds increased

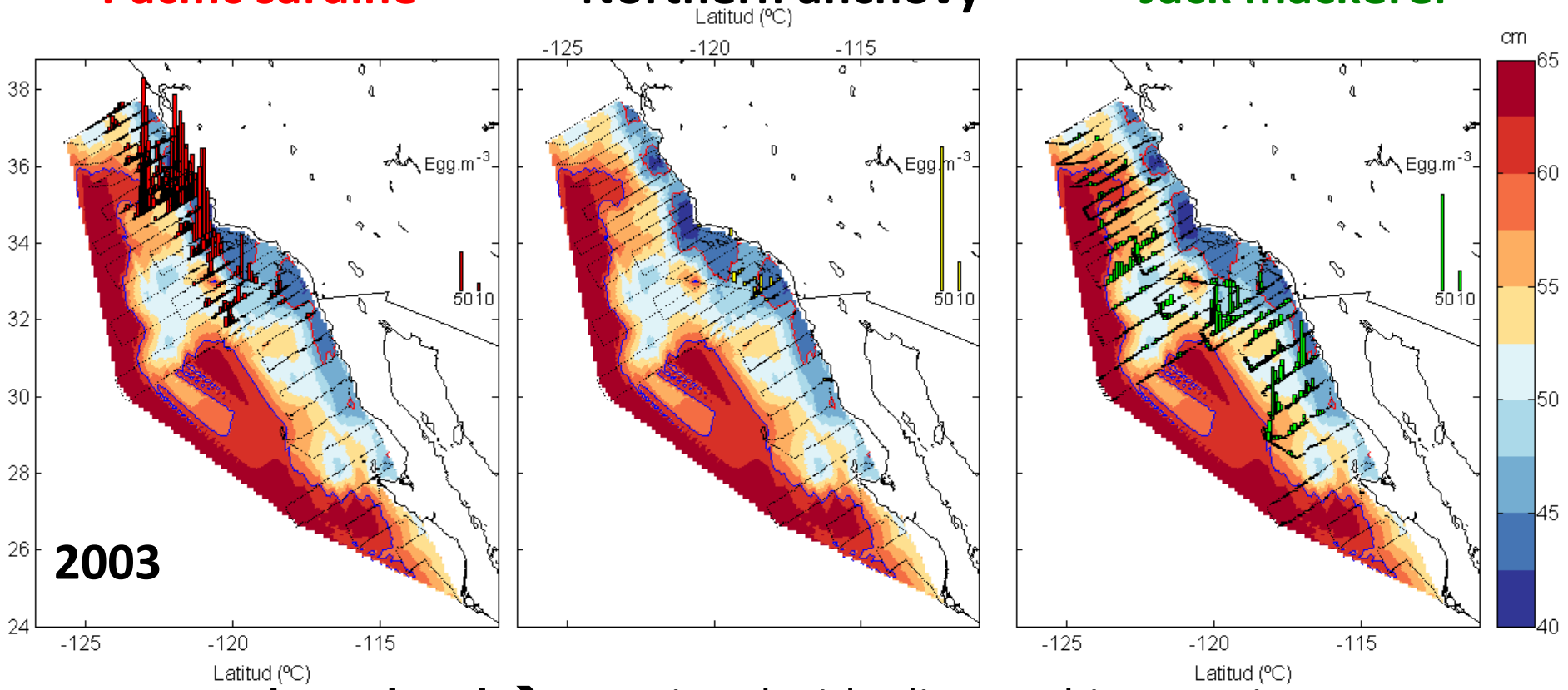


Dynamic topography as indicator of spawning habitat selection by species

Pacific sardine | **Northern anchovy** | **Jack mackerel**



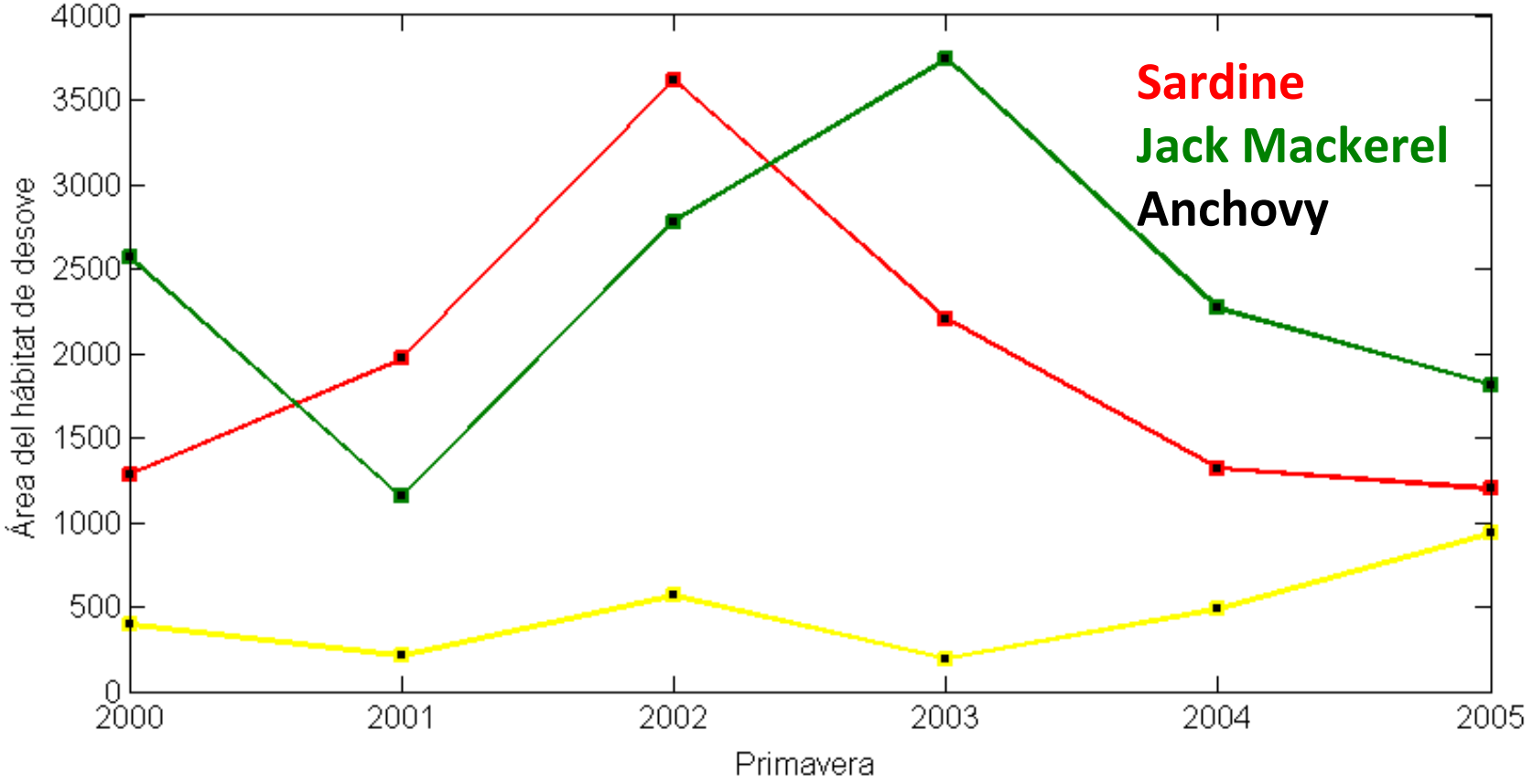
- Sardine ➔ greatest extension of the latitudinal spawning habitat
- Anchovy ➔ spawning in waters off southern California Bight with less egg density compared to the other two species



- **Jack mackerel** ➔ associated with oligotrophic oceanic environments compared to other small pelagic species.

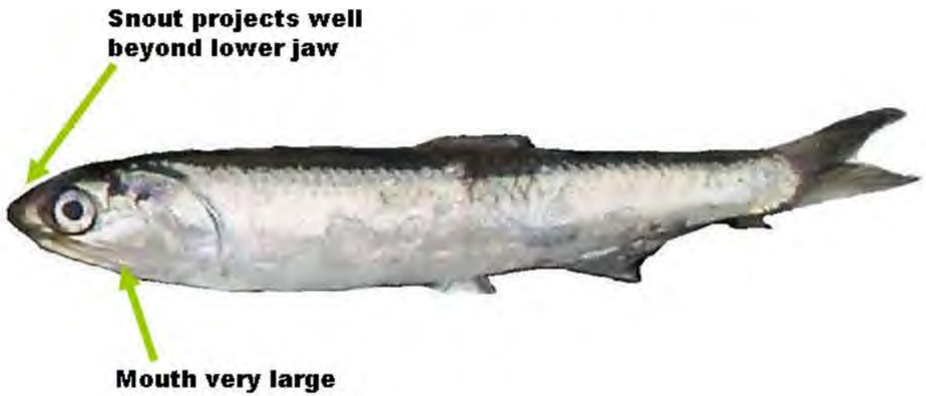
Warming conditions compressed the oceanic environmental towards the coast resulting in more stability of the water column; more favorable for the reproductive success of the J. mackerel and consequent reduction for anchovy and sardine habitat off Baja California

Interannual variability in spawning area

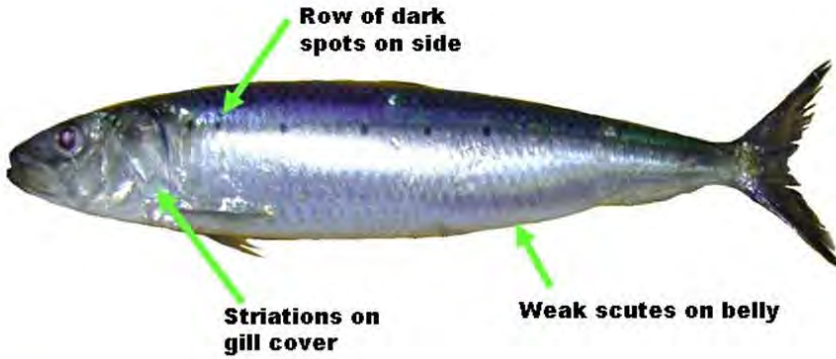


- More spawning area for anchovy (2005) – Jack mackerel (2003)

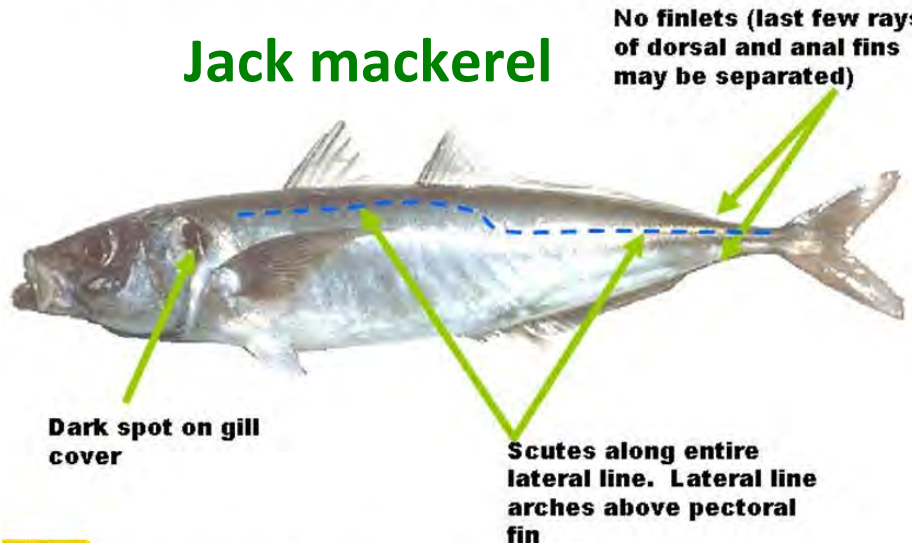
Northern anchovy



Pacific sardine

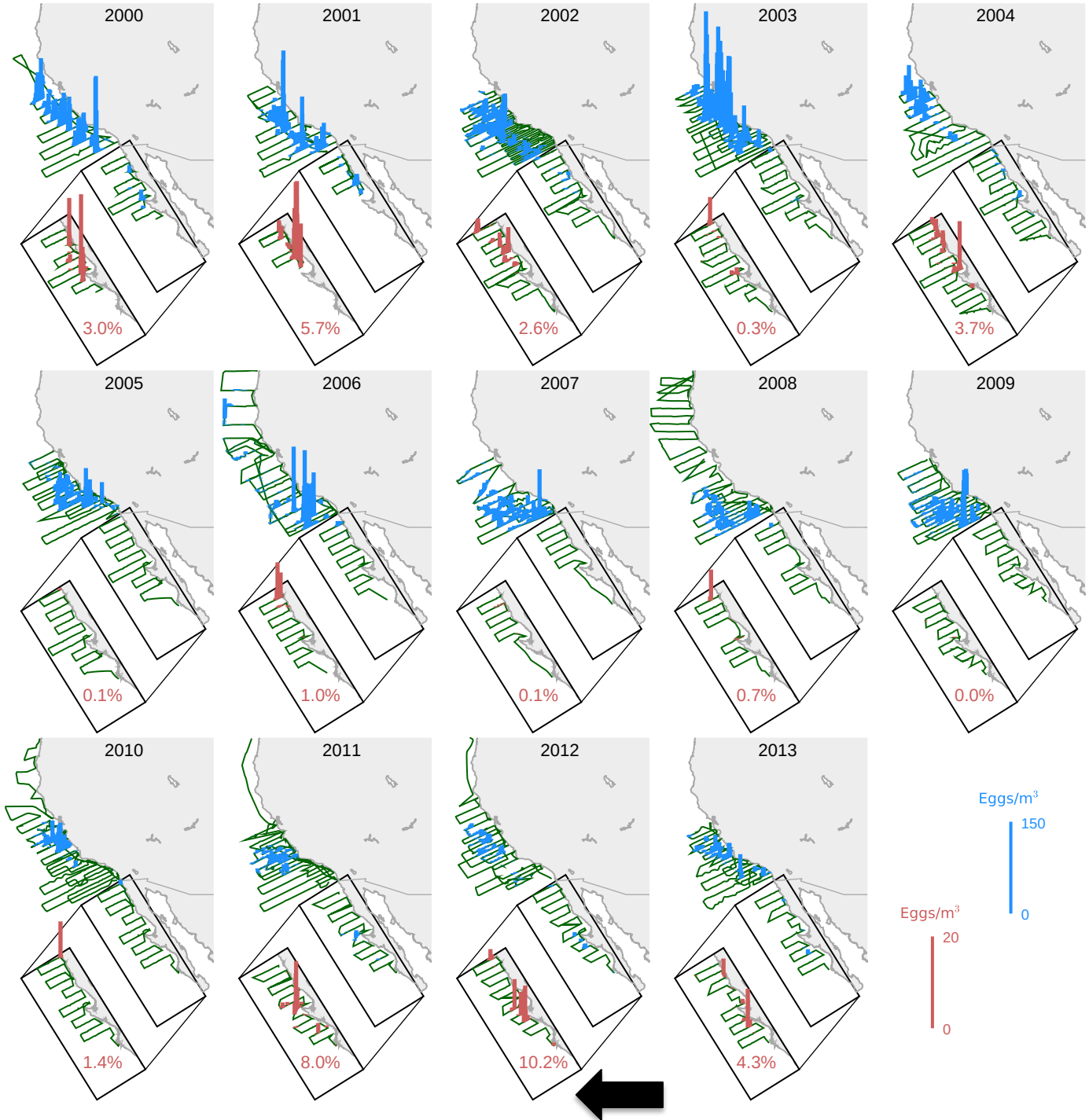


Jack mackerel



www.dfw.state.or.us

Thanks!



- Proporción indica la fracción de huevos totales en México
- Desove en parches últimos años