

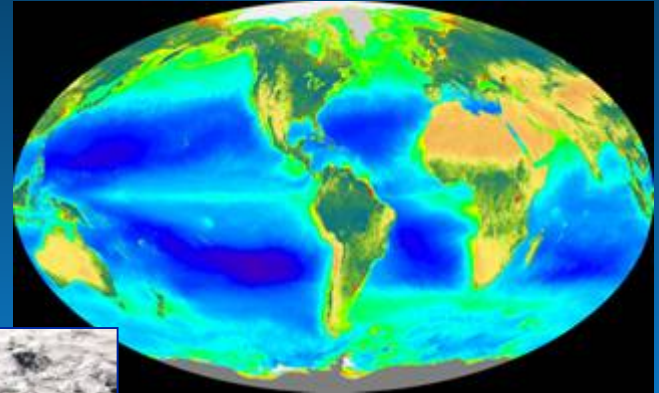


Tagging of Pacific Pelagics: Using Electronic tags to discover Hotspots in the Pelagic Realm

D. Costa, B. Block, S. Bograd, R. Kochevar and the TOPP Team



www.toppcensus.org
Acta Oceanographica



TOPP Team of Organismal Biologists

Cetaceans

Bruce Mate, Don Croll, John Calambokidis, Jim Harvey and Jorge Urbán

Seabirds

Scott Shaffer, Yann Tremblay, Bill Henry, Henri Weimerskirch, Dave Anderson, Peter Hodum, Jill Awkerman, Michelle Wainstein, Julia Parrish & Don Croll

Pinnipeds

Daniel Costa, Dan Crocker, Burney Le Boeuf, Juan Pablo-Gallo Jim Harvey, Mike Weise, Mike Fedak & Robert DeLong

Sea Turtles

Scott Bensen, Peter Dutton, Scott Eckert, Steve Morreale, Frank Paladino, Jeff Polovina, Laura Sarti & James Spotila

Sharks

Dave Holts, Oscar Sosa, Barbara Block, Peter Pyle, Ken Goldman, Peter Klimley, John O' Sullivan, Kevin Weng, Suzanne Kohin & Heidi Dewar

Tuna

Barbara Block, Kurt Schafer, John Childress, Heidi Dewar, Kevin Weng, Steve Teo, Chuck Farwell & Dan Fuller

New Technology for Tracking Large Pelagics

Electronic Tags



- Archival Tags
- Satellite Tags
- Pop-Up Satellite Tags
- Remote Sensing



Measures of Animal Distribution & Abundance

- Surveys

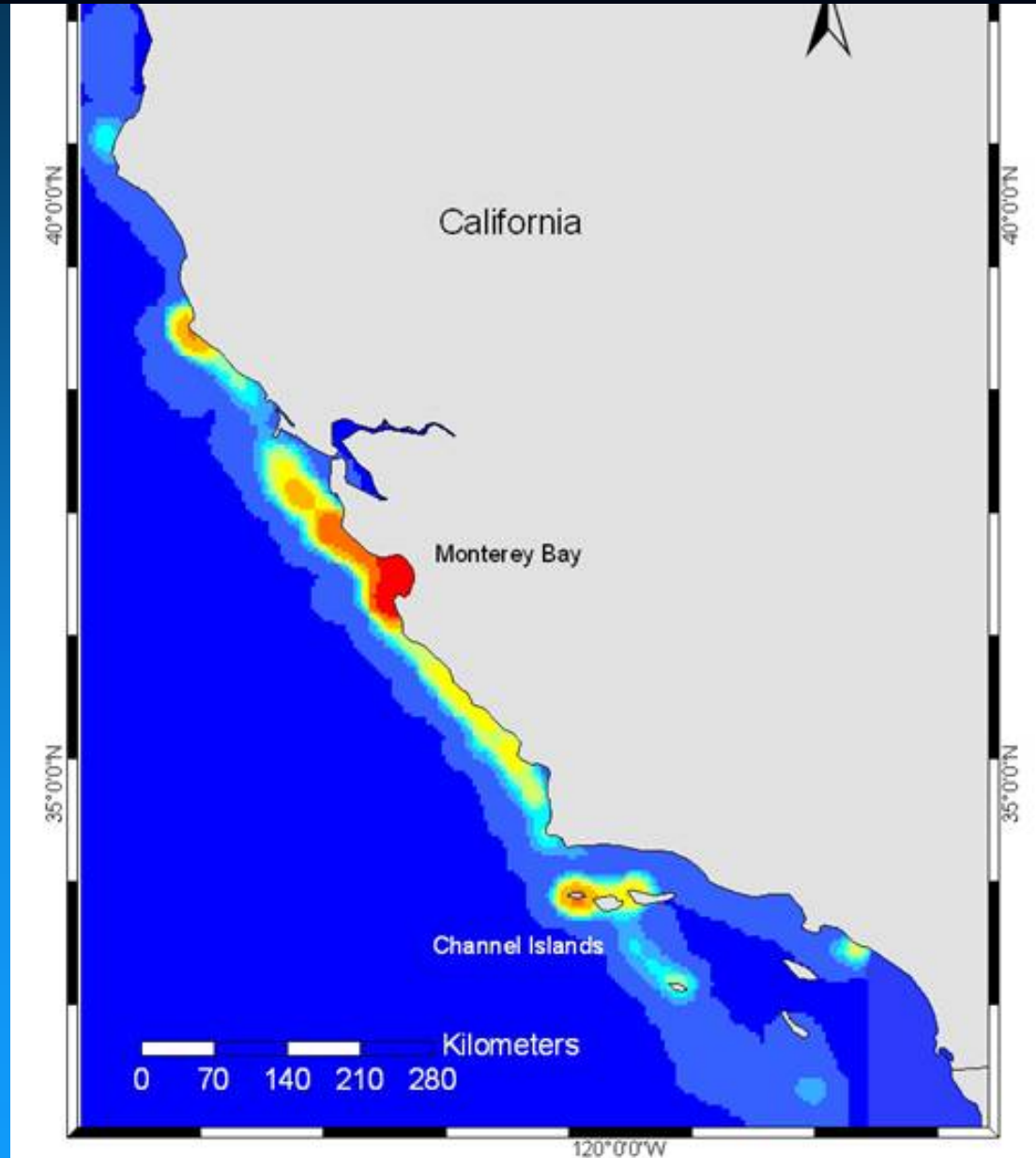
- Can sample hard to study species
- Environmental data
 - » Physical environment
 - CTD, Chlorophyll
- Snapshot
- Only know about area surveyed
 - » Biased measure of range
- Sample bias
 - » Animal behavior

- Tag derived data

- Long time series
- Animal Behavior
 - » Dive pattern
 - » Animal movements
 - » Home range
 - » Habitat utilization
- Environmental data
 - » Physical environment
 - CTD, Chlorophyll
- Must be able to tag animal

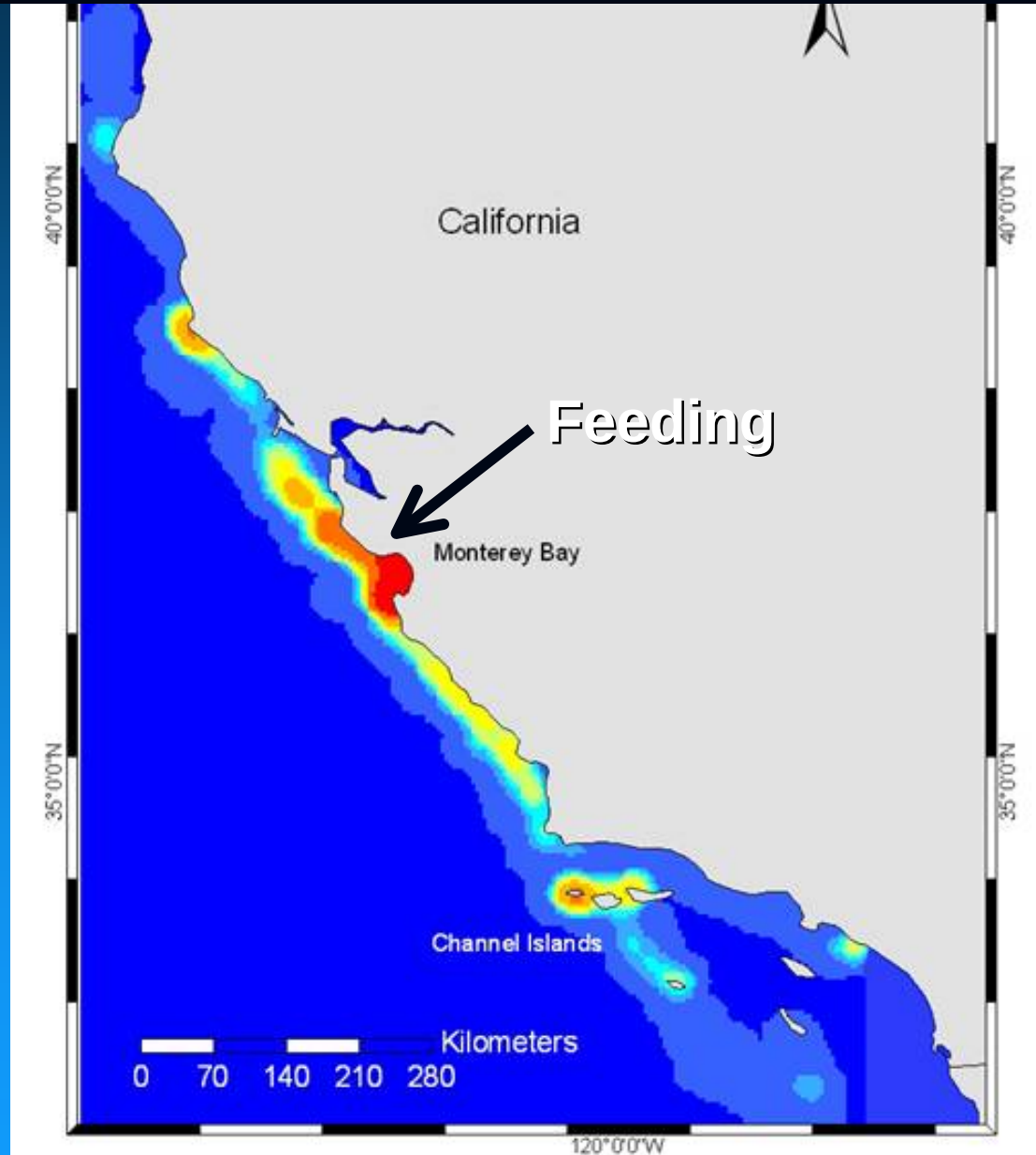
Behavior is Important

22 male California sea lions September-February 2004



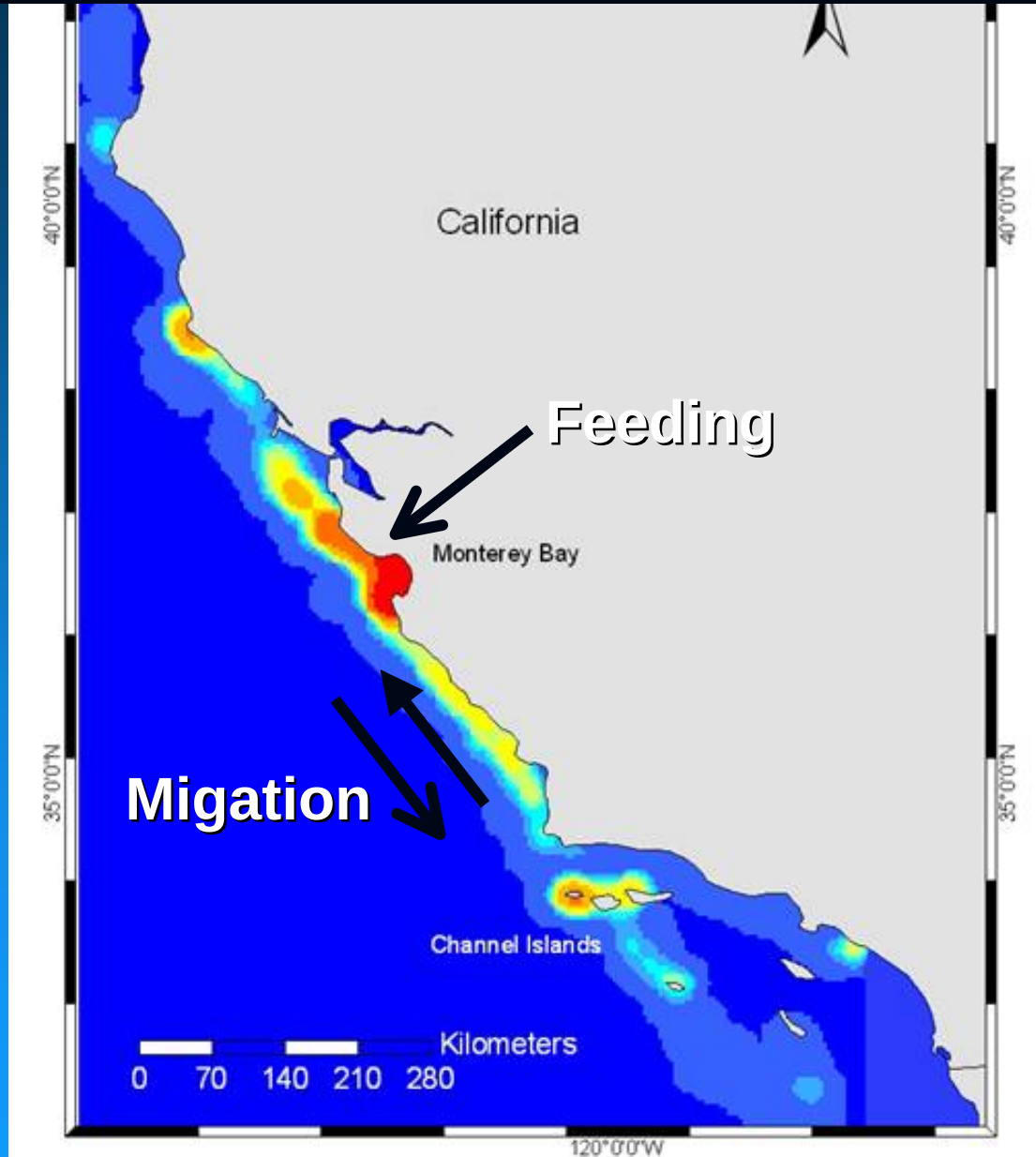
Behavior is Important

22 male California sea lions September-February 2004



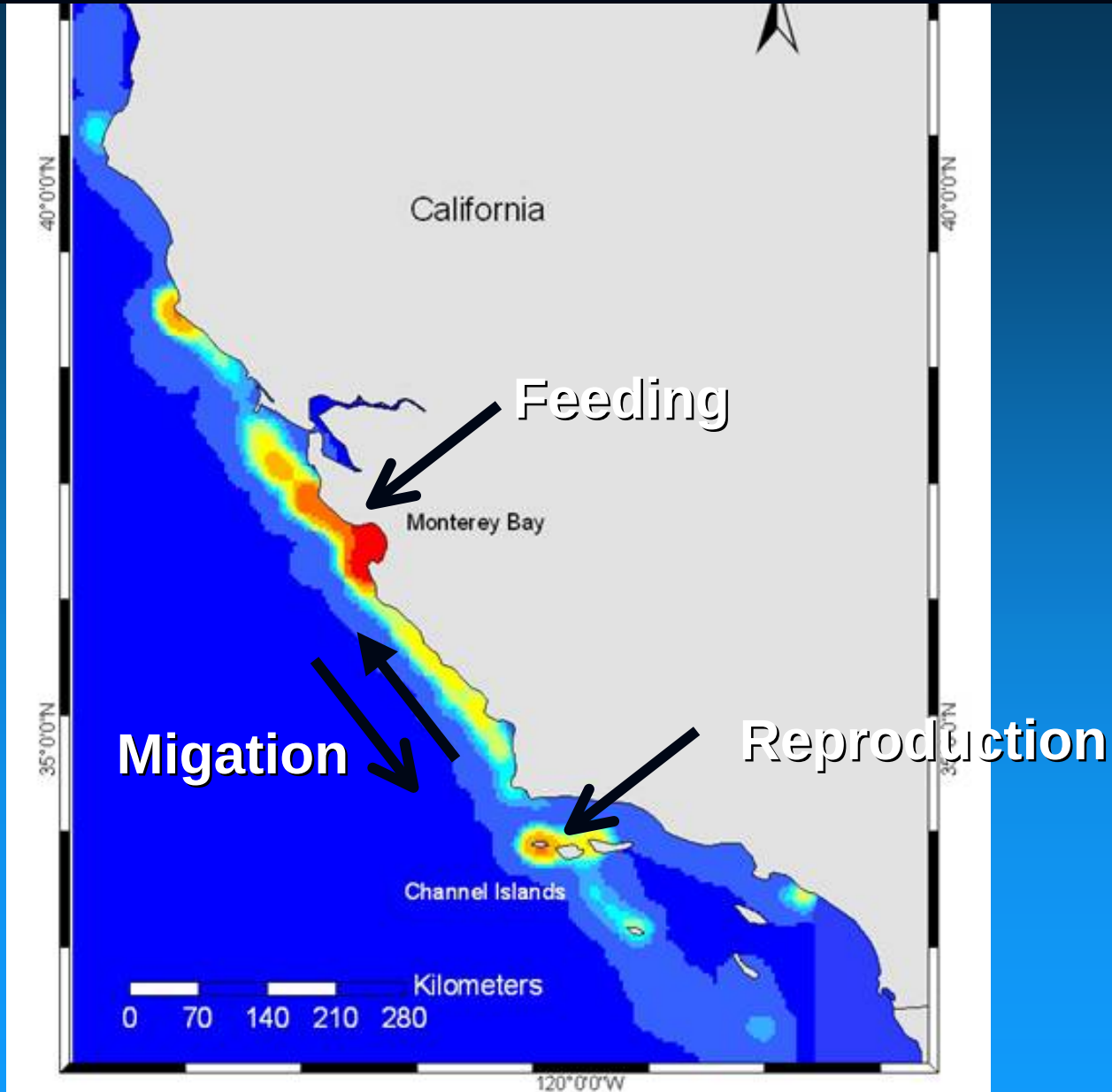
Behavior is Important

22 male California sea lions September-February 2004

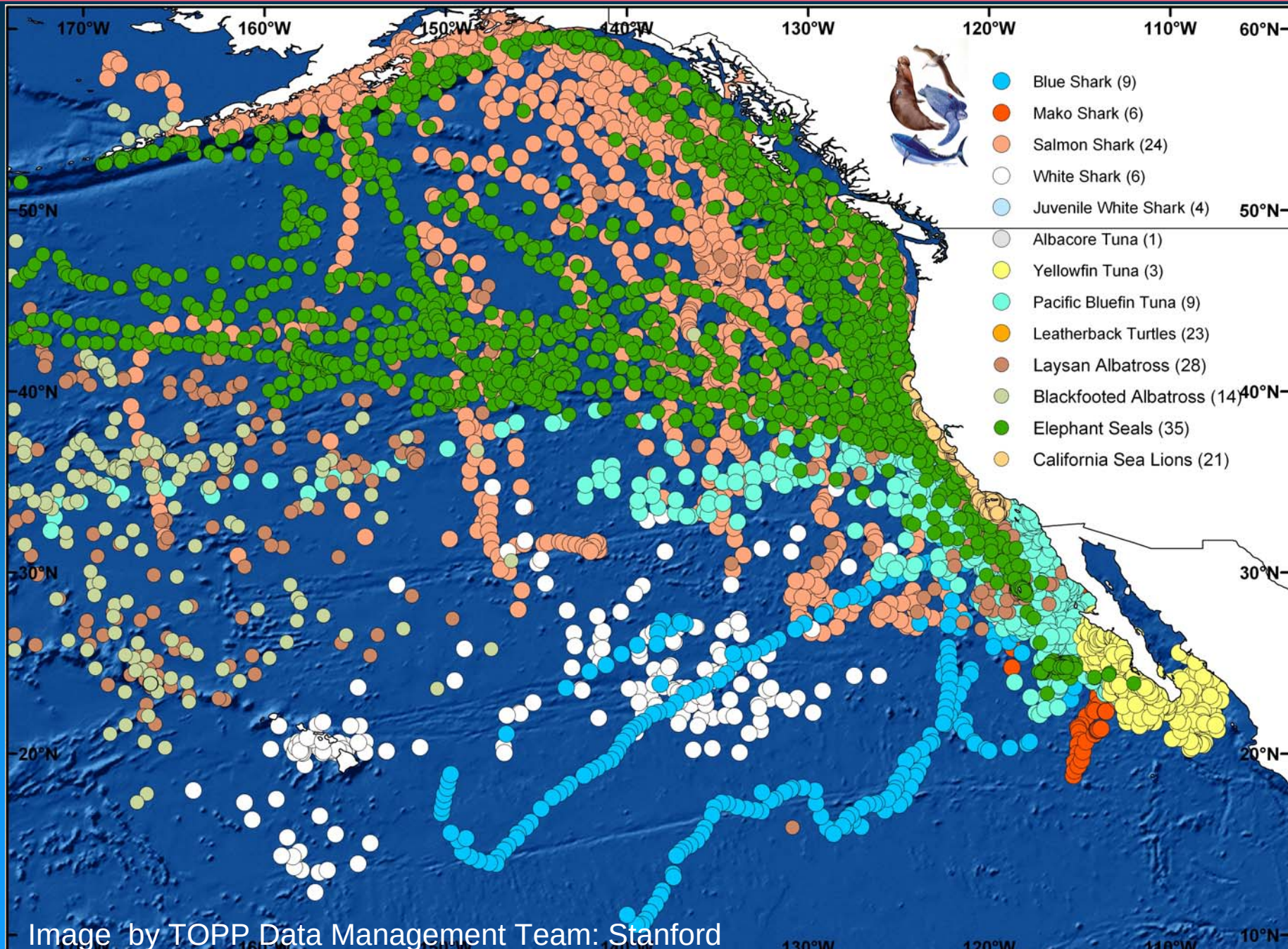


Behavior is Important

22 male California sea lions September-February 2004



TOPP Daily Positions 2002-2003, 14 Species, 120 Tags Reveals Niche Separation



TOPP Hot Spots From 180 Electronic Tags 12 Species

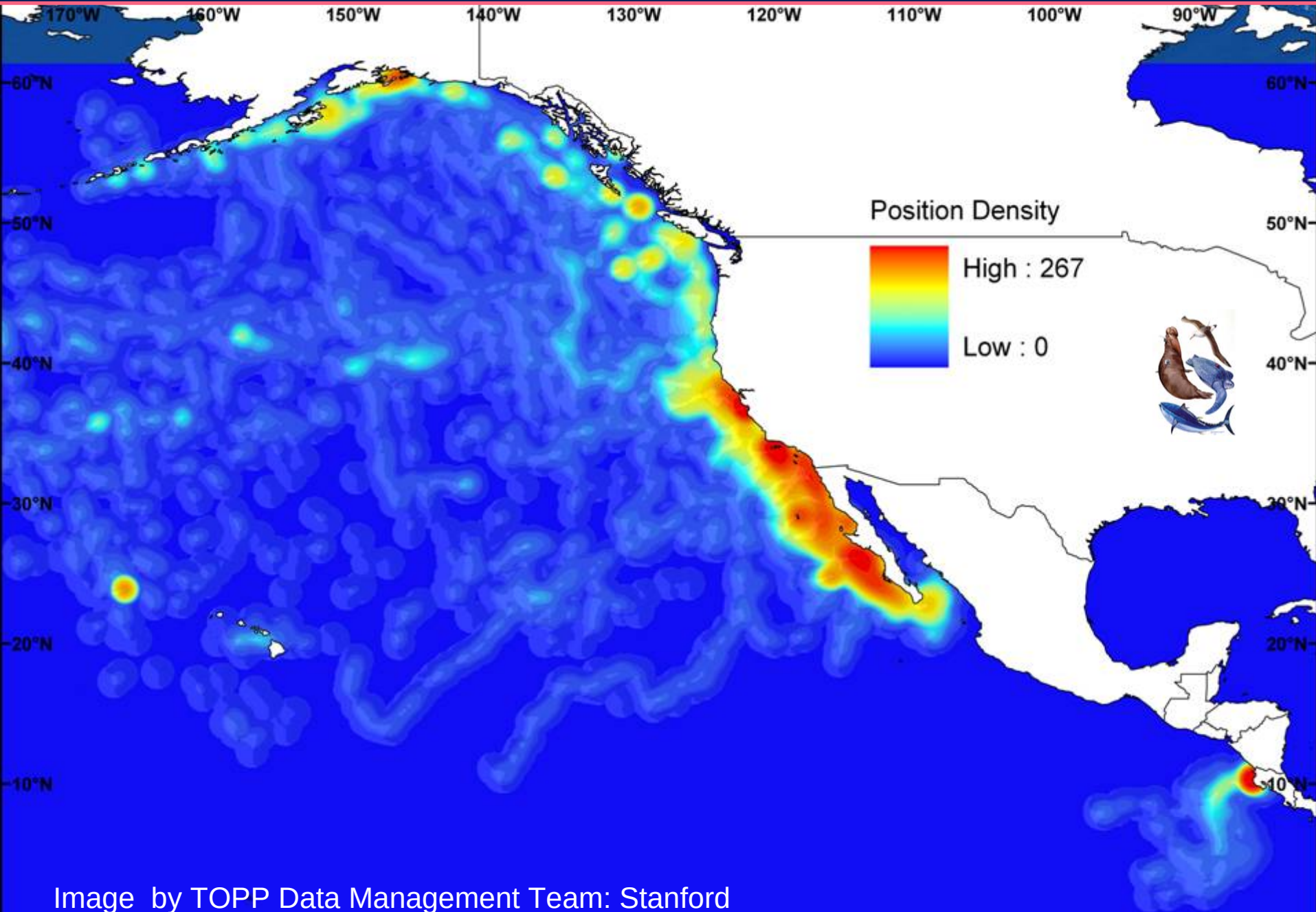
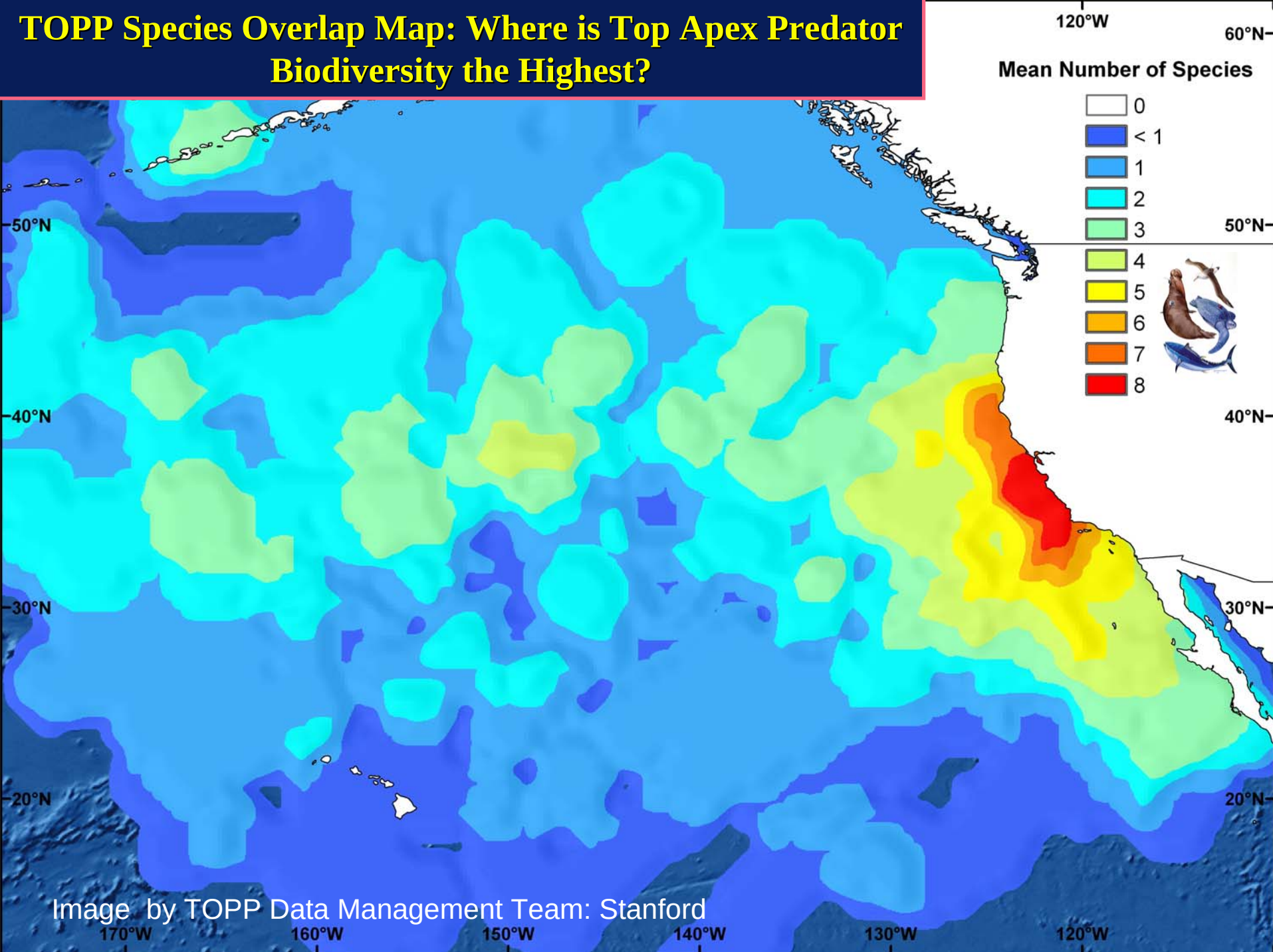


Image by TOPP Data Management Team: Stanford

TOPP Species Overlap Map: Where is Top Apex Predator Biodiversity the Highest?



TOPP Pilot Project Reveals Ecological Niche of Lamnid & Blue Sharks (2002-2003)

Salmon, White, Mako and Blue Sharks

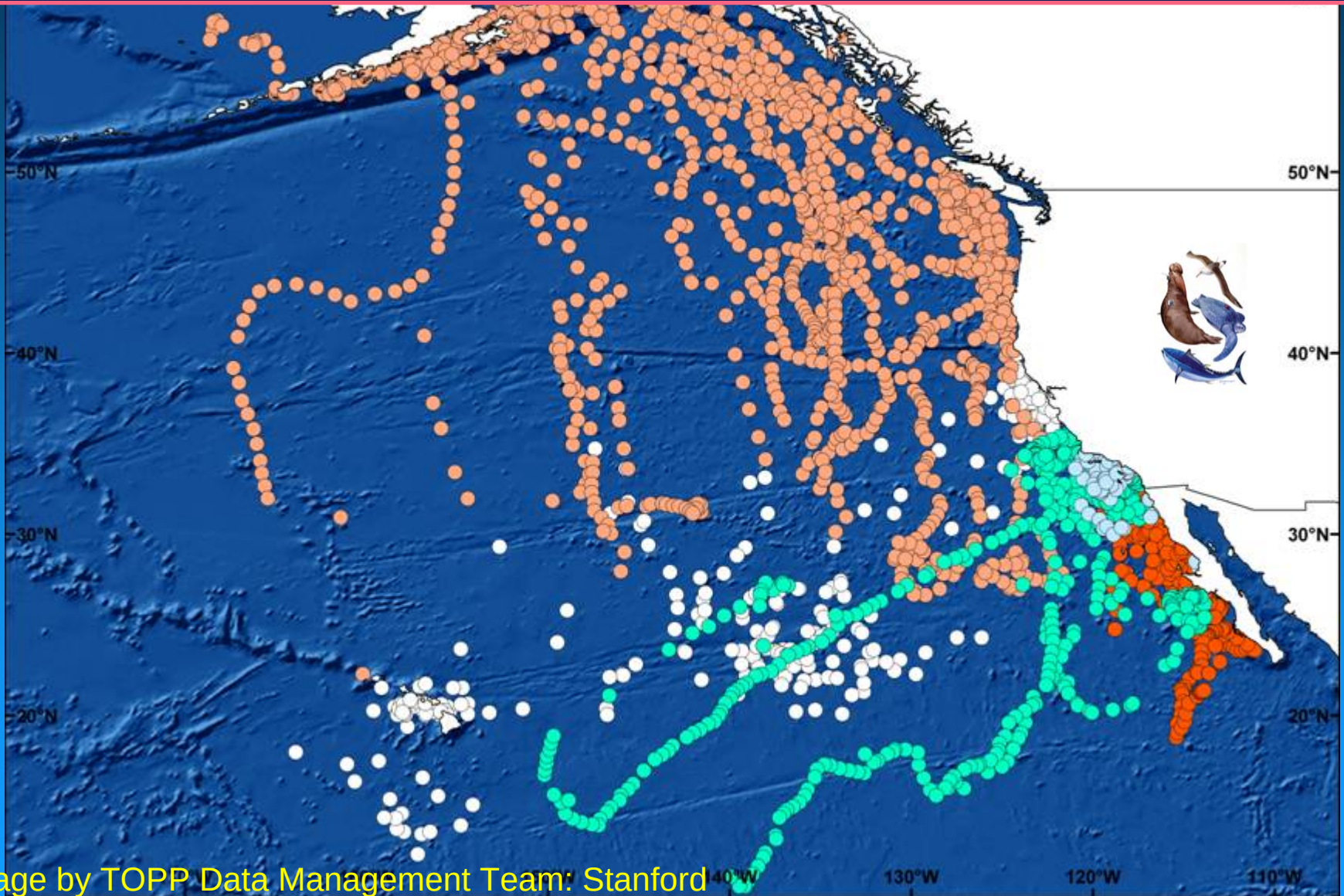
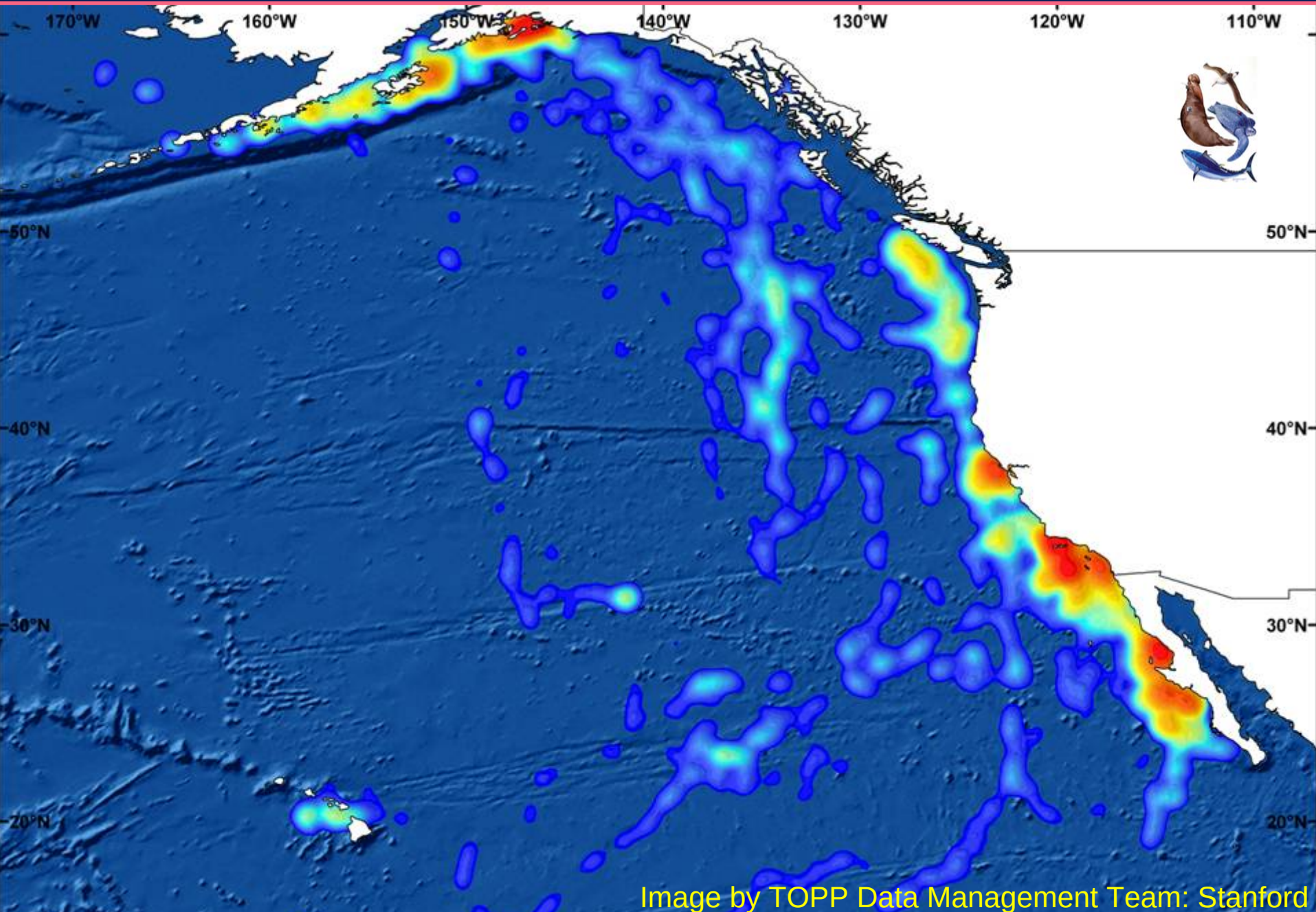


Image by TOPP Data Management Team: Stanford

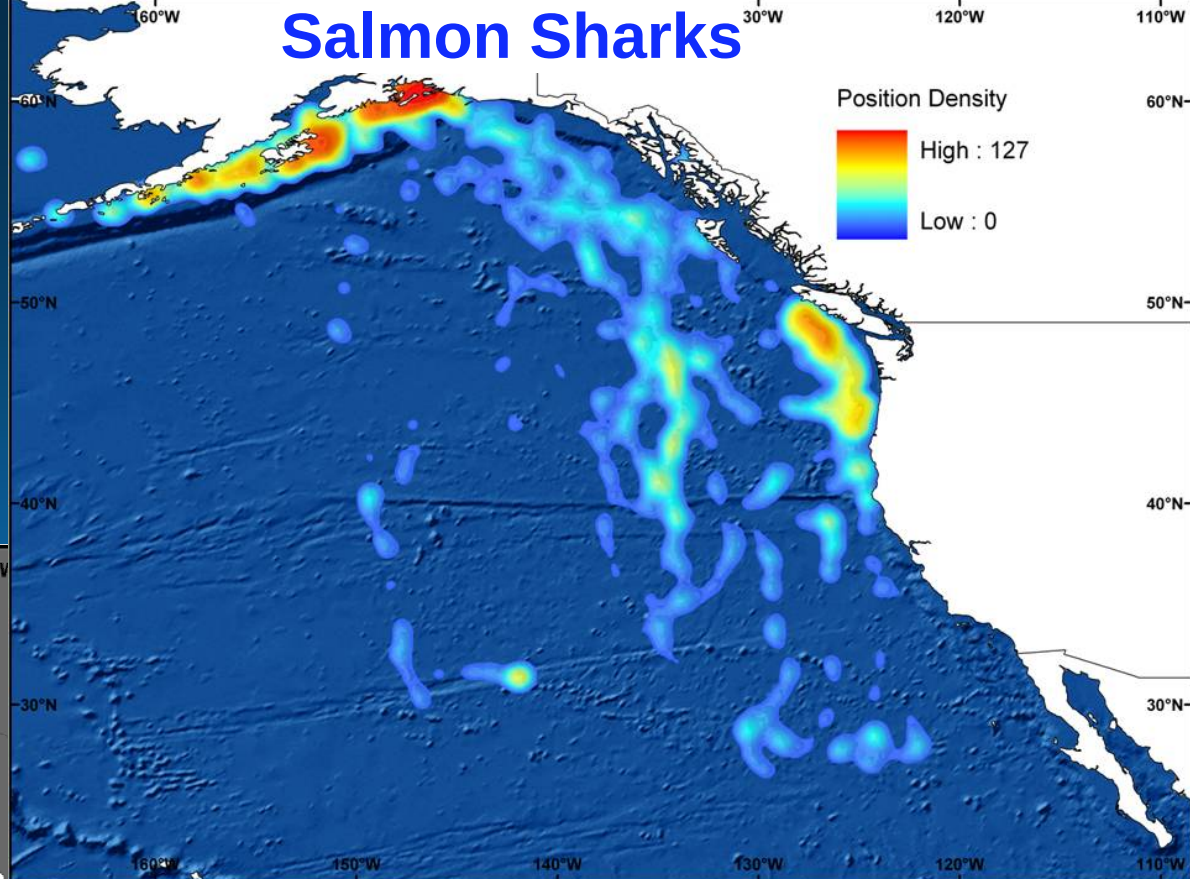
Shark Hot Spot Density



TOPP Shark Team:

D Holts, O Sosa, B Block, K Goldman, K Weng, S Kohin & H Dewar

Salmon Sharks



Mako Sharks

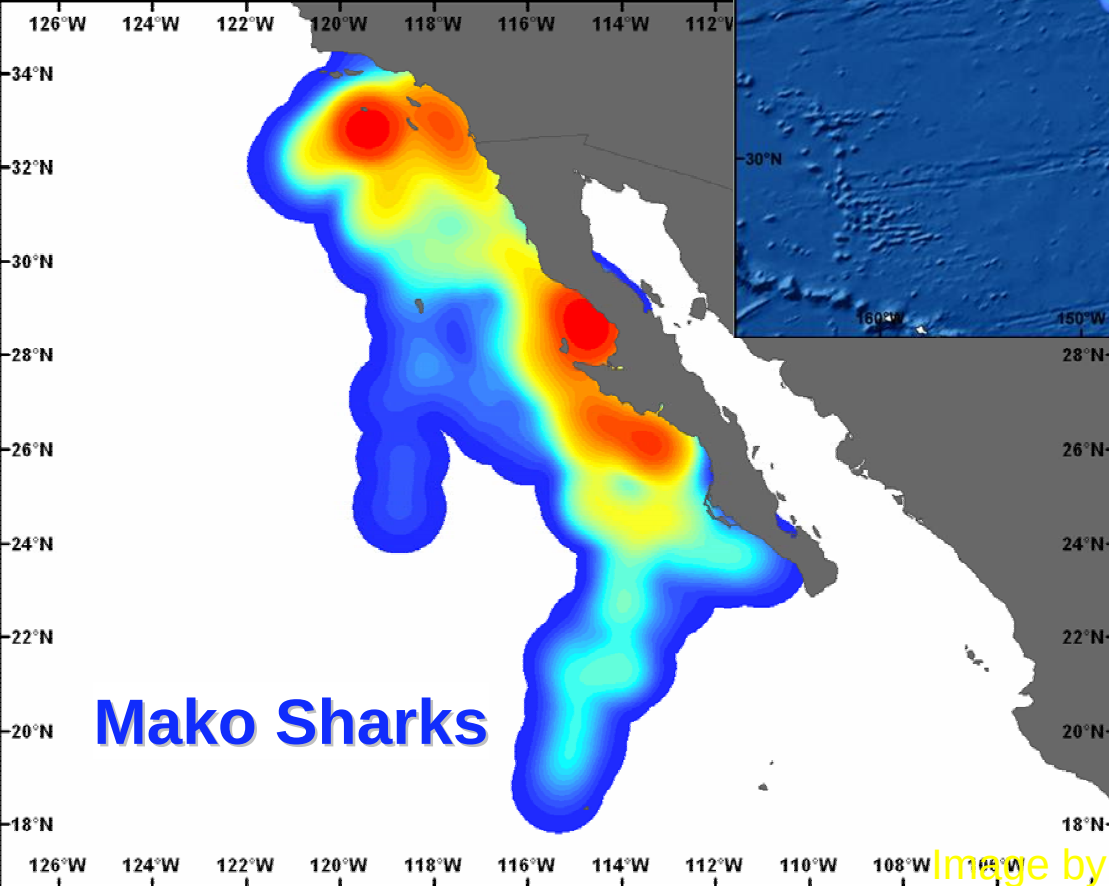
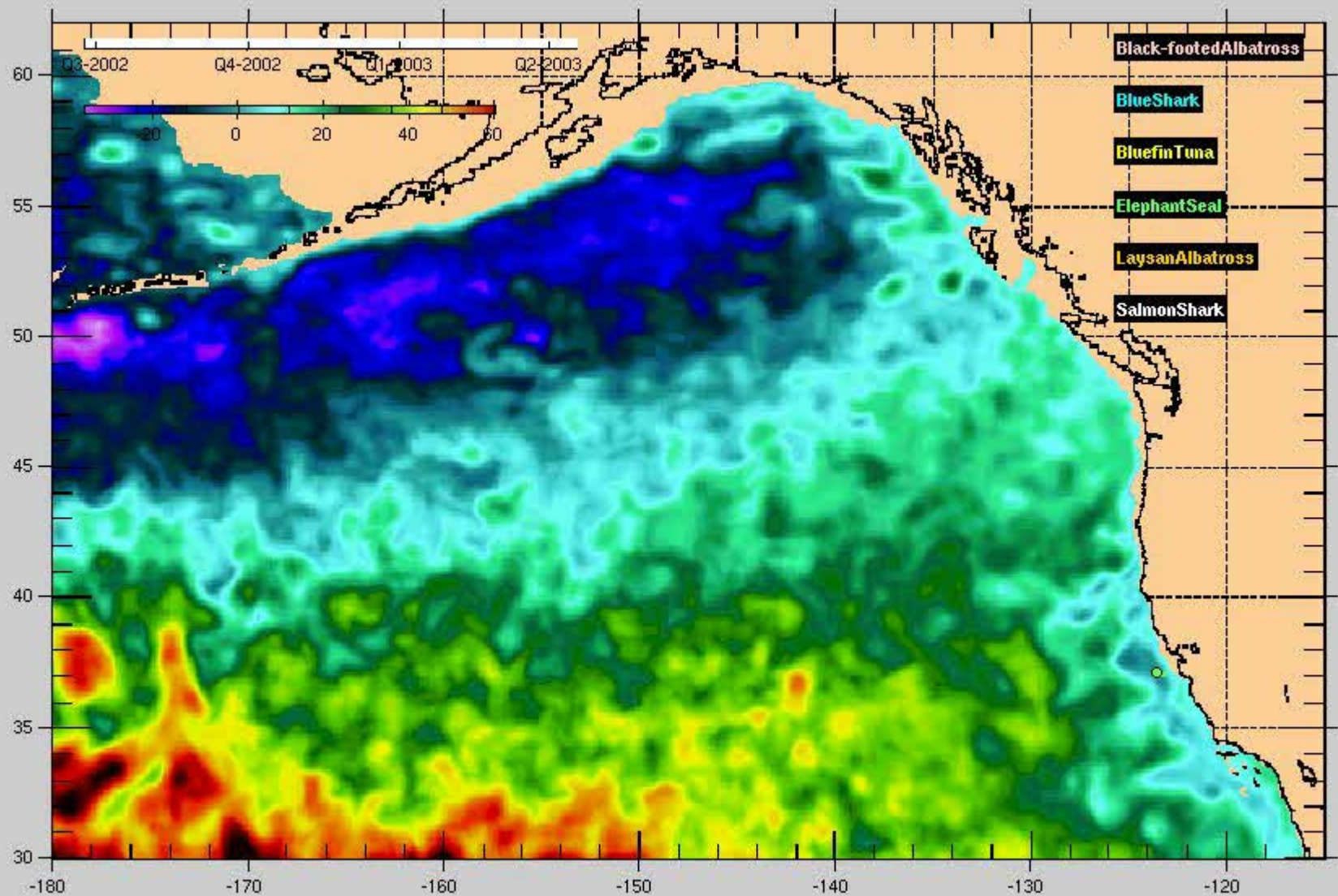


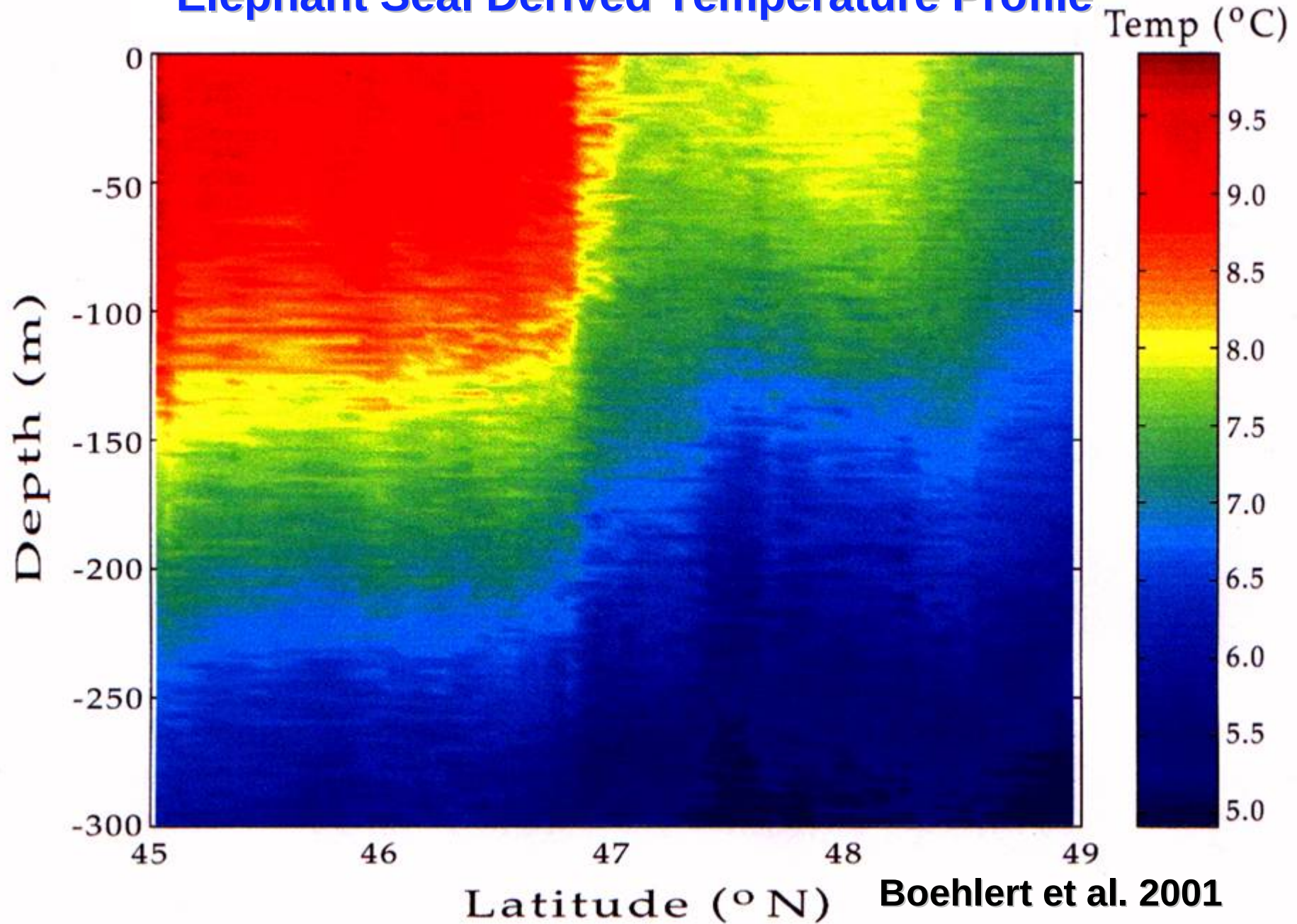
Image by TOPP Data Management Team: Stanford

Movements Relative to Sea Surface Height

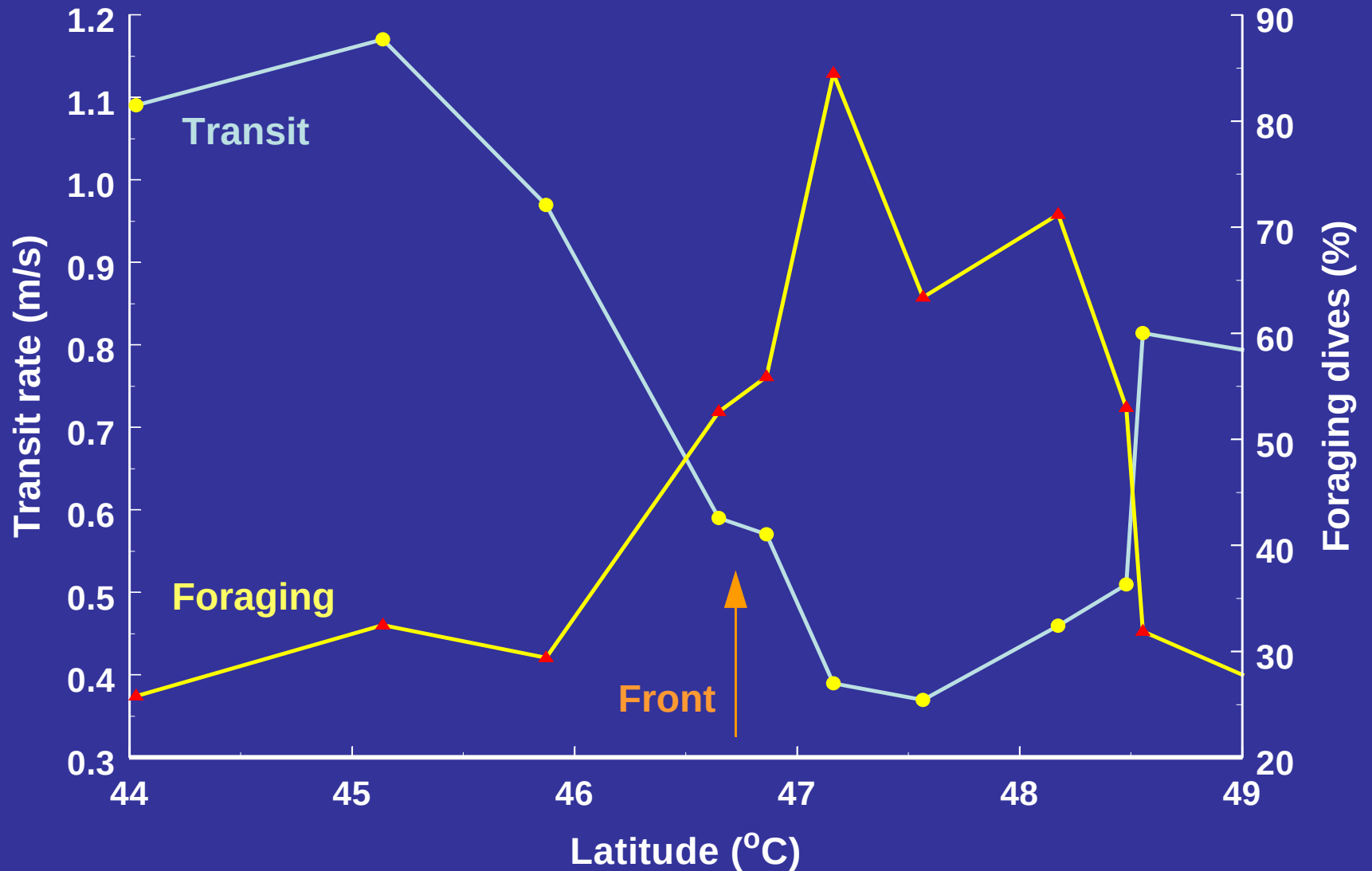


Animation by TOPP Data Management Team: Stanford

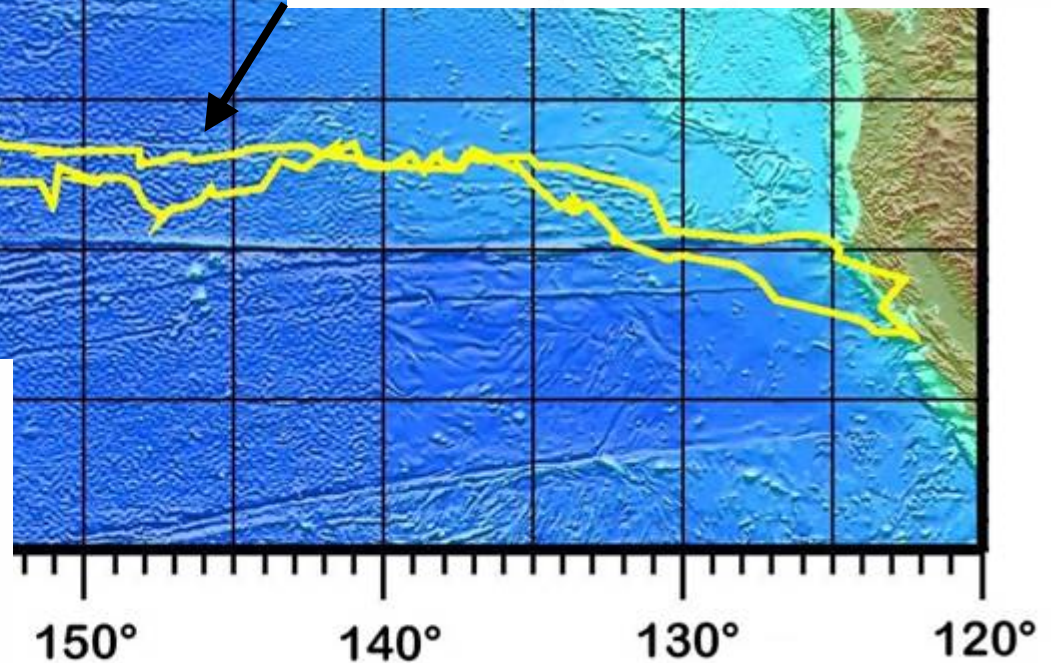
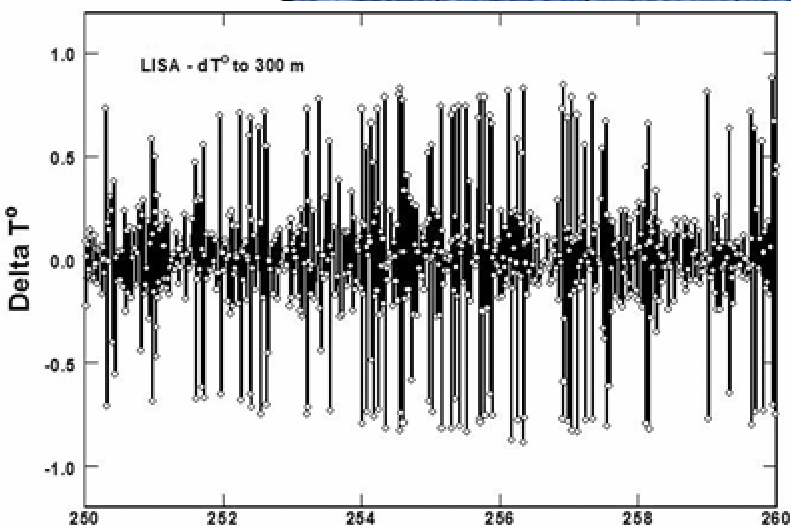
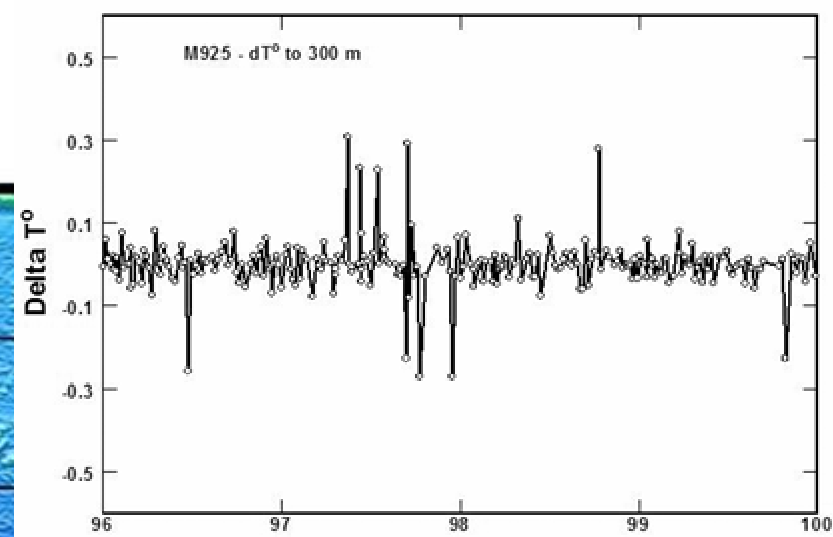
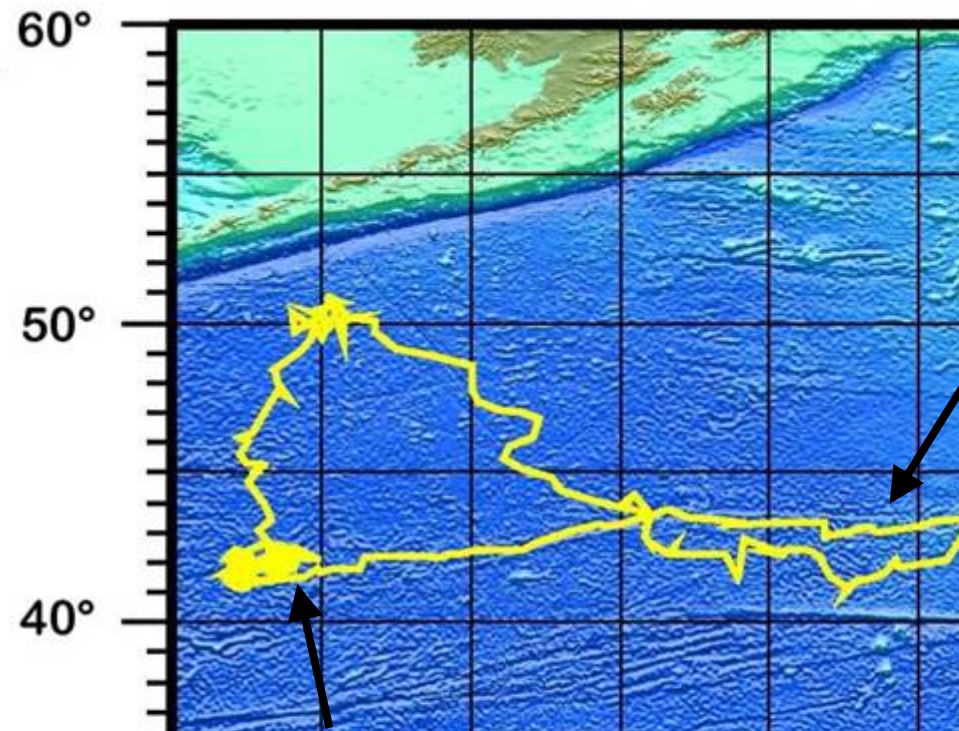
Elephant Seal Derived Temperature Profile



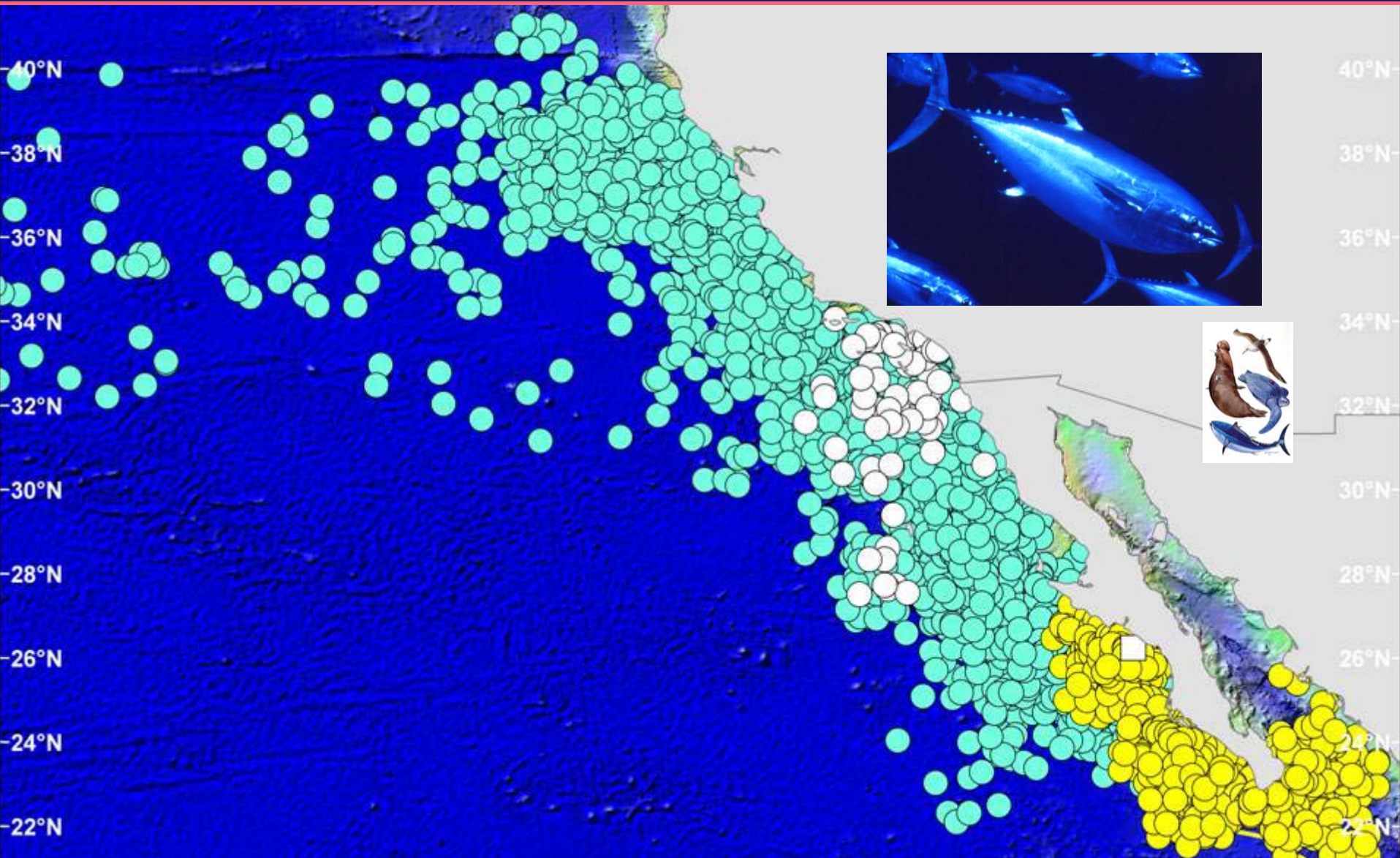
Elephant seal Behavior Associated with Front



Elephant seal Behavior Associated with Front



Examining How Closely Related Species Differ in Critical Habitat (*Thunnus*) Bluefin, Yellowfin and Albacore 44 Total Tagged Fish Returned (7000 Days), 2002-2004



Tuna Hot Spots Along North American Continental Shelf, Southern California Bight & California Current, Yellowfin Extend to Gulf of California

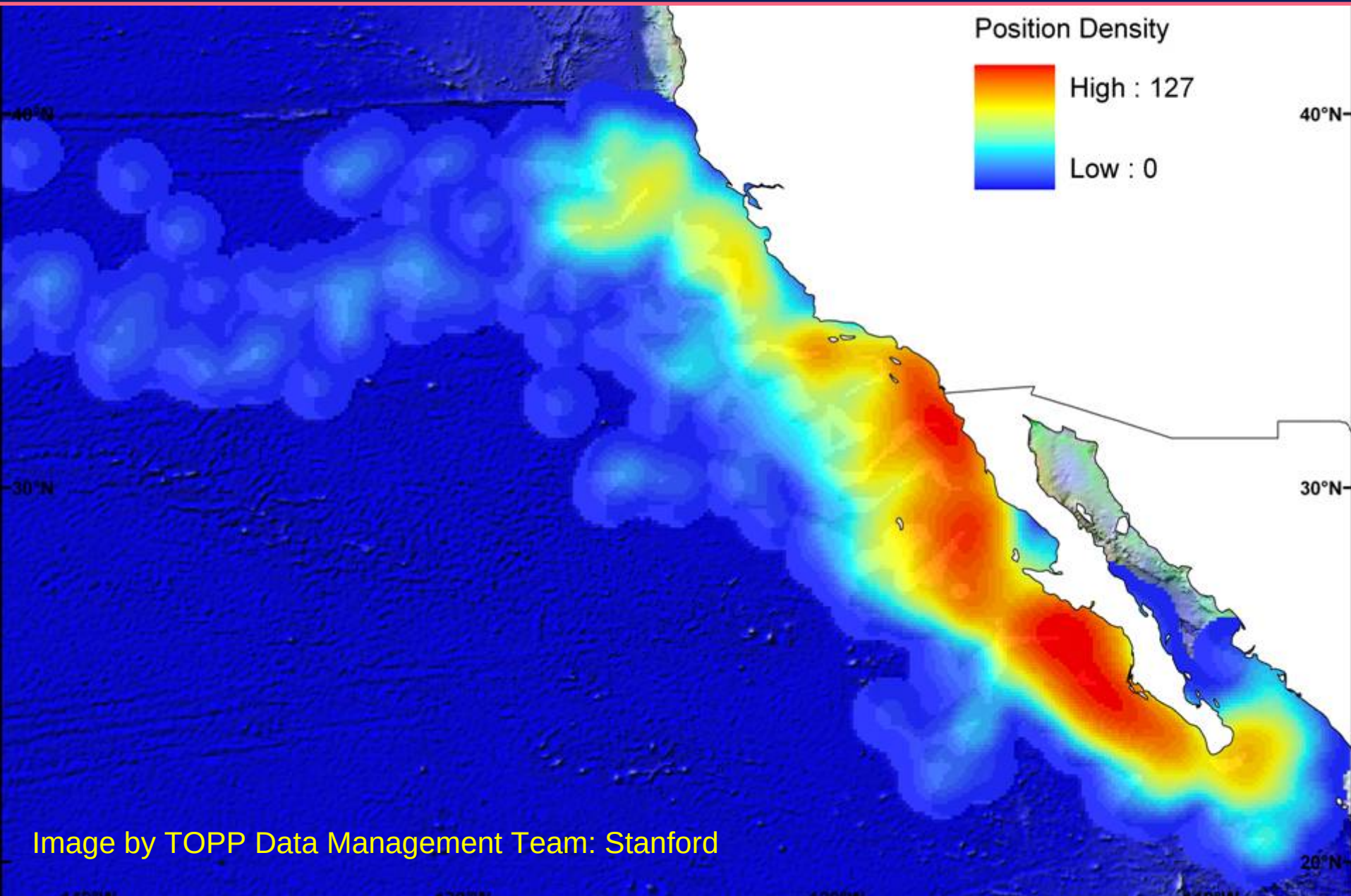


Image by TOPP Data Management Team: Stanford

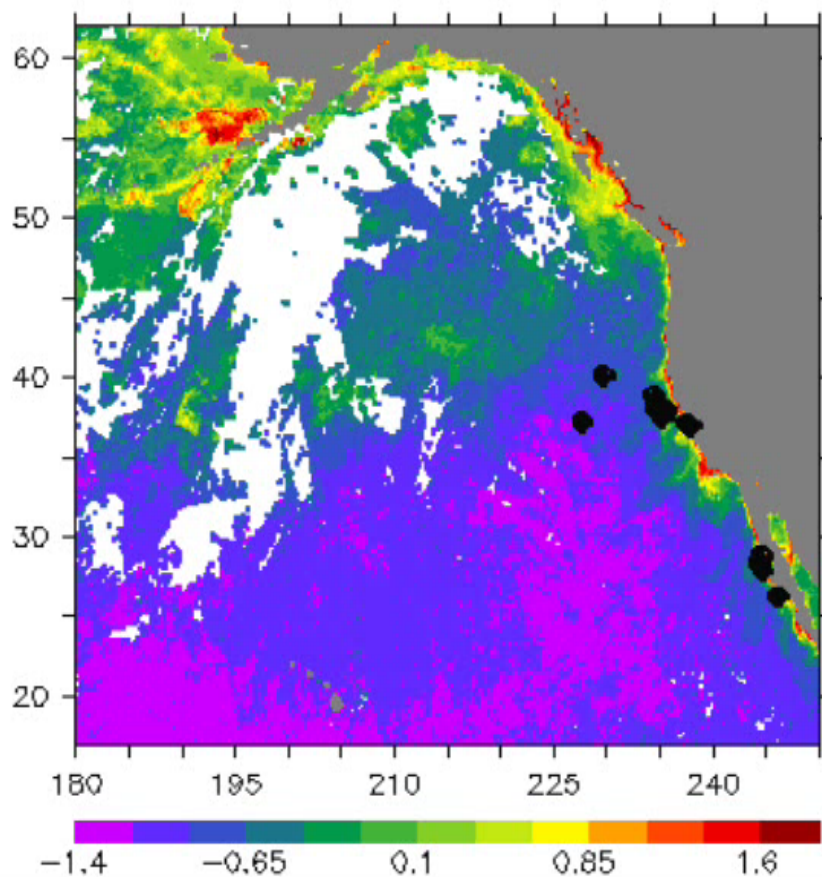


TOPP Pinniped Team: Costa, Crocker, Tremblay, McDonald & Kuhn

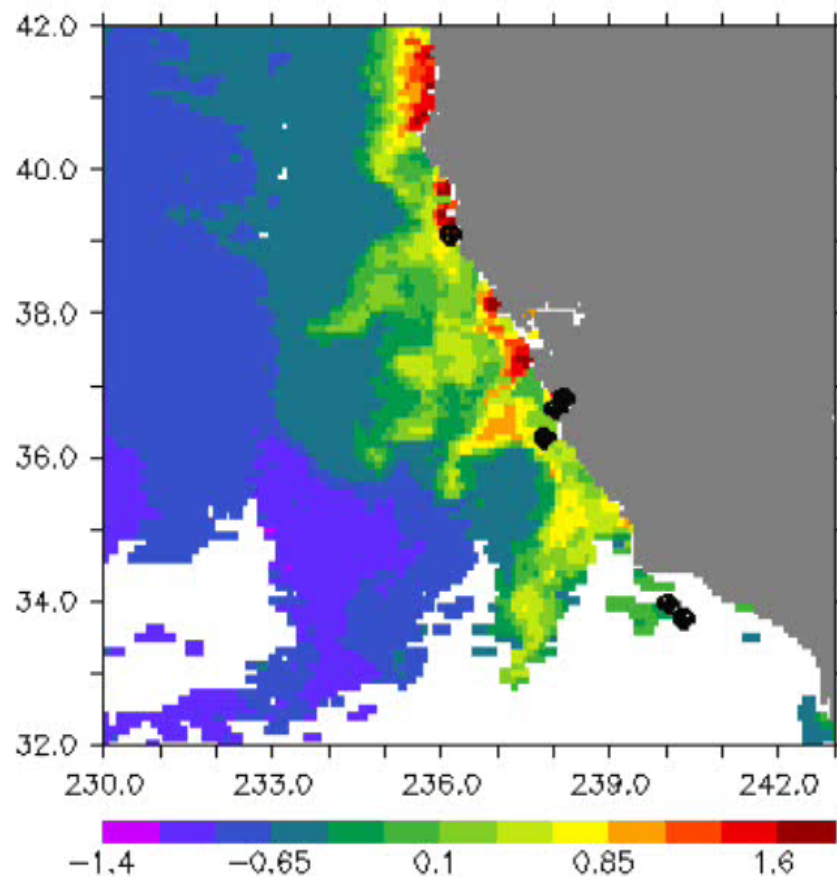
Elephant Seal

Ca Sea Lion

22-May-2004
MODIS: 16-MAY-2004 to 24-MAY-2004



4-Jun-2003
MODIS: 1-JUN-2003 to 9-JUN-2003



Live Access to
Climate Data

Images by TOPP Data Management Team: Stanford/NMFS PFEL



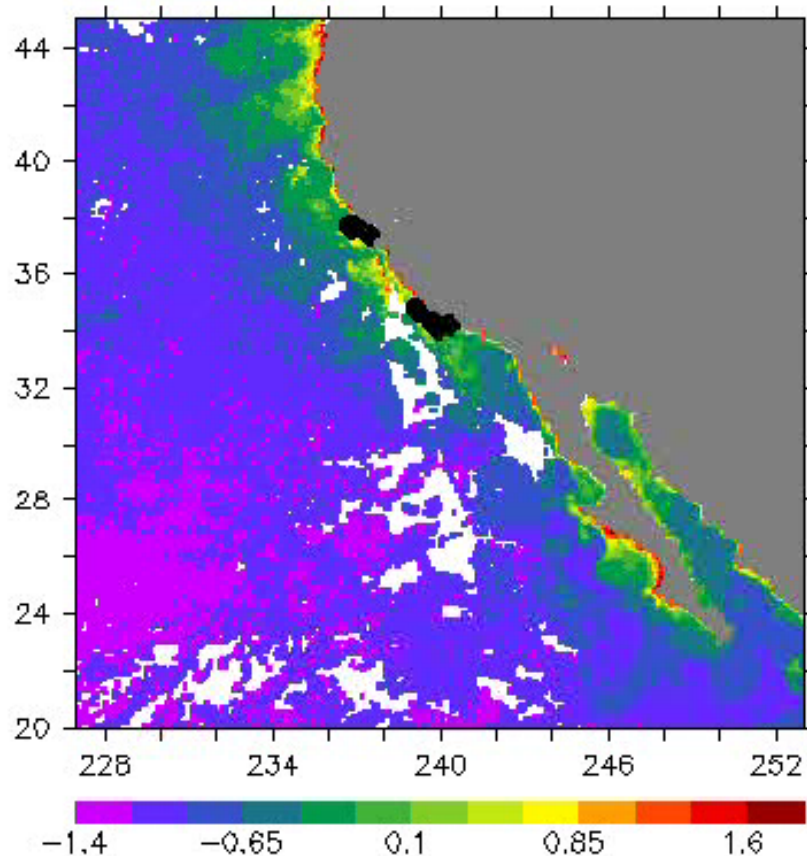
TOPP Cetacean Team: Mate, Croll, Harvey, Calambokidis

Blue Whale

Humpback Whale

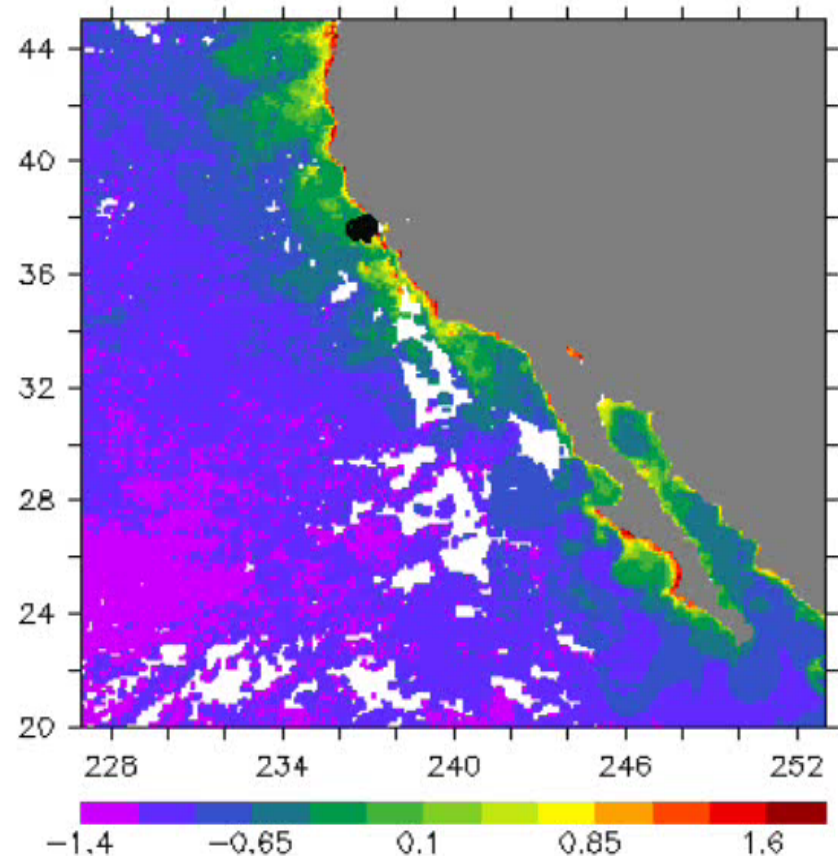
30-Jul-2004

MODIS: 27-JUL-2004 to 4-AUG-2004



30-Jul-2004

MODIS: 27-JUL-2004 to 4-AUG-2004



Live Access to
Climate Data

Images by TOPP Data Management Team: Stanford/NMFS PFEL

Acknowledgements

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- Sloan Foundation
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- Office of Naval Research
- NOAA Ocean Exploration

