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Presented to: Pacific Fishery Management Council

June 21st, 2019

Agenda Item F.4.b

Supplemental Public Presentation 2

June 2019

The Need for Ecosystem-Based Forage Fish Management to Benefit Endangered CA Least Terns



California Least Tern feeding chick. Photo: S. Nelson-Embry



Fostering the protection and appreciation of birds, other wildlife, and their habitats...

Presentation Outline

- CA Least Tern (CLTE) ecology and population trends
- Importance of anchovy to CLTE nesting productivity
- Apparent effects of climate change on CLTE foraging resources
- Issues with anchovy management within the Monitored Stock Category
- Asks of the PFMC



California Least Tern. Photo: W. Dalton



Our Work to Benefit Least Terns

- SD Audubon: Since 2011, over \$500,000 in state and local funds to support CLTE restoration
- SDZG Institute for Conservation Research: Manage and monitor CLTEs at Camp Pendleton and Coronado, which together make up 35% of the nesting pop. of the species



California Least Tern, with eggs. Photo: N. Johnston



Fostering the protection and appreciation of birds, other wildlife, and their habitats...

California Least Tern (CLTE)

- *Sterna antillarum browni*
- Small, migratory seabird
- Winter: Central America
Nest: Dunes of CA and Baja
- Forage for YOY and Age 1 anchovies in lagoons, offshore water
- Single bill-load feeding



CA least tern in Mission Bay
Photo: B. Struck



CLTE Conservation Status

- State and federally-listed endangered (1973)
- Very cryptic eggs and chicks
- Threats: Habitat loss, human disturbance, non-native vegetation, urban predators, issues with food availability
- Foraging time = highly sensitive to predation



Well camouflaged chick. Photo by Point Blue Conservation Science.



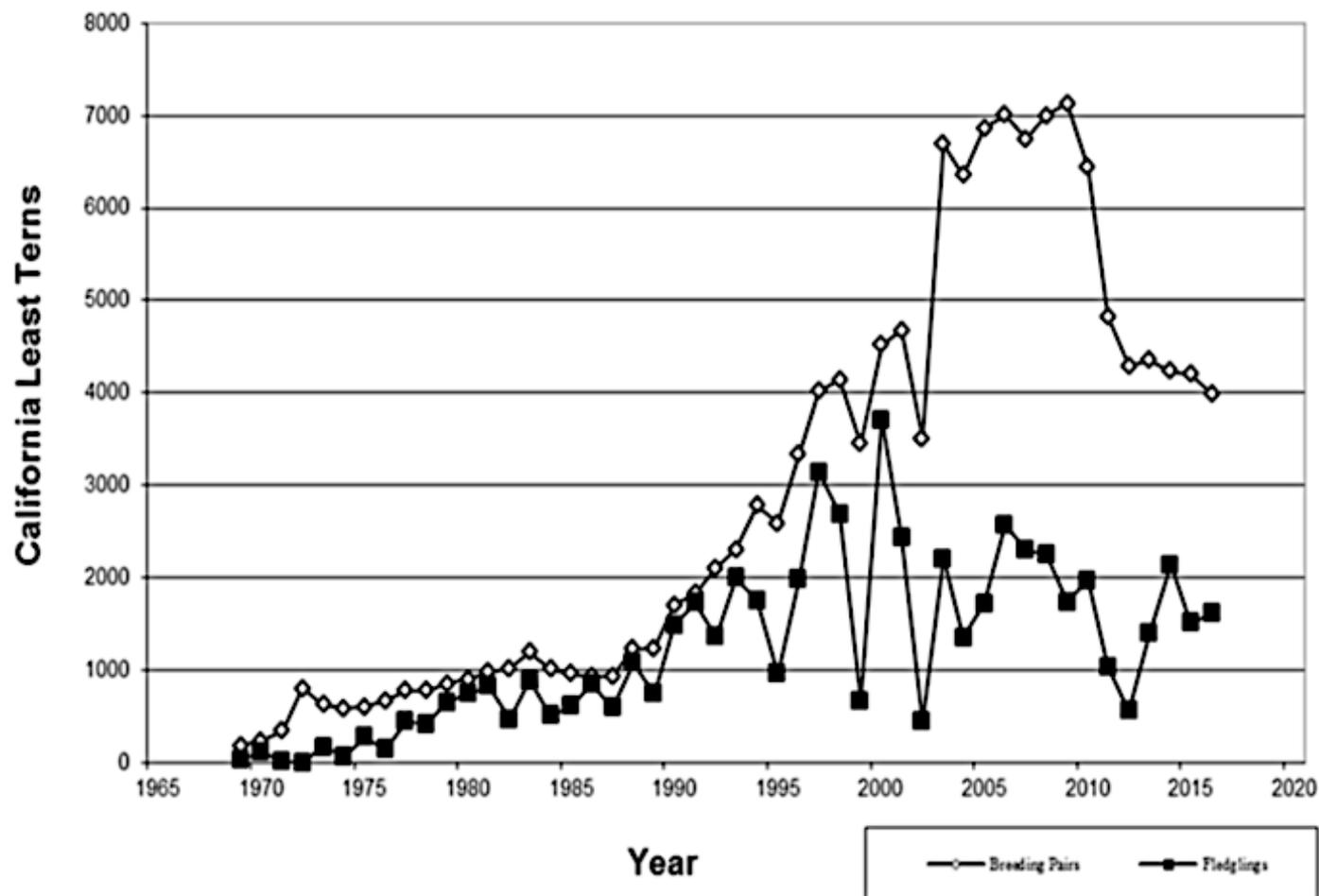


Figure 2. Minimum number of documented California least tern breeding pairs and fledglings in California during annual surveys, 1969-2016 (data from: Craig 1971; Bender 1974a, 1974b; Massey 1975, 1988, 1989b; Atwood *et al.* 1977; Jurek 1977; Atwood *et al.* 1979; Collins 1984, 1986, 1987; Gustafson 1986; Johnston and Obst 1992; Obst and Johnston 1992; Caffrey 1993, 1994, 1995b, 1997, 1998; Keane 1998, 2000, 2001; Patton 2002, 2004 unpublished table; Marschalek 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012; Frost 2013, 2014, 2015, 2016).

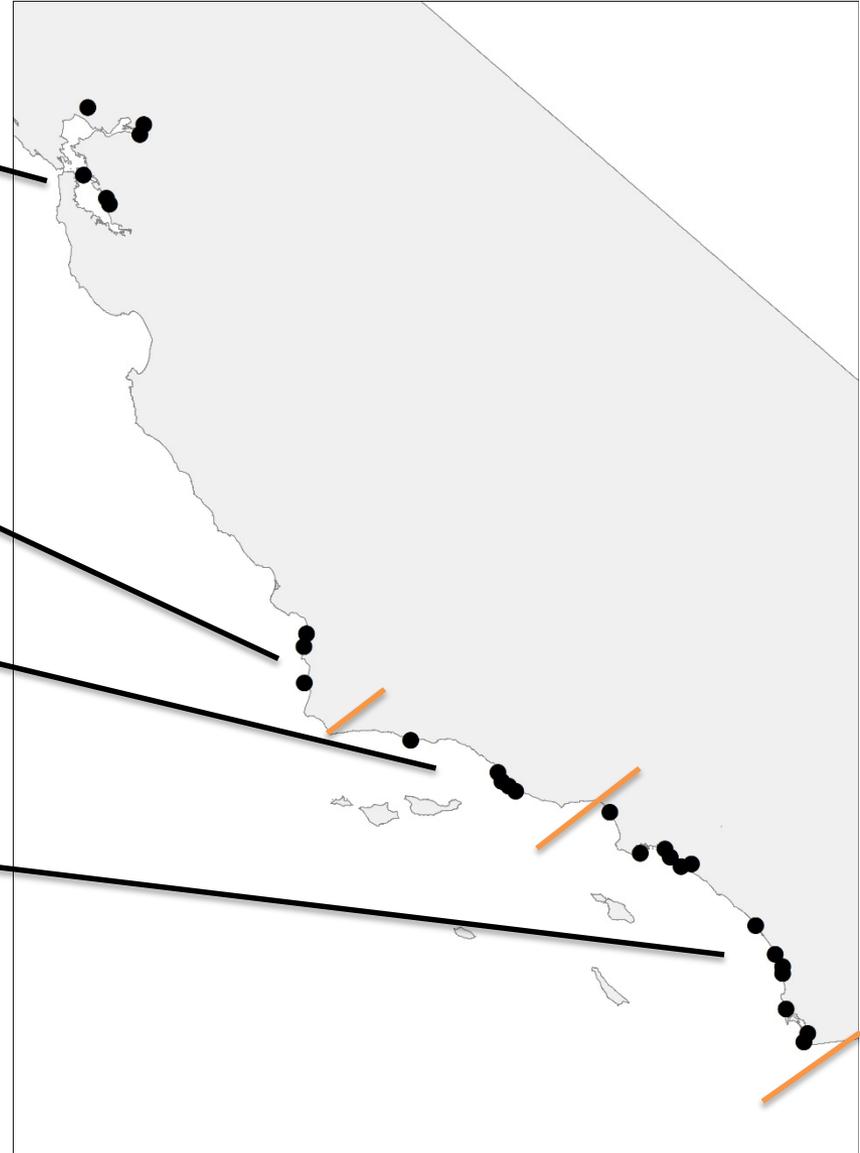
2015 Breeding Distribution

San Francisco Bay
465 breeding pairs

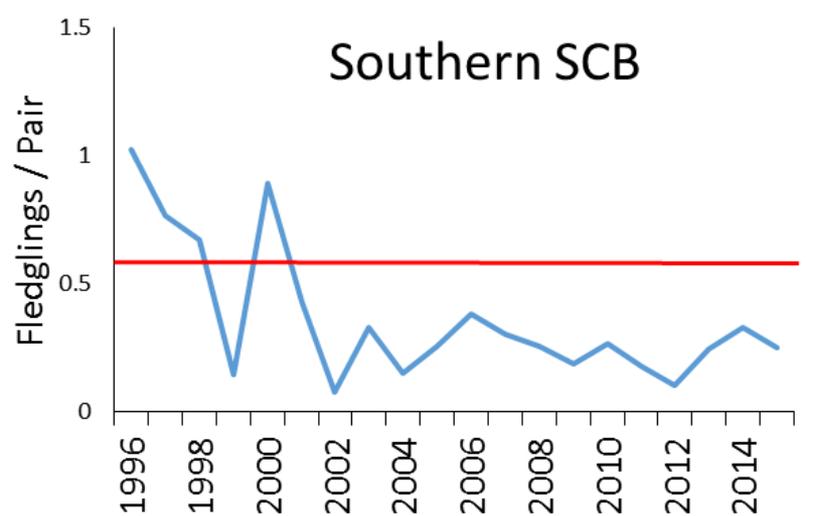
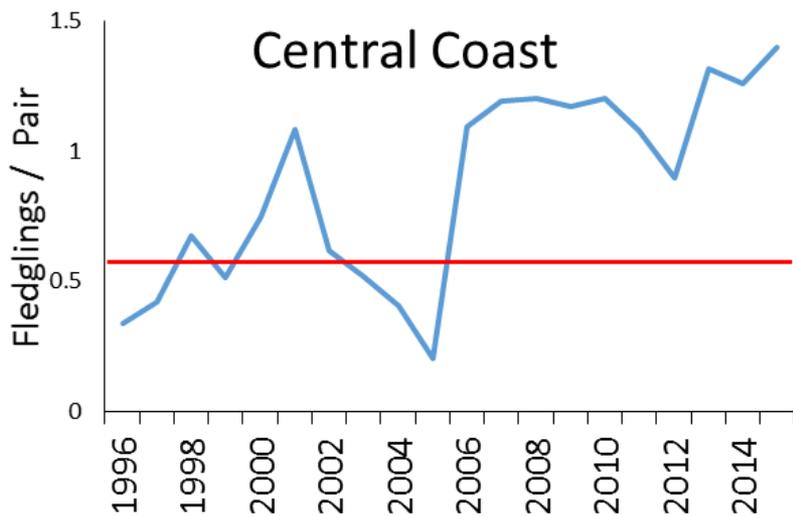
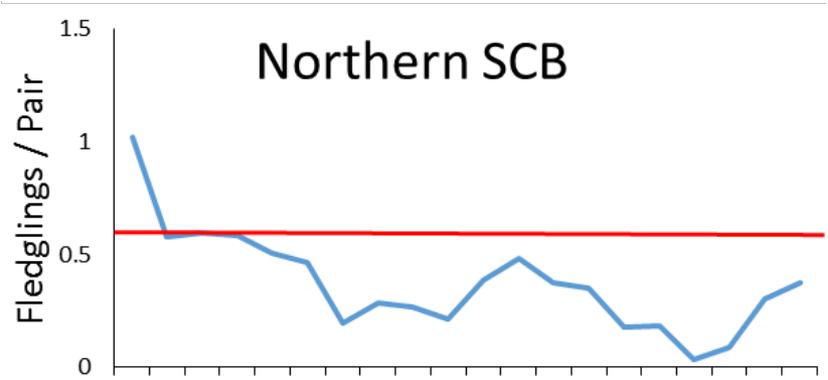
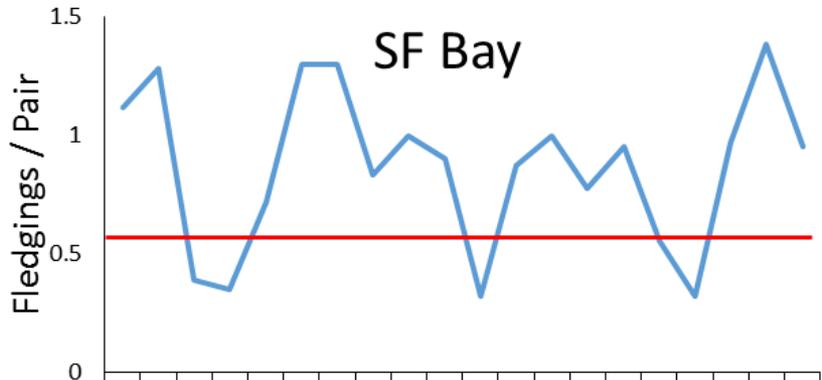
Central Coast
70 breeding pairs

Northern So Cal Bight
383 breeding pairs

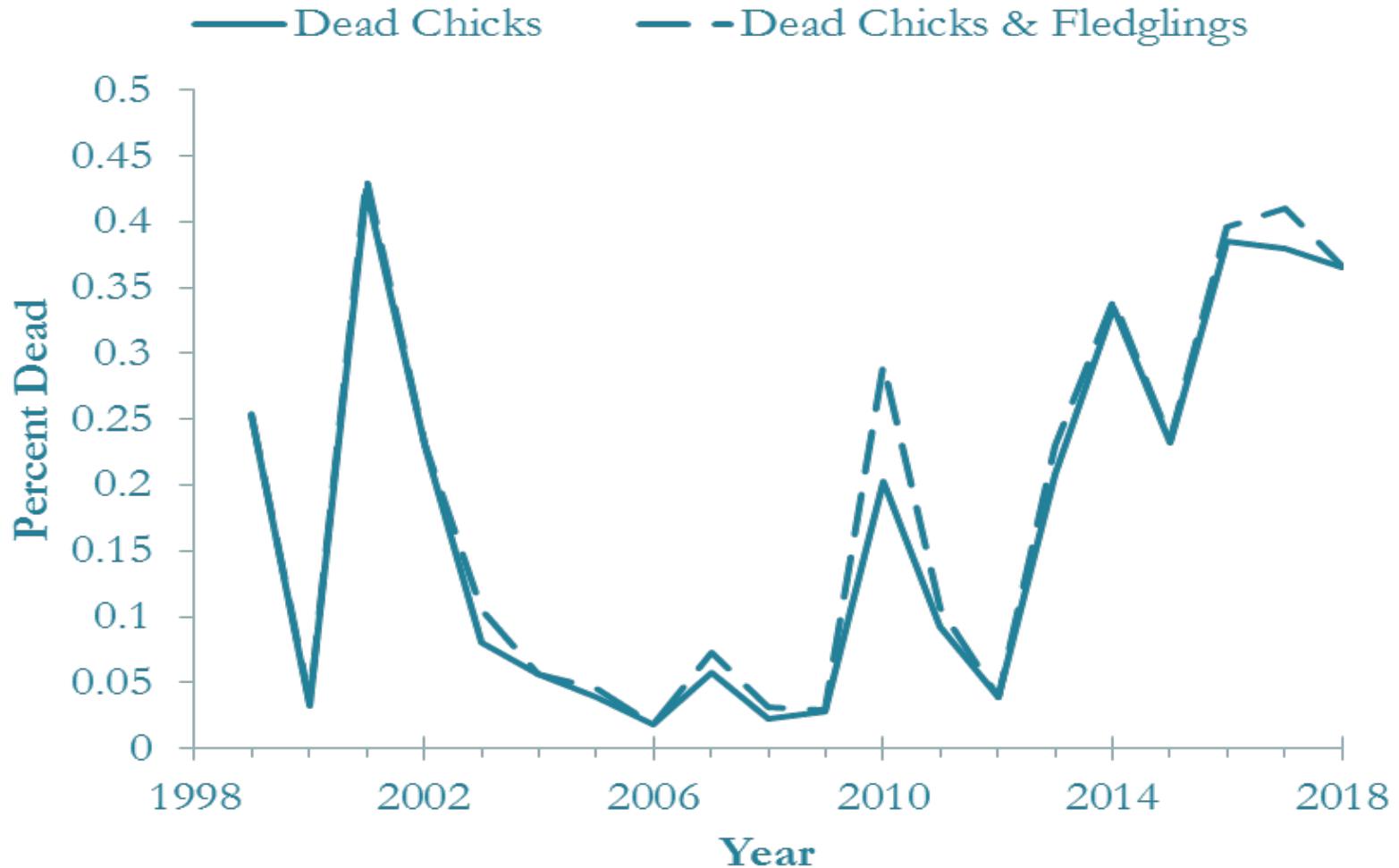
Southern So Cal Bight
3,287 breeding pairs



Breeding Productivity

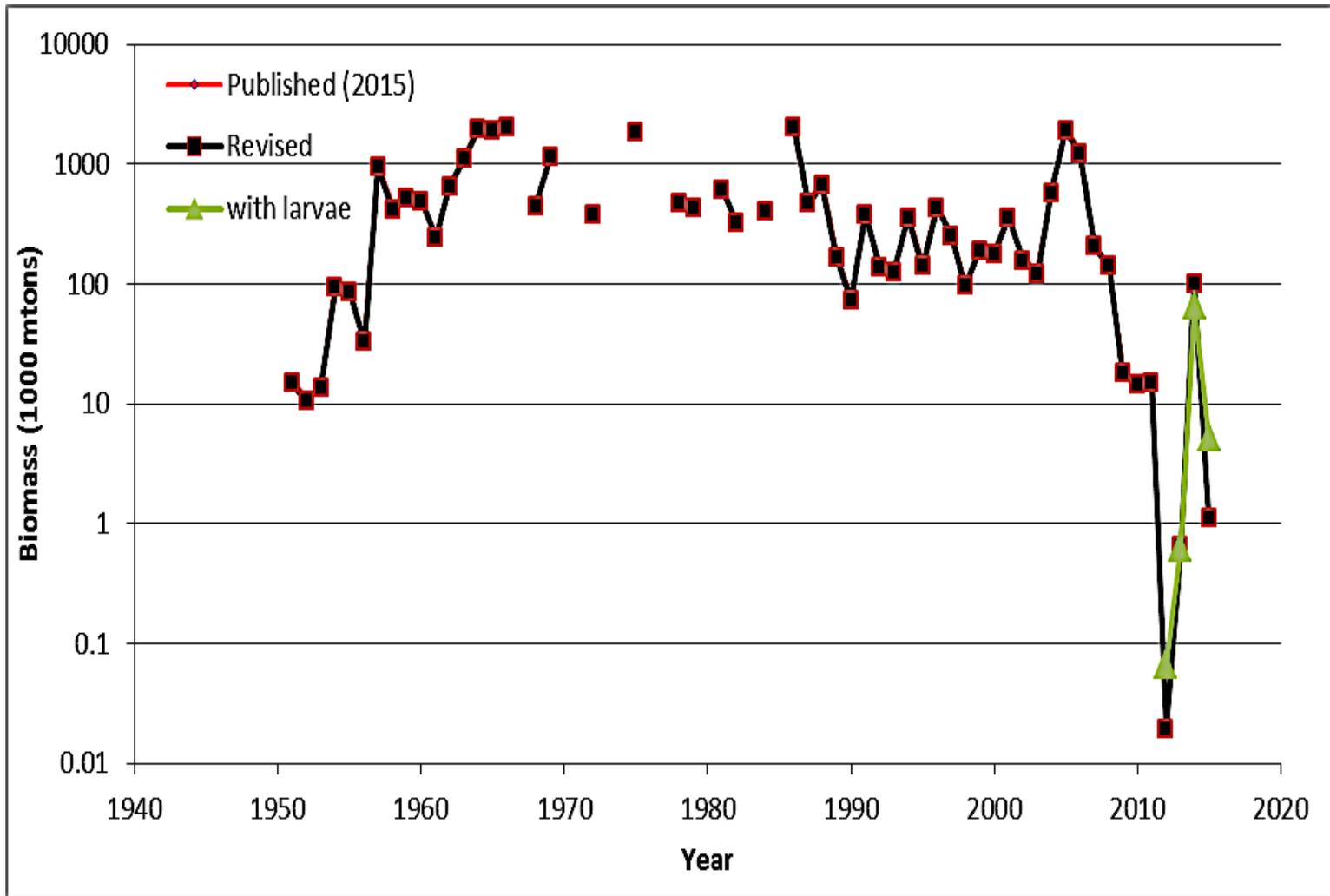


Increase in Non-Predation Mortality of Chicks and Fledglings

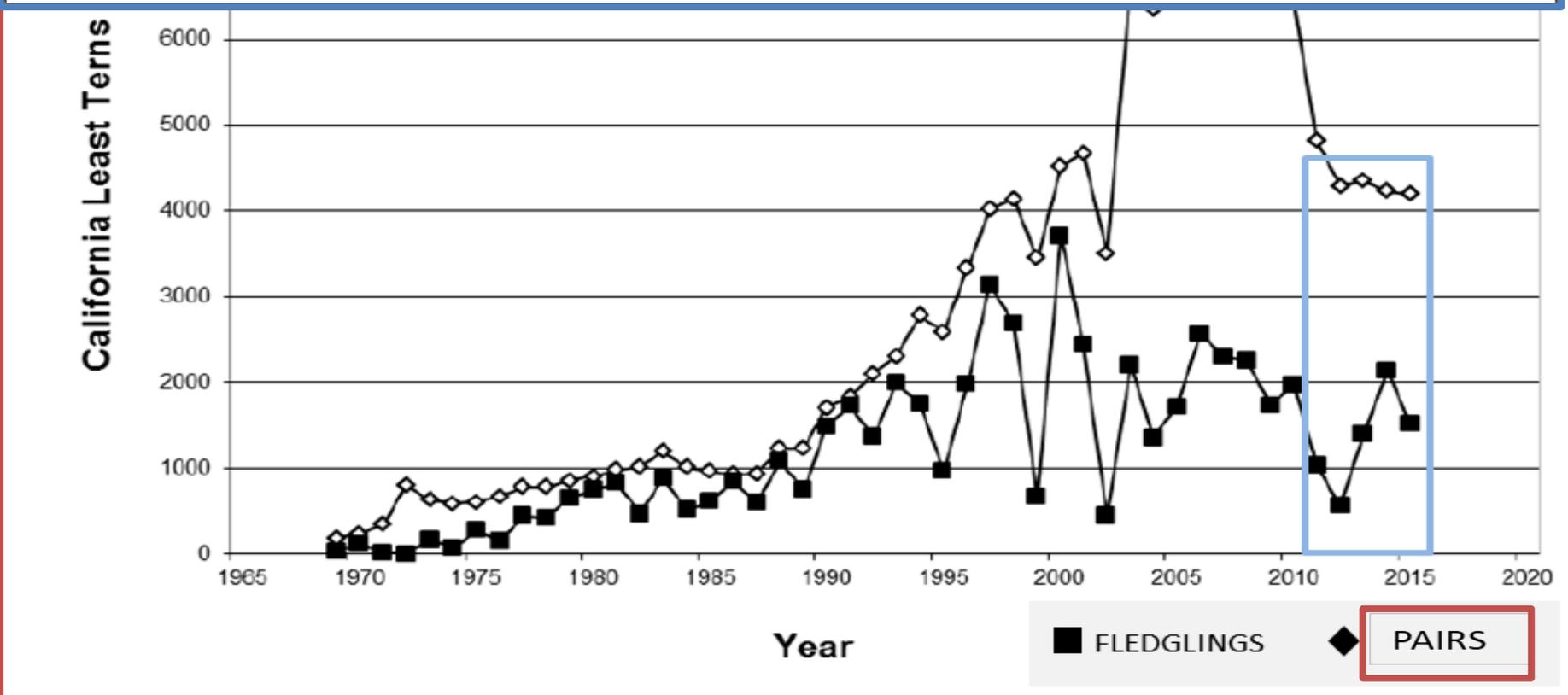
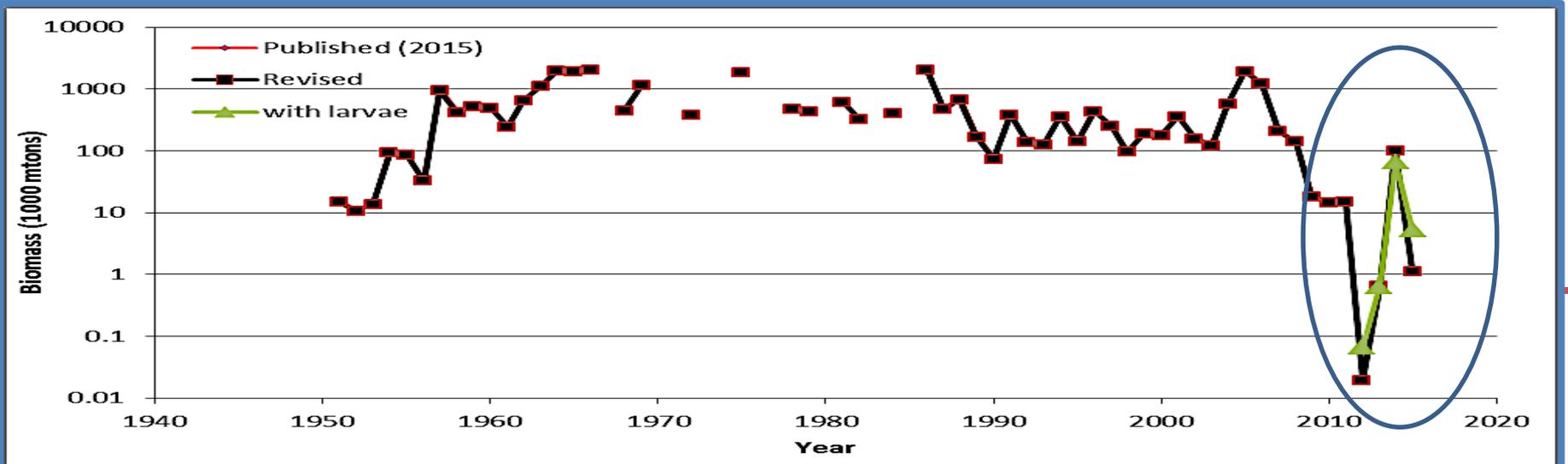


Percentage of non-predation mortality for chicks and fledglings, Naval Base Coronado.

Decline in CSNA Stock



Anchovy biomass estimates on a log scale, from MacCall et. al 2016

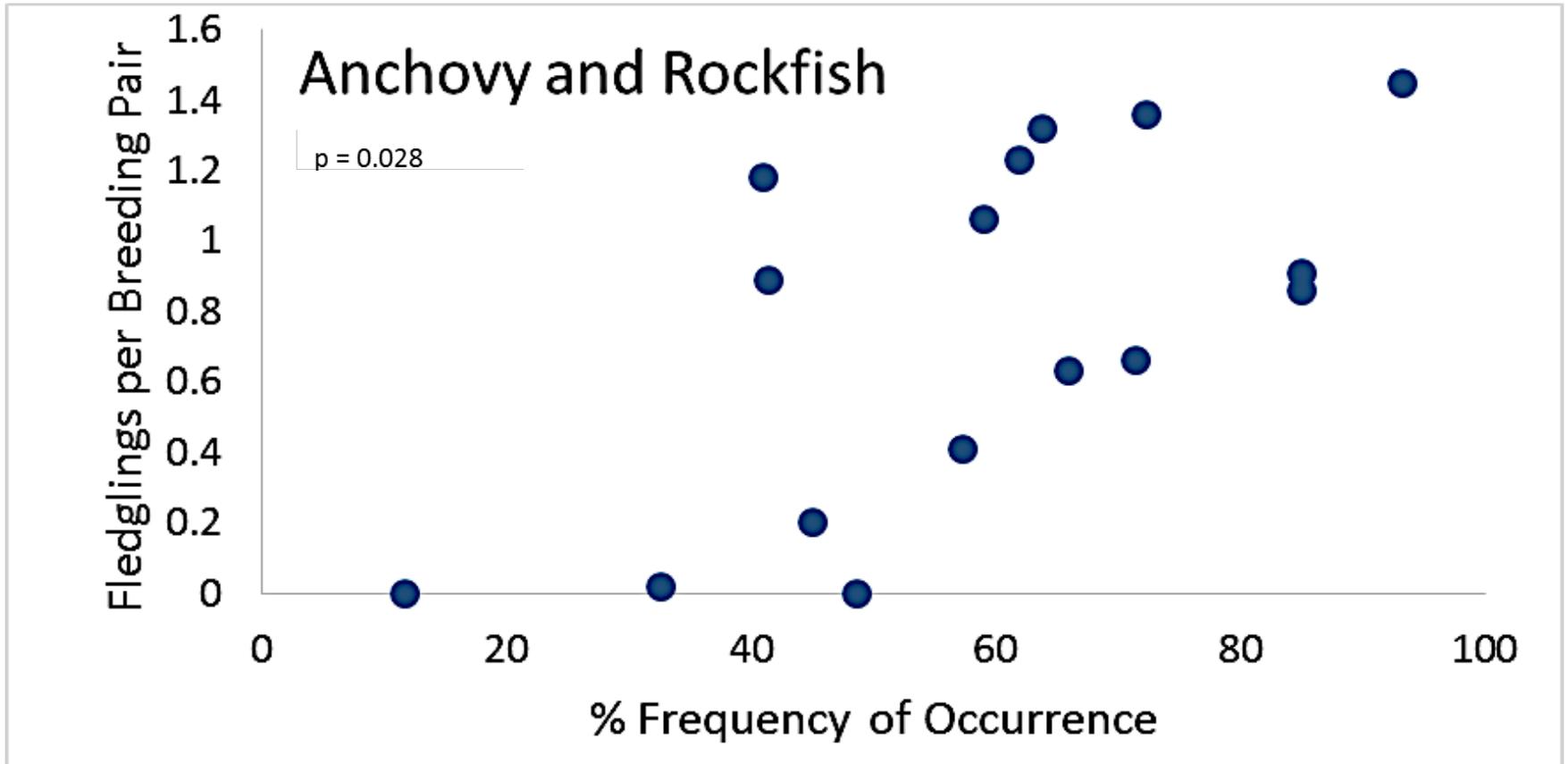


Effects of Declining Anchovy Stock on CLTE Nesting Productivity

- Point Blue Conservation Science - northern anchovy decreasing near CLTE colonies in Southern CA Bight
- Beneficial fish - anchovy and herring, YOY rockfish, silverside smelt
- Switch to fish larva, less nutritious food sources and nesting productivity goes down



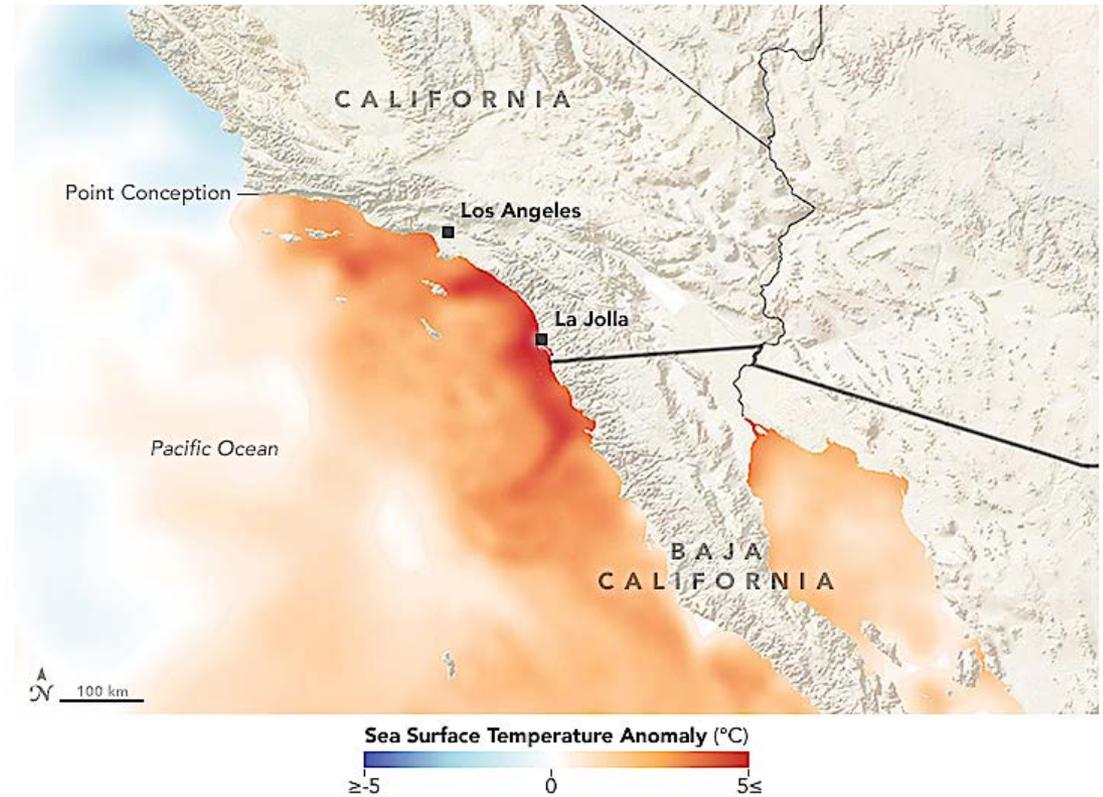
CA Least Tern with fish. Photo by B. Struck.



Significant relationship of CA least tern productivity with the presence of young-of-the-year (YOY) rockfish and age 1 anchovy in the diet of Central California birds. Figure provided by D. Robinette, Point Blue Conservation Science, 2017.

Additional Effects of Climate Change

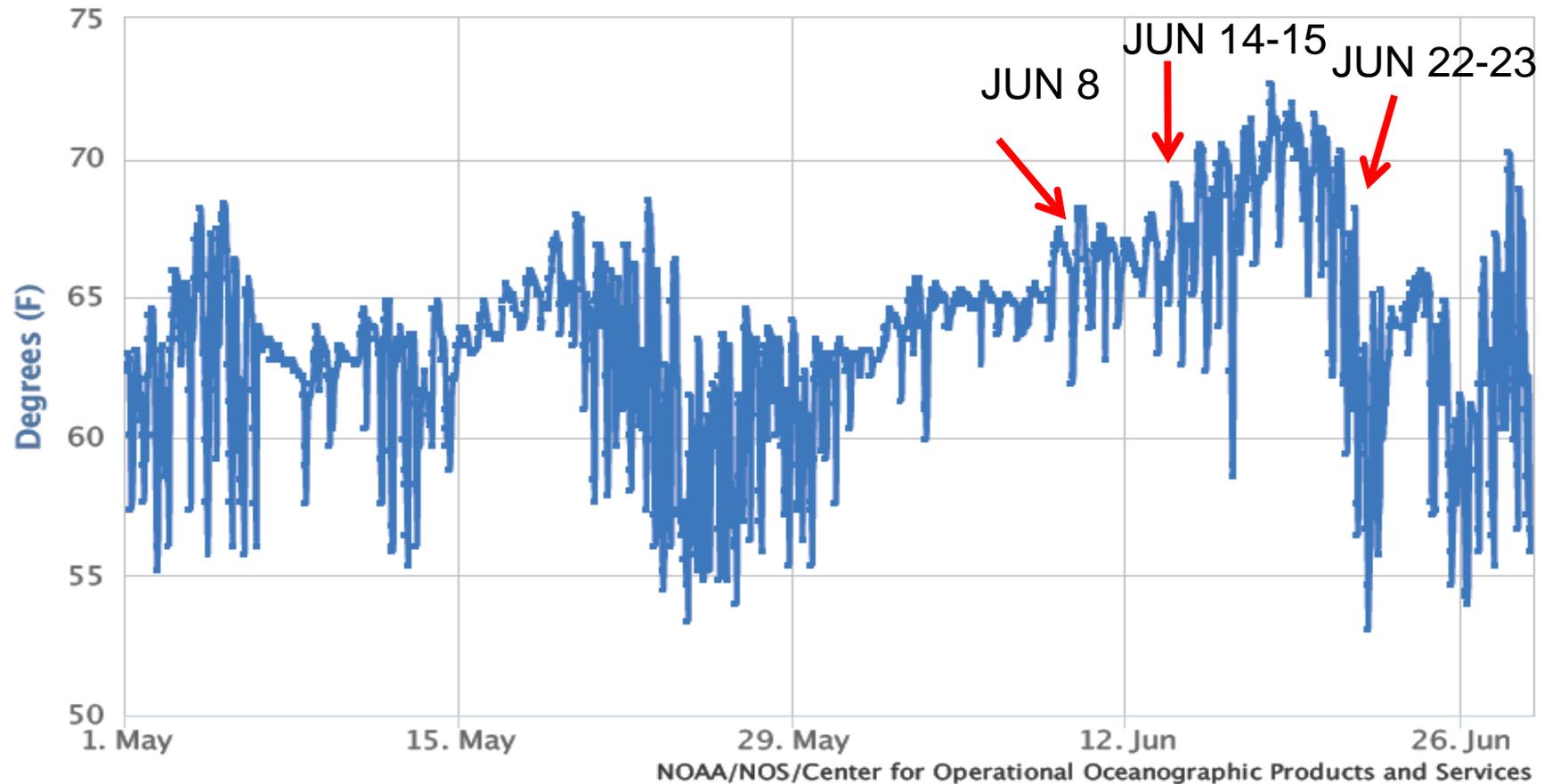
- “Warm blob” along our coastline
- Cold water fish move deeper into the water column
- Large “die-off” events in Southern CA colonies
- Worrying trends in chick and adult body weights



Sea surface anomalies, August 2018

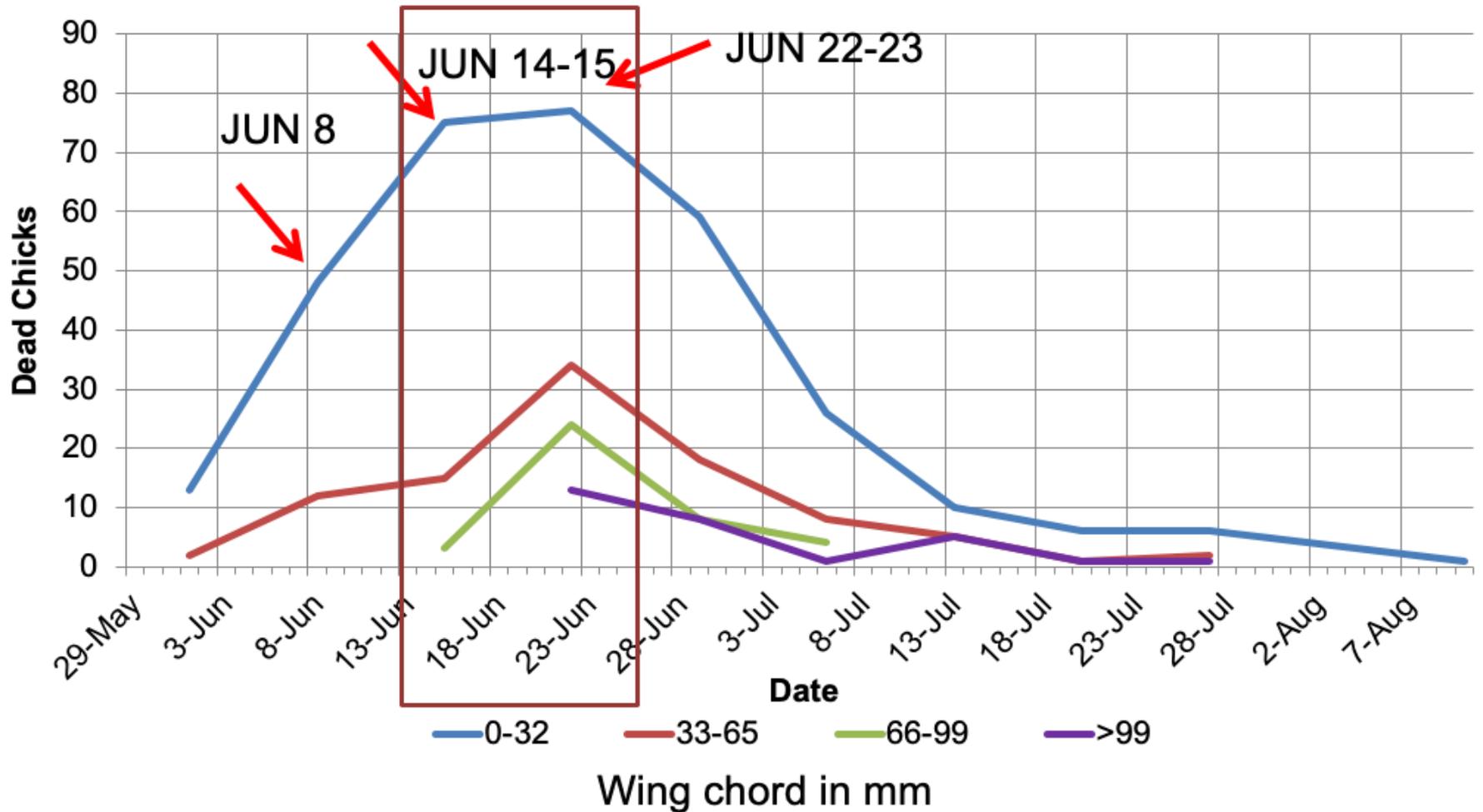
Increase in Sea Surface Temps.

NOAA/NOS/CO-OPS
Water Temperature at 9410230, La Jolla CA
From 2017/05/01 00:00 GMT to 2017/06/28 23:59 GMT



Spikes in sea surface temps at Scripps Pier, May 1 – June 30, 2017

CLTE chick mortality vs. “warm blob” event





29.85 inHg - 59°F 06/21/2018 07:26AM BA6



29.83 inHg - 70°F 06/21/2018 05:24PM BA6

Fish Declines In Southern California

Vol. 538: 221–227, 2015
doi: 10.3354/meps11444

MARINE ECOLOGY PROGRESS SERIES
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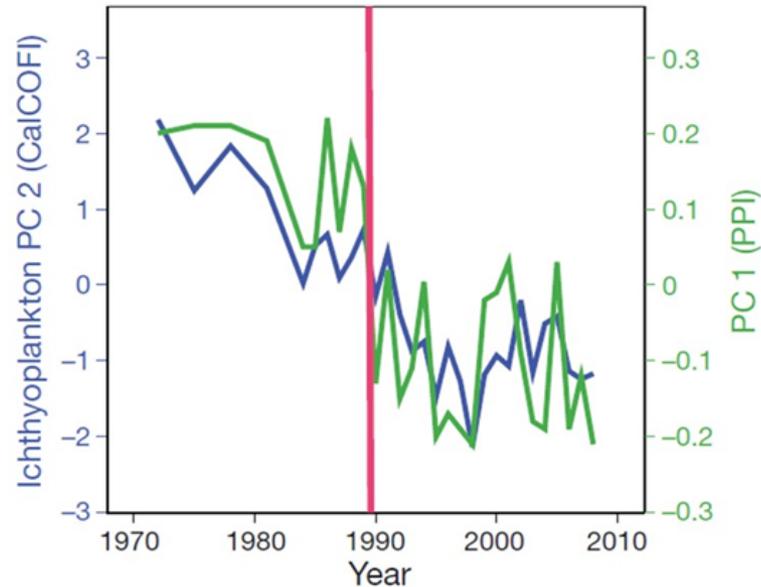
Published October 28

Dramatic declines in coastal and oceanic fish communities off California

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CSNA within the Monitored Stock Category

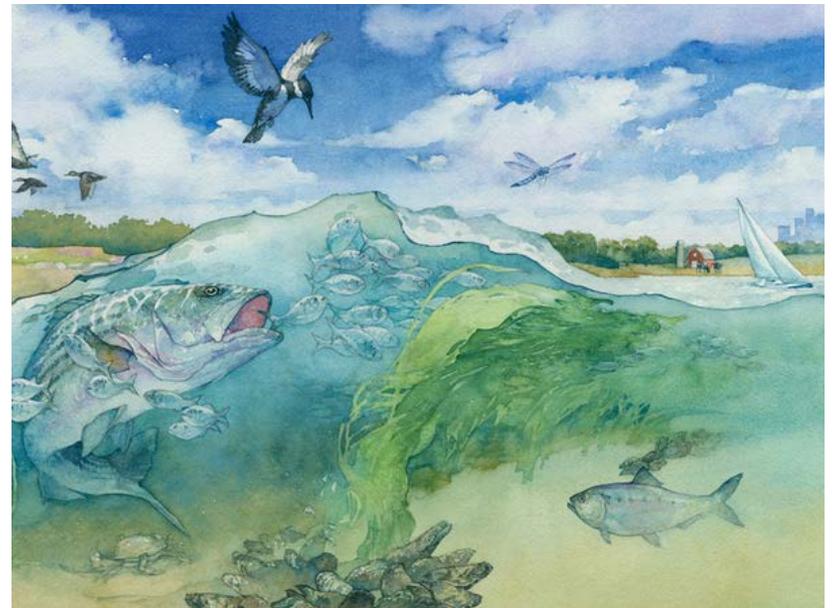
- Since 2016, annual catch limit for the stock is 25,000 mt.
- This limit is based off of a 1991 study, tracking pop. From 1960s-1990
- 2012-2015: Estimates show that stock is between 24,300 - 31,427 mt.



Northern anchovies, Jeanne Menjoulet

Our Ask: Eliminate the Monitored Stock category

- Same features and updates as Actively Managed Stock:
 - Annual stock assessments
 - Science-based catch limits that respond to fluctuations in population size
- Many unknowns: need for more pre-cautionary management or forage fish due to a changing ocean



Benefits to Other Marine Species



CA sea lion. Photo by Klaus Stiefel.



Brown Pelican. Photo by John Menard.



Humpback Whale. Photo by: Anite Ritenour

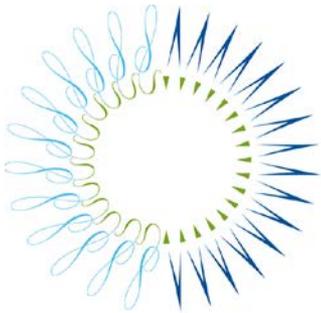
Summary

- Dramatic decline in FFP for CA Least Terns within the SoCal Bight
- Large chick die-off events that correspond with “warm blob” events
- Overall decline in larval fishes in Southern CA waters
- The Monitored Stock Category sets static catch limits that do not react to changing conditions to accommodate dependent marine predators, some of which are endangered
- The framework to begin Active Management of northern anchovy already exists

Acknowledgements



SAN DIEGO ZOO
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for a healthy planet.™



Fostering the protection and appreciation of birds, other wildlife, and their habitats...

Questions?

