

# The Case for Sustainable Anchovy Management

Agenda Item E.4.b  
Supplemental Public Presentation 1  
April 2019



Anchovy management controversy ~  
a manufactured “crisis”

*First presented November 2016, updated April 2017 and April 2019*

# Context: Please consider...

- Anchovy abundance is driven primarily by environmental forcing and variability occurs even without a significant fishery
- **Anchovy is only one species in the larger forage pool**
  - Fisheries harvest only 2% of key forage species, only 0.6% anchovy

## California Current Forage Fish Consumption

Agenda Item G.2.b. Sep '18-Parrish FEP Scoping

Table 1. Annual consumption (mt) of forage by major faunal groups and average (2000-2014) U. S. landings. (Calculated from Koehn et al. 2016: Table 1 and supplemental data).

Key Forage Species	TOTAL	Fishes	Mammals	Birds	Fishery	Fishery %
Sardine	918,256	379,032	530,061	9,163	76,754	8.4%
Anchovy	1,318,094	633,862	429,545	254,687	8,095	0.6%
Herring	913,513	709,657	136,559	67,297	1,829	0.2%
Other for. fish	1,322,808	906,608	220,288	195,911	16	0.0%
Juvenile fishes	2,887,172	1,691,576	842,913	352,682	0	0.0%
Market squid	1,309,632	406,604	650,128	252,901	80,460	6.1%
Pacific mackerel	100,146	23,915	75,512	718	5,860	5.9%
<b>Total</b>	<b>8,769,620</b>	<b>4,751,254</b>	<b>2,885,006</b>	<b>1,133,360</b>	<b>173,014</b>	<b>2.0%</b>
Euphausids	52,478,145	49,085,682	3,132,986	259,478	0	0.0%

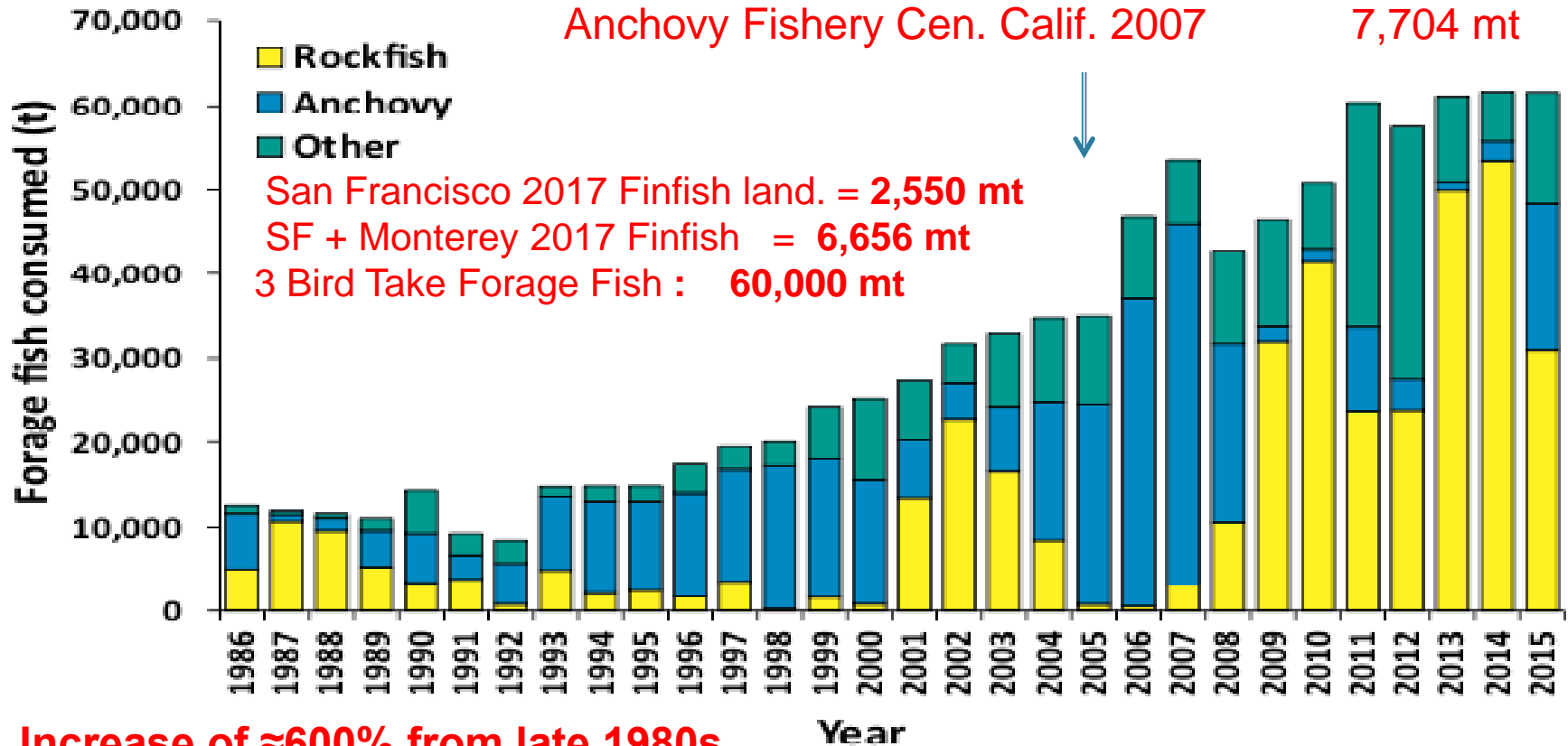
# Prey Switching Seabirds ~ Farallons

Warzybok et al 2018

P. Warzybok et al.

3 species anchovy Farallons 2007  
3 species take of anchovy in CC  
Anchovy Fishery Cen. Calif. 2007

42,000 mt  
122,547 mt  
7,704 mt

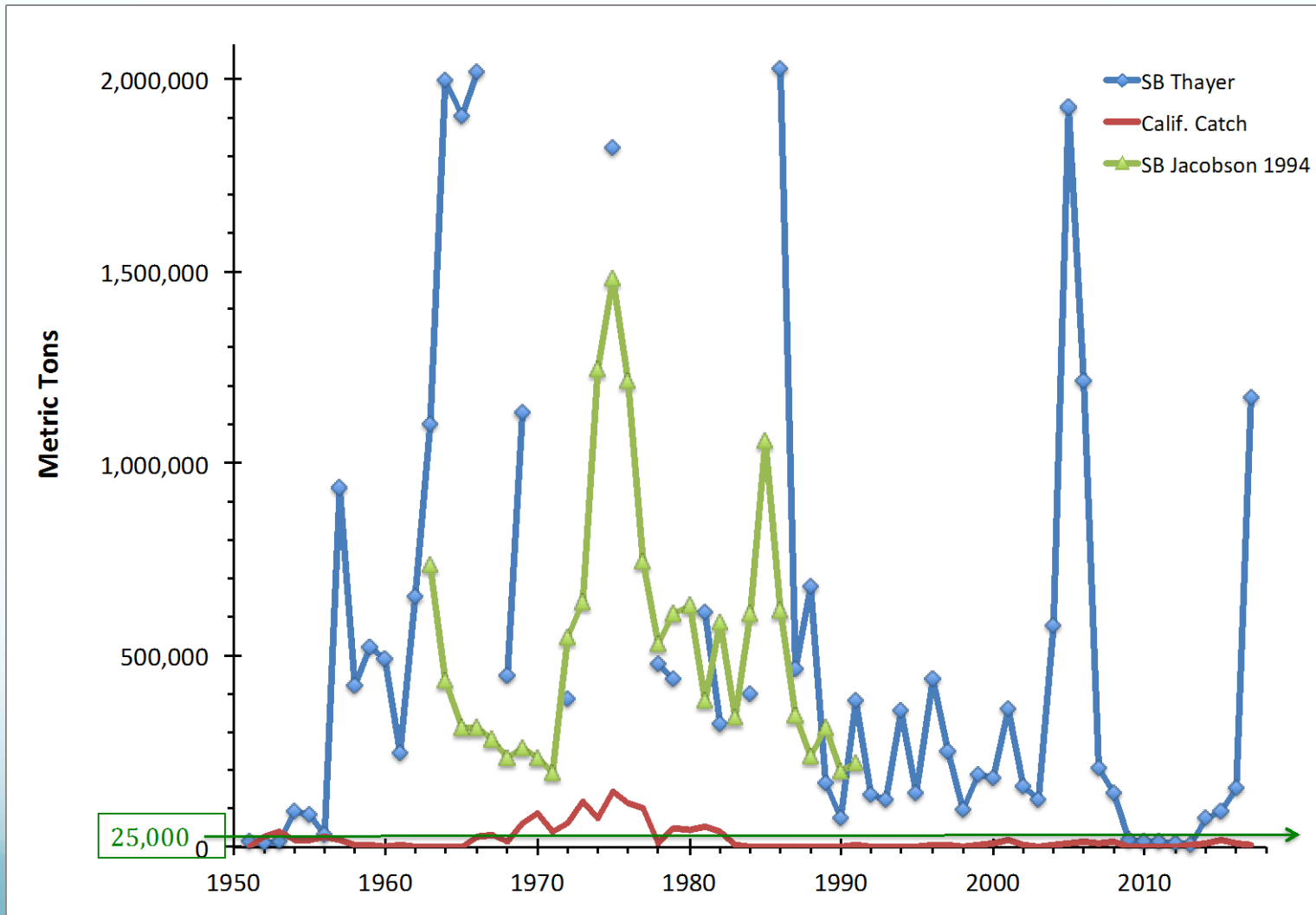


Increase of  $\approx 600\%$  from late 1980s

Fig. 2. Total forage fish consumption during the breeding season and annual prey composition for three abundant seabird species, which among seabirds are the most easily studied in terms of diet and foraging behavior: common murre, Brandt's cormorant, and rhinoceros auklet.

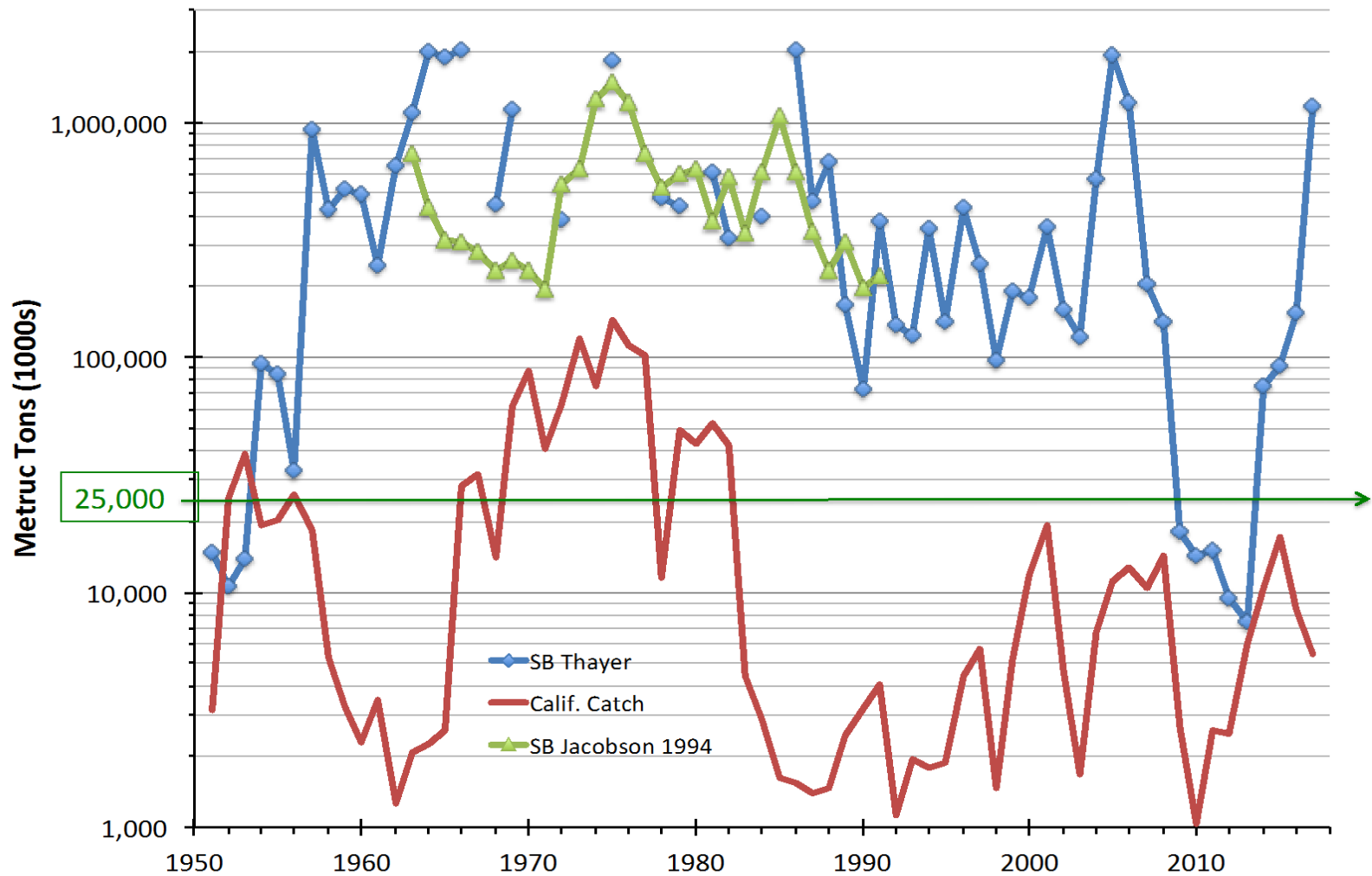
# Spawning Biomass vs. California Landings

(Thayer et al. 2017, Thayer Pers. Comm. for 2015-17 updated estimates and Jacobson et al 1994)



# Log Spawning Biomass: CA Landings

(Thayer et al. 2017, Thayer Pers. Com. for 2015-17 updated estimates and Jacobson et al 1994)



# Context: Biological considerations

- Young anchovy (age 0-2) always occupy the nearshore even when biomass is high.
- The nearshore area not covered in CalCOFI DEPM or ATM surveys
- Monterey resident stock (summer/fall spawning) also excluded from CalCOFI spring DEPM egg/larval surveys centered in S.CA.
- The biomass update submitted in November 2018 based on MacCall et al “DEPM Light” increased their 2015 minimum biomass estimate from 15,000 mt to 92,100 mt
  - (still underestimated ~ based only on S.CA. egg-larval data, excluded Monterey summer-fall spawning and nearshore abundance statewide)
- Despite the omissions, update estimated 2017 biomass at 1,169,400 mt
  - [The District Court judge who vacated the anchovy catch rule did not receive this “oops” update at the time of her ruling...]
- **Anchovy biomass now is similar to peak historic population level**

# Review of Egg/Larval Indices – 2016 Report by the SWFSC

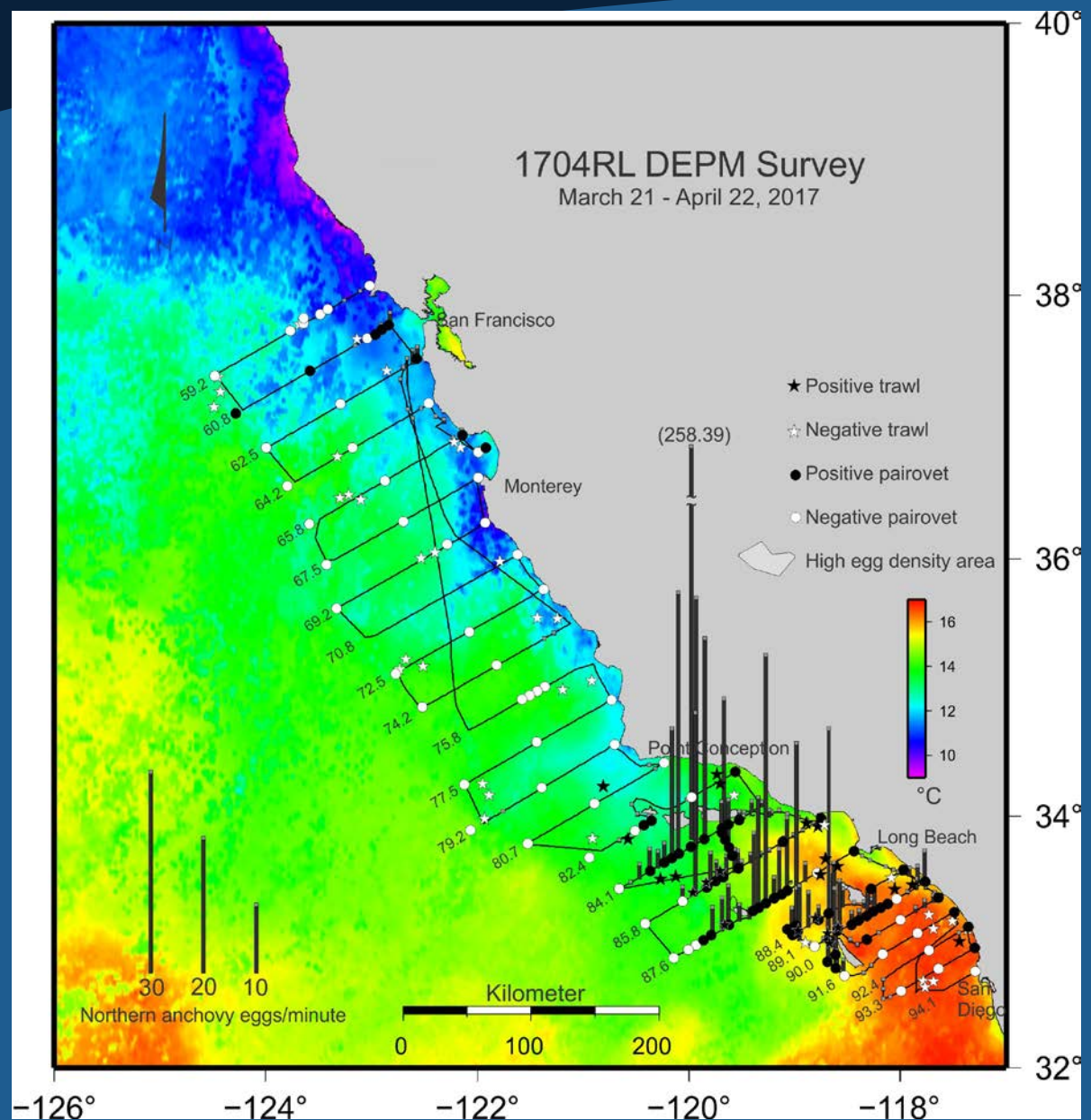
G4a\_Sup\_SWFSC\_Rpt2\_NOV2016BB

- Peak anchovy spawning in S.CA. is Feb. and Mar, but CalCOFI cruise periods cover only the tails of spawning activity ~ January and April
  - **CalCOFI survey was designed for sardine, not anchovy**
- We agree with the conclusion: [existing egg/larval data] are **not suitable for estimating biomass...the [CalCOFI survey area] is smaller than the geographical range of the stock**
- **Further, no egg/larval survey includes summer-fall spawning of Monterey anchovy**
- Even so ~ the **2017 SWFSC DEPM anchovy estimate** (E1b\_Supp\_SWFSC\_Presentation1\_Gerard\_NOV2018BB.ppsx) **indicated the S.CA. anchovy population has returned to high abundance observed in the 1980s (not collapsed!!)**

# 2017 DEPM Survey

➤ Distribution of Trawls, CUFES, and Pairovet tows

Borrowed from E1b\_Supp\_SWFSC\_Presentation1\_Gerard\_NOV2018BB.ppsx



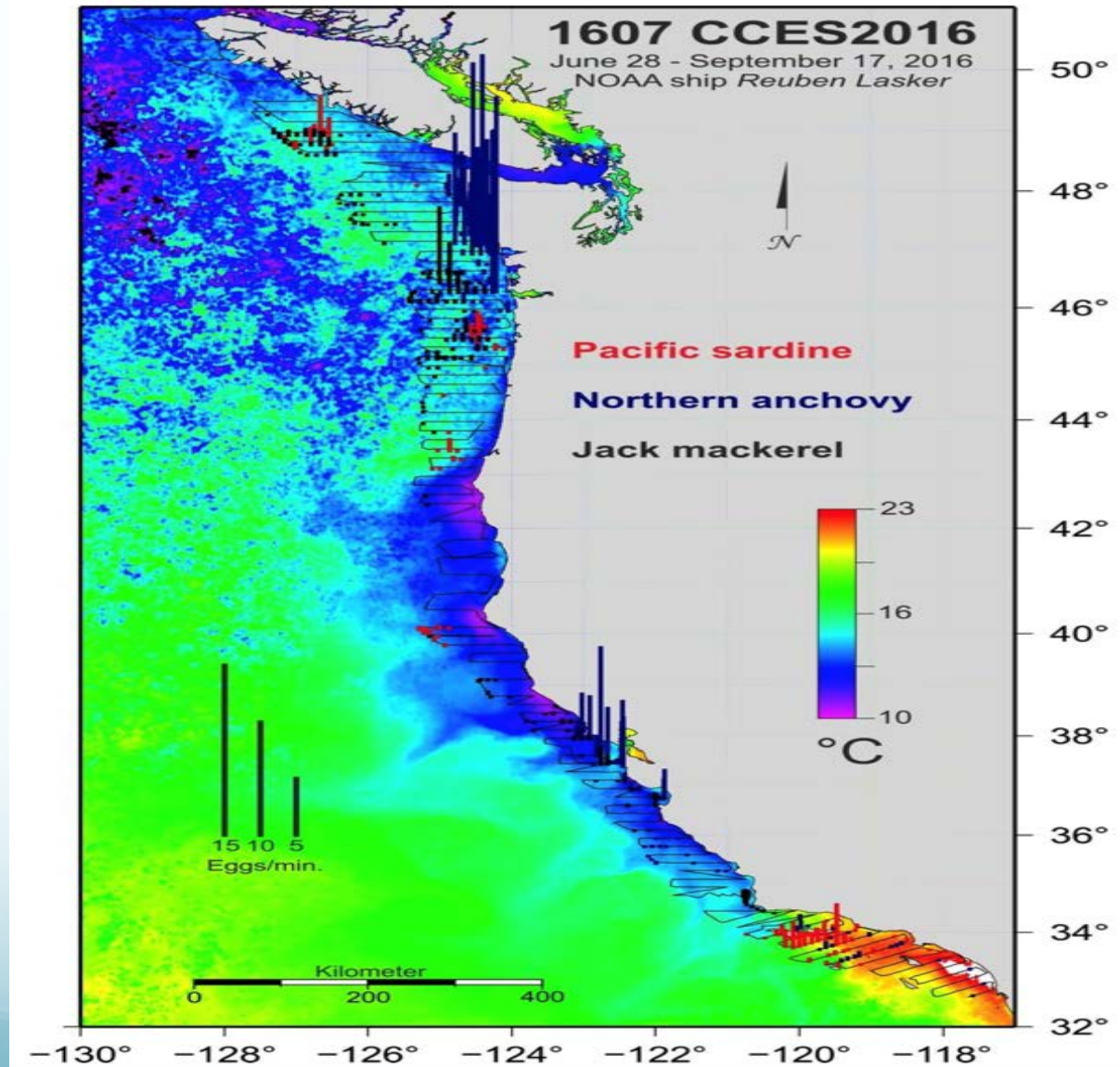


# Time series of spawning biomass

Method	Year	Region	Spawning biomass in mt (cv)
DEPM (SWFSC)	1982	San Francisco, CA - Baja California, Mex	378,000 (0.26)
DEPM (SWFSC)	1983	Moro Bay, CA - Baja California, Mex	652,000 (0.21)
DEPM (SWFSC)	1984	San Fransico, CA - Baja California, Mex	306,000 (0.17)
CalCOFI-Eggs & Larvae (Fissel et al. 2011)	2009	Avila Beach, CA - Baja California, Mex	159,370 (-)
DEPM Light (McCall et al. 2016)	2009-2011	San Francisco, CA - San Diego, CA	15,000 (-)
DEPM (SWFSC)	2017	San Francisco, CA - San Diego, CA	308,173 (0.36)

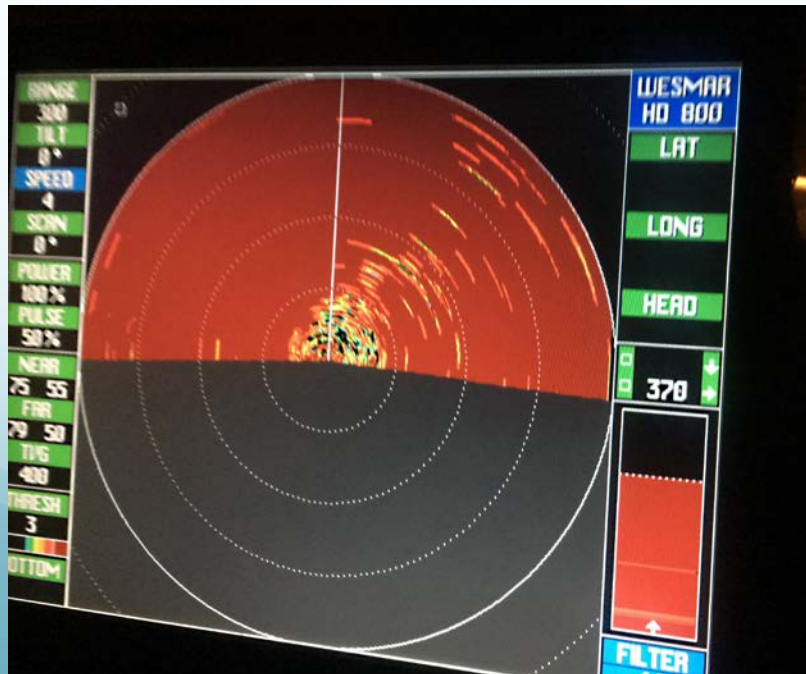
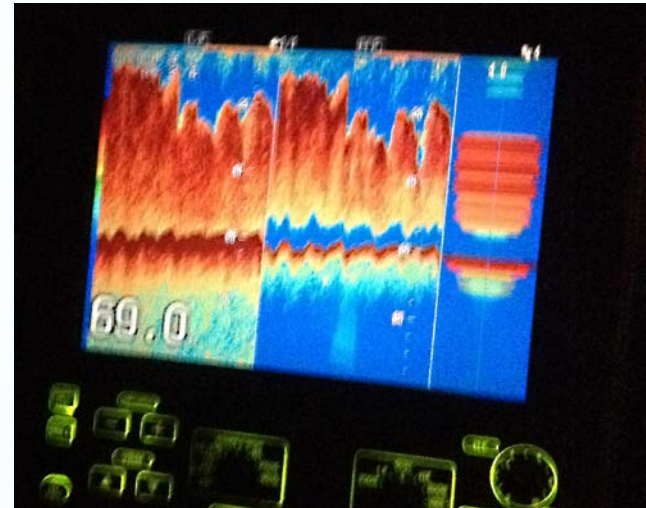
# Summer/fall spawning in Monterey

Resident  
summer/fall  
spawning  
Monterey  
anchovy  
population is  
not included in  
CalCOFI  
Spring DEPM  
estimates



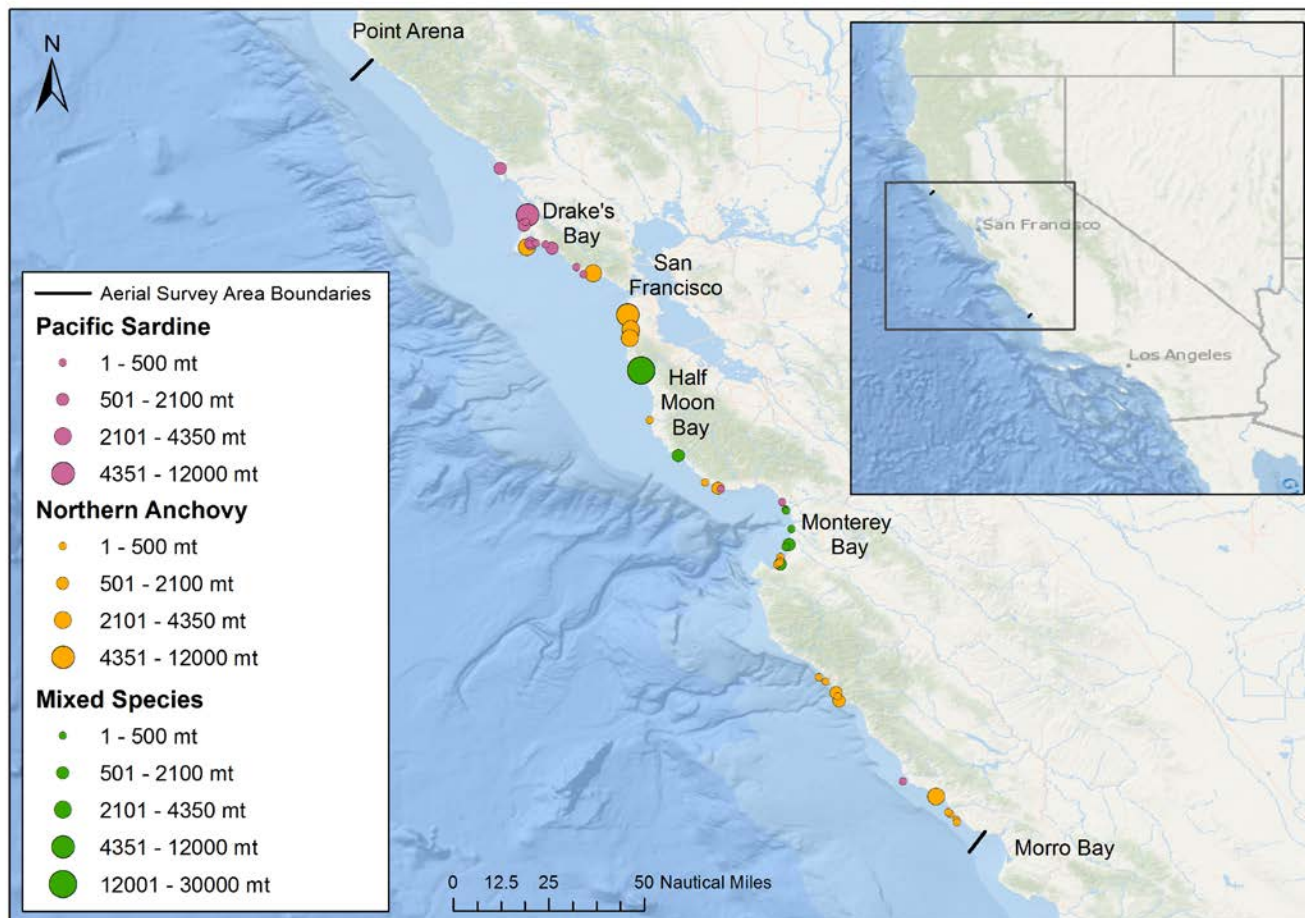
# Fishermen have reported anchovy abundance since 2014 ~ finally validated

Sonar and fathometer screen images from Farallon Is. To S.C.A. Schools for miles and miles ~ tens of thousands of tons



# CDFW/CWPA Aerial Survey also documented abundance

Northern California Summer 2017 CDFW-CWPA Aerial Survey Observations



# Core Issues...

- **NO current survey covers the full range of CA anchovy (or sardine)**
  - **The CalCOFI spring S.CA. egg-larval survey misses the nearshore and DEPM does not measure summer-fall spawning in Monterey**
  - **ATM survey does not cover nearshore area (or upper water column), plus summer survey has missed S.CA. in recent years ... in addition...**
- **CIE reviewers at ATM methods review recommended **ATM NOT BE USED for absolute biomass FOR ANY CPS until nearshore abundance is accounted for.****
  - (CDFW and CWPA are developing aerial survey method to estimate abundance in the nearshore.)
- **Lack of data (including time series of age) precludes developing an accurate biomass estimate or integrated model to estimate biomass now.**

# One interim option suggested by SSC

Agenda Item C.4.a Supplemental SSC Report 1, April 2018

- Short-term: use ATM survey to set OFL by multiplying anchovy biomass estimate by estimate of Emsy (expressed as proportion)
  - Fmsy estimate SSC approved for northern subpop. = 0.3
  - **Emsy/OFL from NMFS proposed rule = 0.239**
- **But prior to using ATM survey results, it is necessary to apply nearshore correction factor**  
(Agenda Item C.4.a Supplemental SSC Report 1 Apr 2018)
  - ATM review panel suggested extrapolation as a short-term option, but recommended **conducting nearshore survey as preferred approach**
  - **We hope the SSC will approve our aerial survey method soon!**

# Alternative Control Rules

Agenda Item C.4 Attachment 4, Andre Punt, April 2018

- Adopted in cases where **index of abundance is relative** vs. absolute (as with anchovy)
  - Both AT and egg-larval surveys are relative indices
- **Adjust catch limits based on trends in biomass estimates**
- Some HCRs use **multiple relative abundance indices**
  - **For CPS, include both AT and DEPM/CalCOFI data (and other indices)**
  - Set multi-year catch limits (e.g. ABC given fixed OFL at average biomass levels or thresholds)
- **Assign harvest rate categories based on values of indices and only change OFL/ABC if a category changes**
  - **Dynamic approach**
- **MSE should be used to help Council select a way to use ATM results or test management strategies**
  - Construct operating model to evaluate many scenarios
  - Sardine MSE may provide good starting point

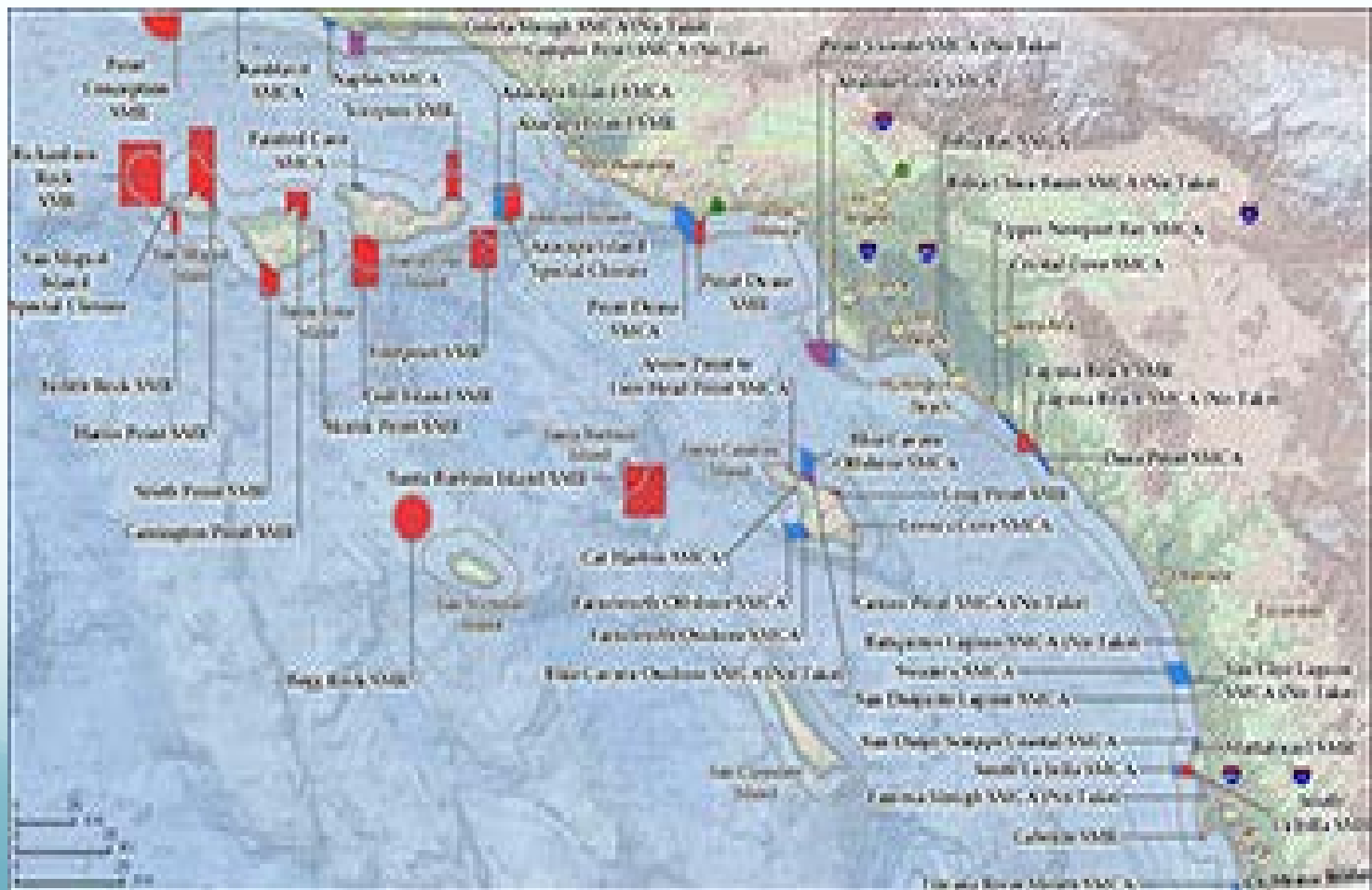
# Anchovy Management Considerations

- The anchovy OFL/MSY (**Emsy**) is intended to reflect the **largest long-term average fishing mortality** rate that can be harvested over the long term
  - Given anchovy's high variability (**even without fishing**), **OFL should be based on a trend – not a single stock assessment**
  - No documented evidence exists that current fishing has had competition effect on dependent predators
    - Most predators have opportunistic diets, e.g. prey switching
    - **Olsen et al 2018 ecosystem modeling indicated that small pelagic fish harvest could be doubled with negligible harm to ecosystem function**
- **Also important to recognize that CA has MPA network in place to protect forage for place-based predators**



# In addition to harvest limit, CA has no-fishing Marine Reserves

- Many reserves sited near bird rookeries and marine mammal haul outs ~ including the **front side of Anacapa Island**

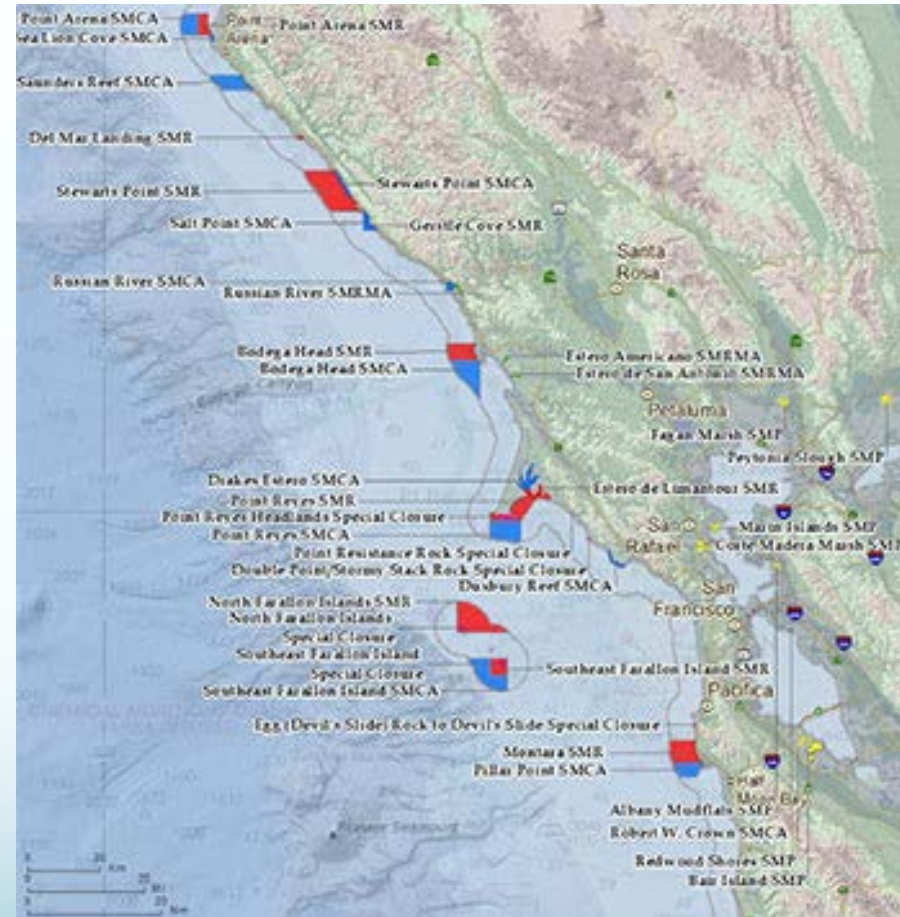


# More MPAs include Año Nuevo and Farallon Islands

## Central California



## North Central CA



# Habitat Considerations / Tradeoffs

## Protected Species vs Fisheries

- Most of the abundant protected species in the California Current have critical breeding areas on offshore islands and remote areas of the coastline, many protected by marine reserves.
- **In contrast, CPS fisheries have critical berthing, mooring and processing facilities that will be permanently lost if fisheries decline to very low levels.**
  - The areas suitable for berthing, mooring and processing are extremely limited; this is particularly true in California.
- Prey switching is very common in marine mammals and birds – **but not in fisheries.**
- **California's CPS fisheries are highly dependent upon just 4 species; market squid, sardine, Pacific mackerel and anchovy.**
  - Sardine is now closed; squid availability is influenced by El Niño.
- **Tradeoffs:**
  - Need to consider the critical importance of **maintaining fishing infrastructure**
  - **CA's anchovy fishery harvests small portion of anchovy available (<1%)**
  - MSA mandates **BALANCE** between fishery and forage needs.

# Socio-Economic Considerations

- **The anchovy fishery is very important to CA's historic wetfish industry**
- Anchovy fishery is necessary (especially in Monterey) to keep fishing boats employed and market doors open, especially when no other CPS are available (as in 2015 and 2018)
  - Fish meal production is gone from CA
  - Landings for the past two decades averaged less than 10,000 mt per year (2017 landings were 5,502 mt)
- **CA's wetfish industry needs to maintain the opportunity to fish anchovy when abundant and other CPS are not available**

# CA Ports Rely on CPS Fisheries



## **Moss Landing**

CPS average

94% of port landings

63.9% of dockside value



## **Monterey Harbor**

CPS average

88.8% of port landings

44.4% of dockside value

Fishing takes place close to harbors to preserve quality.  
Fishermen rely on a complex of CPS – 4 legged stool –  
including anchovy

# Economic Impacts in Monterey

- 3 major processors
- All rely on anchovy at least 6 months a year
  - Fill in-between squid season, or when other CPS are unavailable
- As many as 1,000 people directly affected
  - Up to 15 vessels with average 5-6 crew
  - 300+ plant workers
  - Trucking
  - Packaging
- **Anchovy is a lifeline ~ keeps boats and markets working**

# Our Recommendations for Anchovy Management

- [1] **Acknowledge anchovy abundance reported by fishermen coast-wide** and now validated by NOAA surveys
- [2] Support the need to **expand surveys into the nearshore as a high priority** to properly carry out a defensible survey that can be used in a population model
- [3] Recognize that **Monterey has a resident anchovy population that spawns in summer-fall**, and **incorporate that data** (both egg/larvae, AT estimate and nearshore estimate) into stock assessments
- [4] **Support Management Strategy Evaluation (MSE) as high priority** and continue the **step-wise approach** to gather data essential to produce an integrated population model to assess biomass accurately.

# Recommendations for Anchovy Management ~ 2

- “Monitored” is simply a word to characterize a fishery with relatively small landings
  - This concept can be addressed without using the word by developing a stock-assessment priority framework
- Industry needs sustainable HG to develop business plans for the future (e.g. surety of 25,000 mt catch limit)
  - Not a Yo-Yo approach that changes annually
- **We’re concerned about long-term ability to fund annual surveys, annual stock assessments for CPS fisheries**
  - Sardine fishery is closed, anchovy landings average < 10,000 mt per year
- We’re working on a ‘stepped’ harvest approach to provide conservative and sustainable harvest opportunity, with set harvest levels scaled to thresholds
- **BUT NEED MSE FIRST!**
  - (As soon as adequate age data are available)



# Last word: No crisis (or collapse) exists

- There is **no biological point of concern** re: anchovy abundance
- but there could be a serious **socio-economic point of concern** if the small harvest limit now allowed in the anchovy fishery is further restricted.
- **The key to the future is accurate stock assessments!**

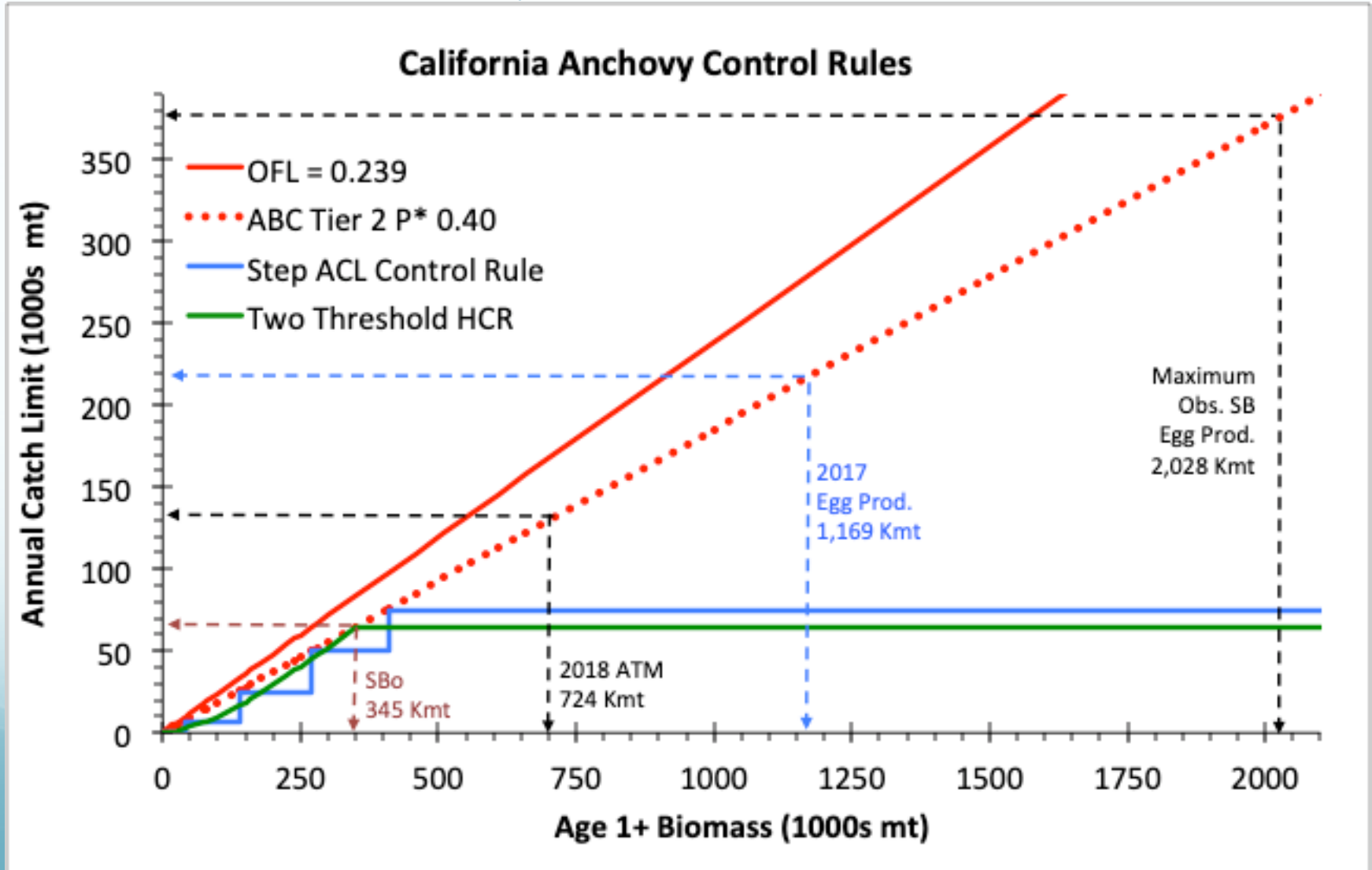


Thank you for your attention!  
Questions?



# Examples of Two Step Threshold and Step ACL Control Rules (for MSE)

Reference Points, parameters and current biomass estimates based on recently published or NMFS proposed values



# Close up: Two Step Threshold and Step ACL Control Rules (for MSE)

Reference Points, parameters and current biomass estimates based on recently published or NMFS proposed values

