Agenda Item G.2
Northern Anchovy Management (Central Subpopulation)

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OCEANA Protecting the World's Oceans

Summary of Requests

- Initiate move from monitored to active management
- By April 2018
  - Update Harvest Specifications (OFL, ABC, ACL)
  - Establish MSST
- Prioritize completion of full stock assessment
- Set an ecosystem-based harvest control rule, with cutoff

Management Concerns

- Current OFL out of date, not based on best available science
- No way to determine whether stock is overfished or depleted
- Static quota does not account for natural variation in stock
- Ecosystem effects of fishing, optimum yield not assessed or incorporated

Updating OFL

- Must be based on best available science and current stock & oceanographic conditions

- SSC/CPSMT Option C – Sub-option 1
  - F_{MSY} multiplied by annual abundance estimate
  - Data is available now

- NMFS now providing annual abundance estimates via ATM survey → consistent with active management

Minimum Stock Size Threshold

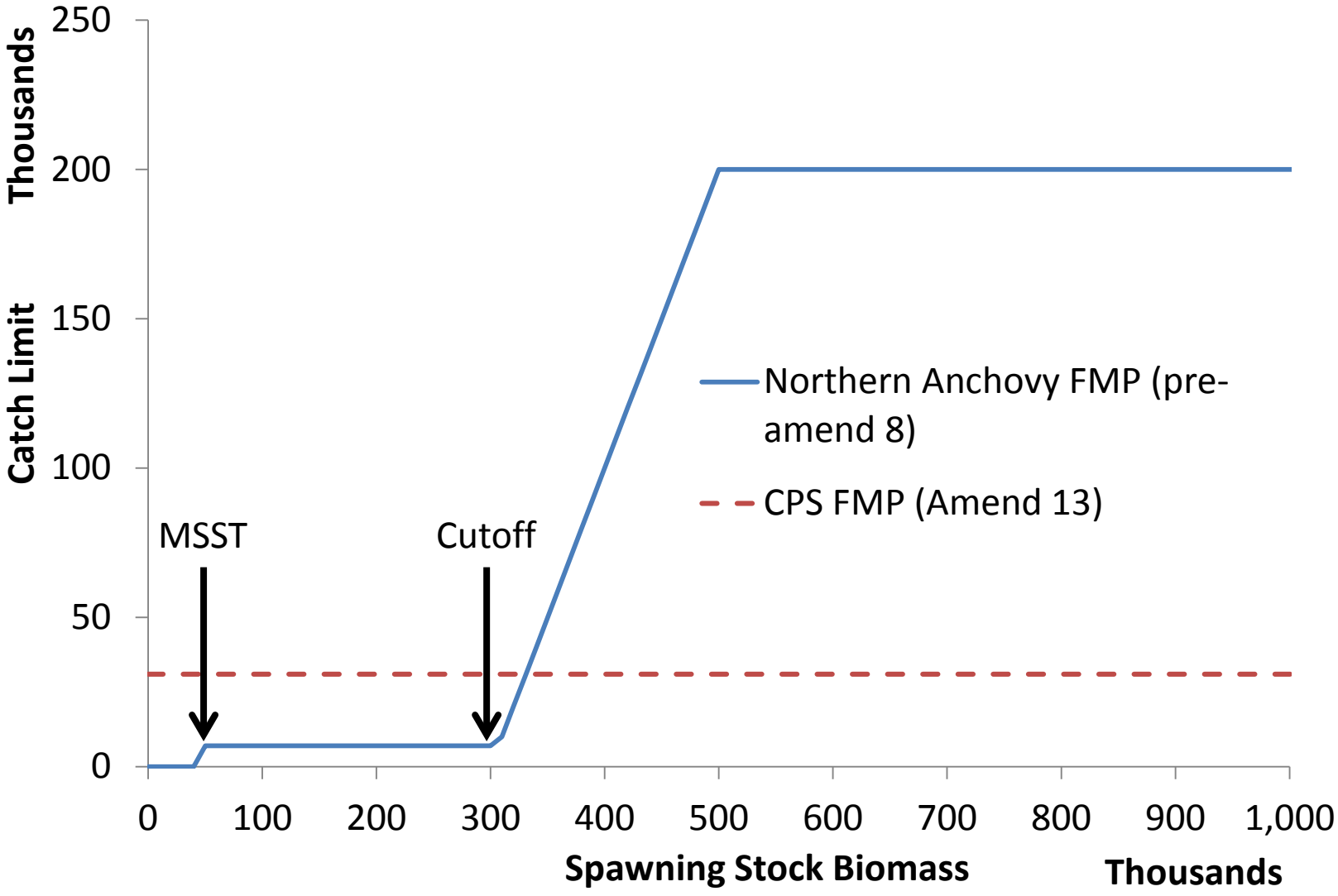
FMPs must "specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished". 16 USC § 1853 (a)(10)

Table 7. Estimates of equilibrium SSB_{MSY}, SSB_0, and dynamic SSB_0, with associated MSST calculations. Calculated MSSTs are provided in the lower half of the table.

	Pacific Sardine	Pacific Mackerel	No. Anchovy CSP	Jack Mackerel	No. Anchovy NSP
Metric \ Source	Hill et al. 2016	Crone & Hill 2015	Jacobson et al. 1995 & SRFIT	MacCall & Stauffer 1983	none available
Natural Mortality (M)	0.4	0.5	0.8	0.46	nd
Equilibrium SSB_{MSY}	101,790	55,297	139,561	nd	nd
Equilibrium SSB_0	421,572	156,849	345,246	1,360,800	nd
Dynamic $SSB_{0current\ (1\ gen)}$	349,726	122,996	nd	nd	nd
Dynamic $SSB_{0current\ (2\ gen)}$	608,484	130,763	nd	nd	nd
Current MSST Definition	50,000	18,200	50,000	nd	nd
$0.5*SSB_{MSY}$ (for M>=0.5)	na	27,649	69,781	nd	nd
$(1-M)*SSB_{MSY}$ (for M<=0.5)	61,074	na	na	nd	nd
$0.2*SSB_0$	84,314	31,370	69,049	272,160	nd
$0.2*SSB_{0current\ (1\ gen)}$	69,945	24,599	nd	nd	nd
$0.2*SSB_{0current\ (2\ gen)}$	121,697	26,153	nd	nd	nd

September 2016 NMFS Report on CPS MSSTs

Harvest Control Rules for CSNA

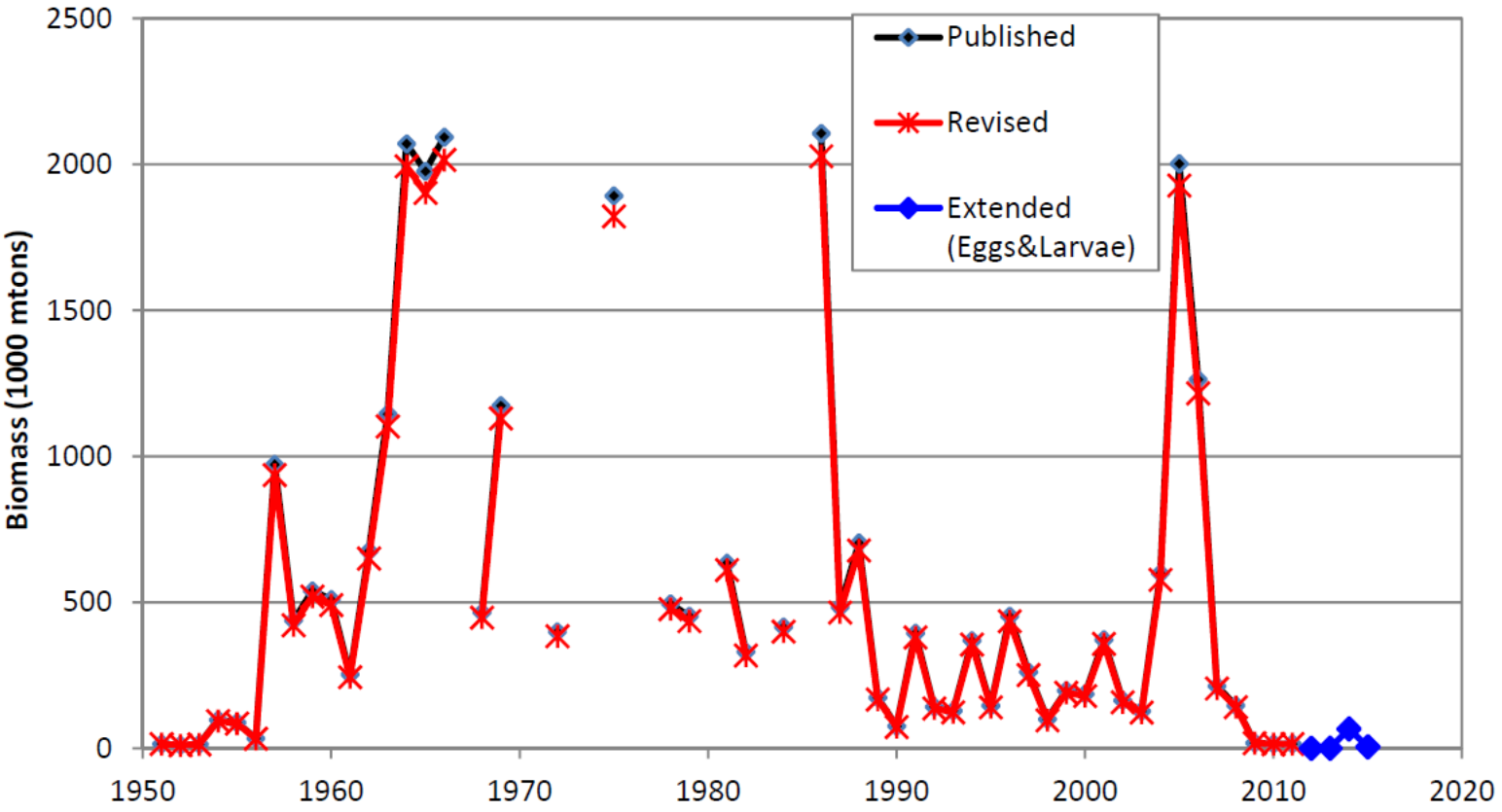


Rationale for Cutoff

Northern Anchovy FMP (Amend 6) (1990):

"The biological rationale for the 300,000 mt threshold is to prevent depletion of the resource and to provide an adequate forage reserve for marine fishes, mammals, and birds."

Clear evidence of CSNA collapse 2009-2015



Thayer et al. 2017

From NMFS 2017 ATM survey report:
2015 ATM biomass estimate: 16,415 mt
2016 ATM biomass estimate: 151,558 mt

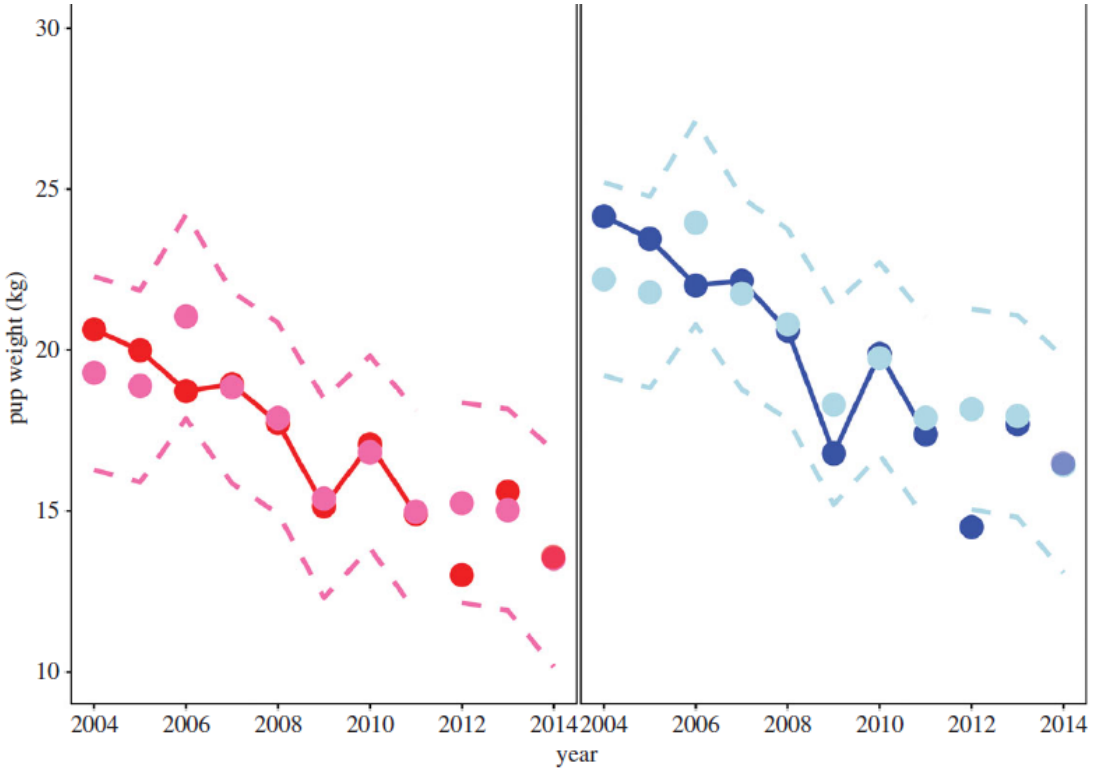
Food limitation of sea lion pups and the decline of forage off central and southern California

Sam McClatchie, John Field, Andrew R. Thompson, Tim Gerrodette, Mark Lowry, Paul C. Fiedler, William Watson, Karen M. Nieto, Russell D. Vetter

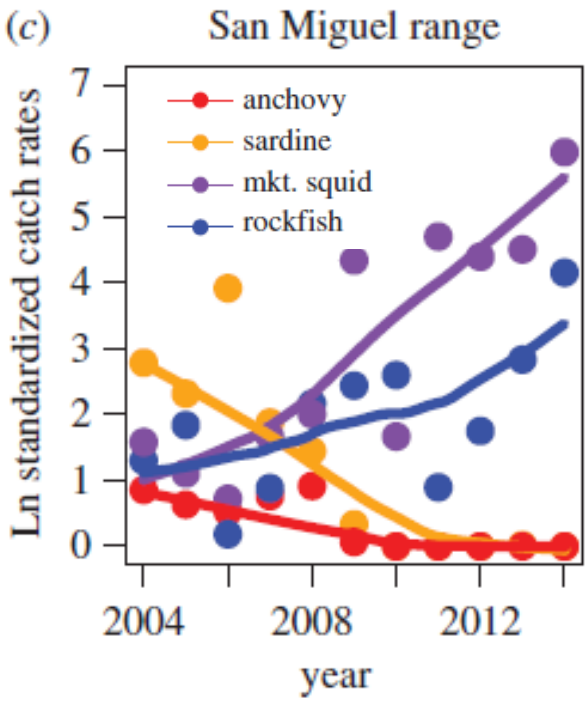
Published 2 March 2016. DOI: 10.1098/rsos.150628

ROYAL SOCIETY OPEN SCIENCE 2016

Sea lion pup weights



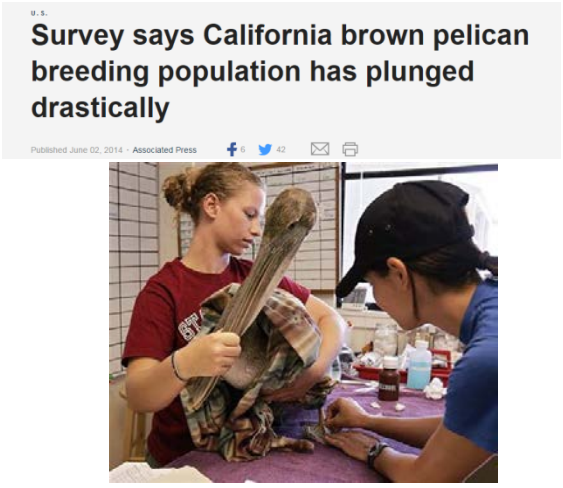
Forage available



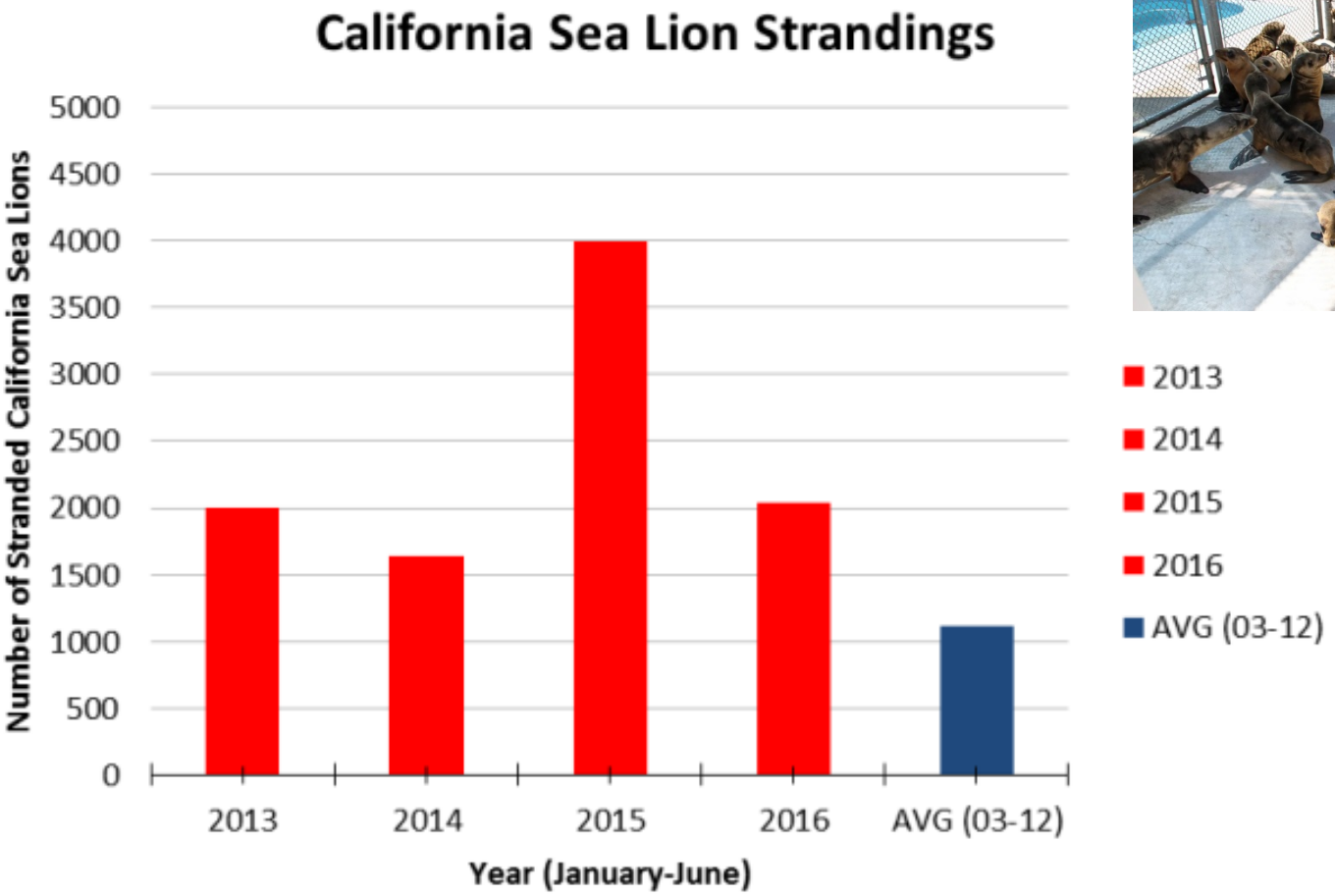
Sea lion Unusual Mortality Event caused by insufficient availability of sardines and anchovies

Detecting and Addressing Ecological Concerns

- Identify dependent predators
- Identify indicators and reference points for inadequate forage triggering management action/Point of Concern
  - Examples: CA sea lion Unusual Mortality Event, brown pelican nesting failures
- Consider temporary area closures at known foraging grounds if inadequate prey detected
- Ecological expertise needed



Example Indicator of Forage Availability



http://www.nmfs.noaa.gov/pr/health/mmume/californiasealions2013.htm

Current Science Enables and Indicates Need for Active Management

- Continued improvement:
  - ATM Methodology review, integrated stock assessment, survey coverage, aerial surveys
  - Real-time management – minimize lag between surveys and harvest specs
  - Integrated stock assessment
  - Management strategy evaluation including ecosystem