28 May, 2018. Marine Mammal Commission, Seattle

Status and Trends: Pinniped Abundance and Distribution in the North Pacific

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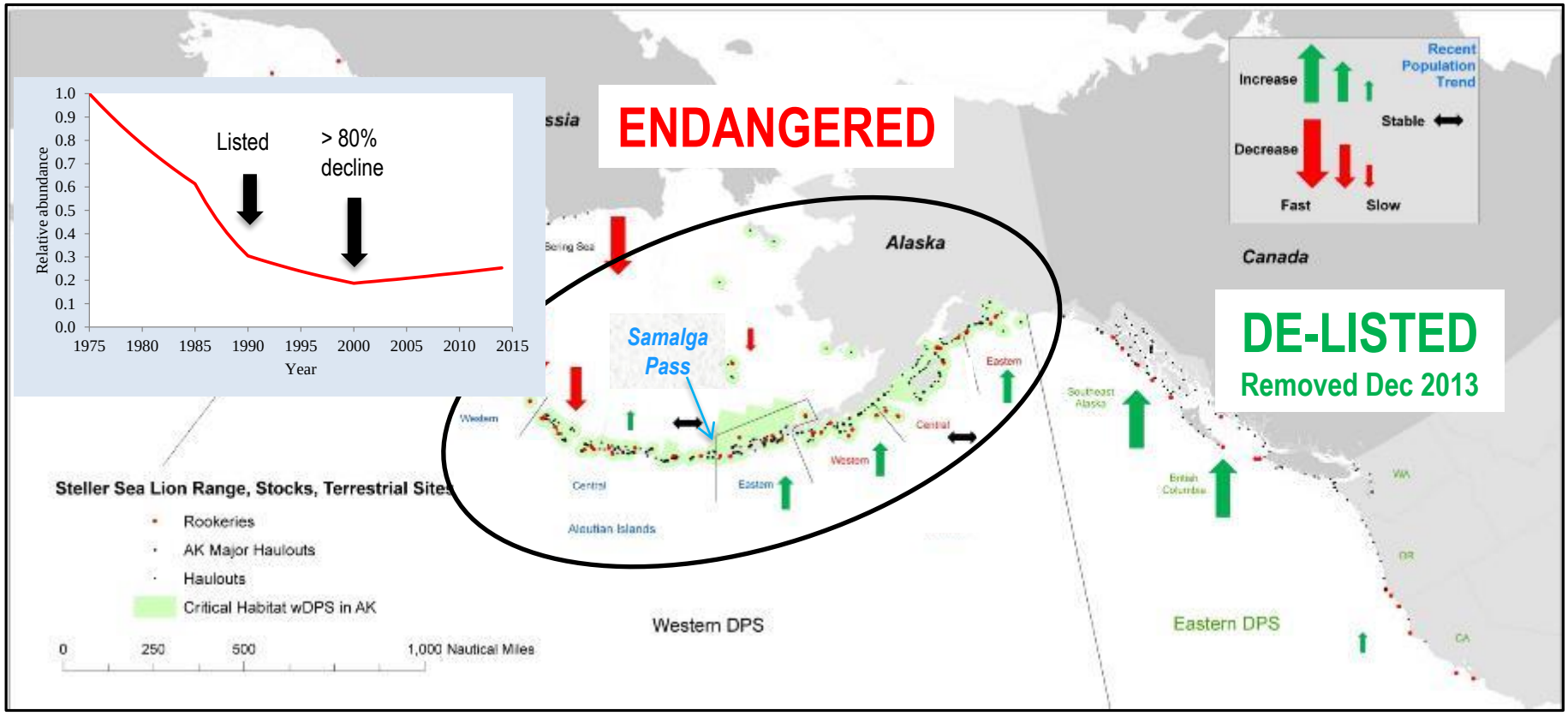
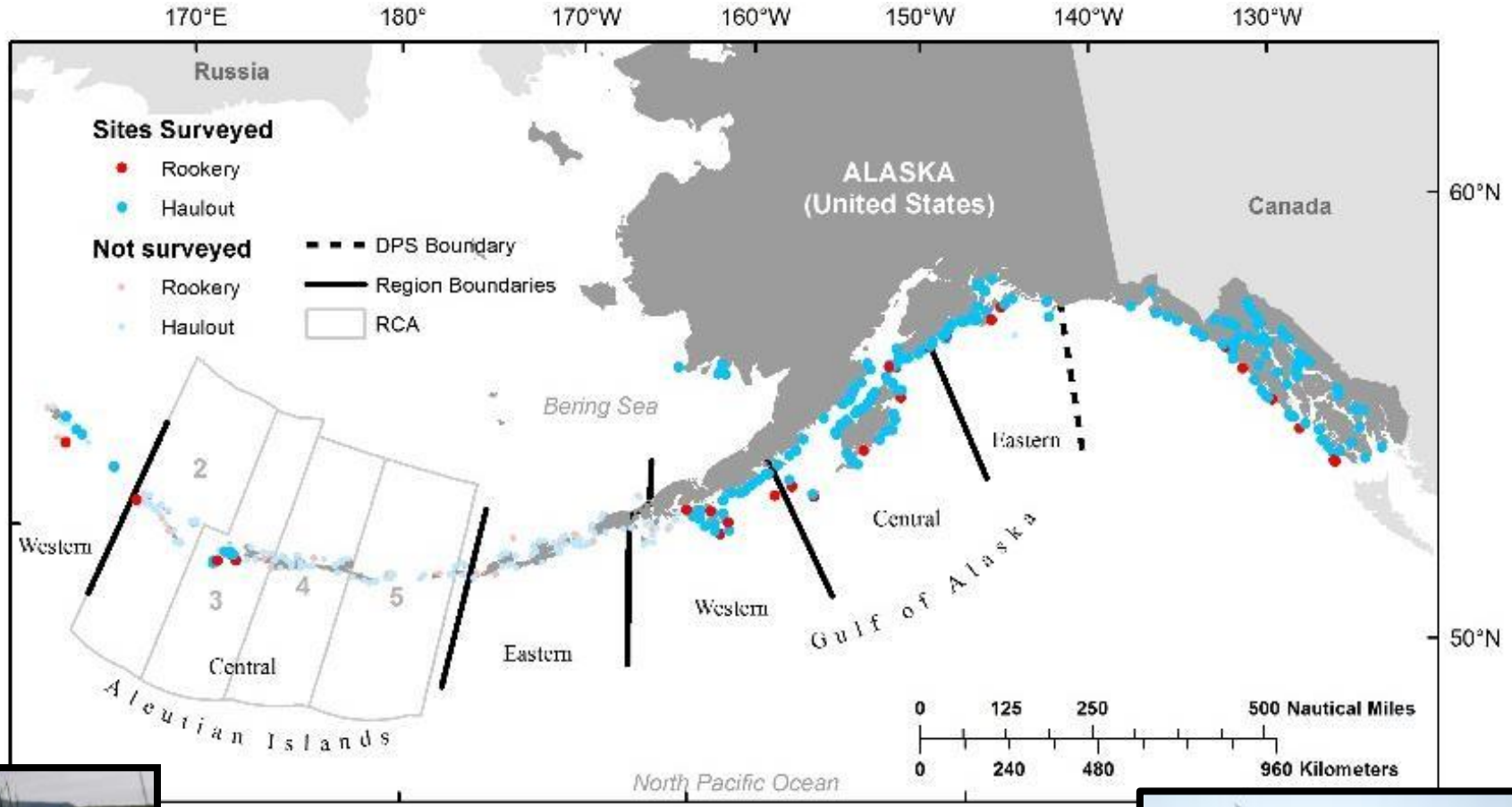
Steller sea lion abundance and stock structure



- Two Distinct Population Segments: wDPS endangered, eDPS delisted
- Sub-structure within wDPS
  - Asia, “Oceanic” AK west of Samalga Pass, “Shelf” AK east of Samalga Pass
- Regional variation in recent population trends

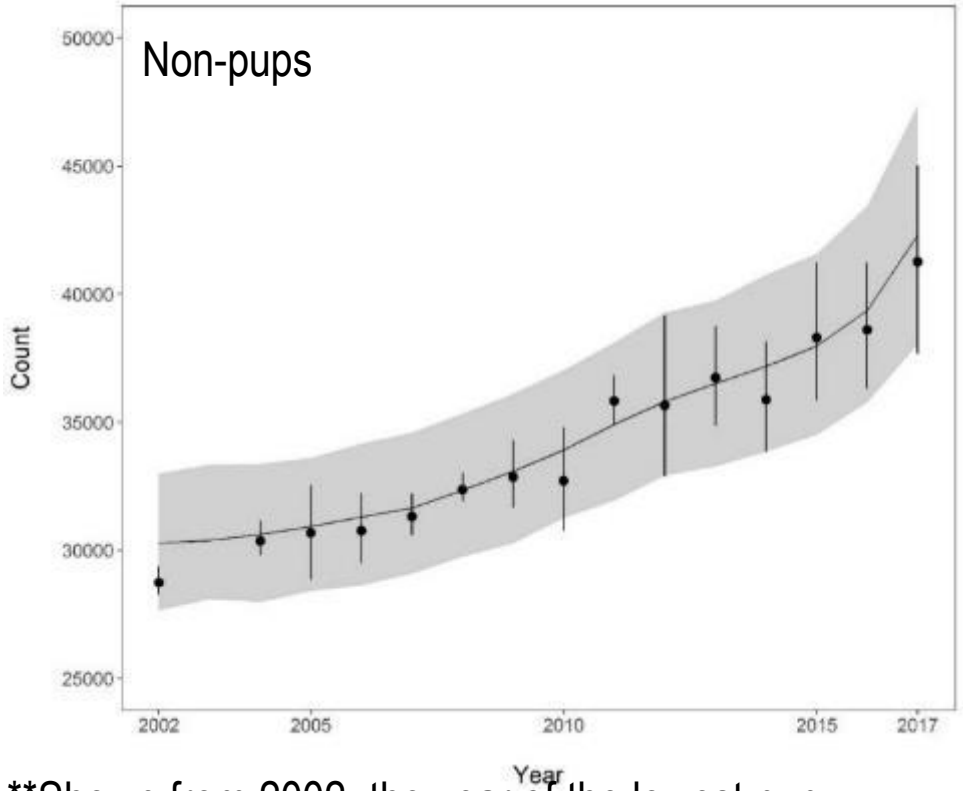
2017 Steller sea lion survey

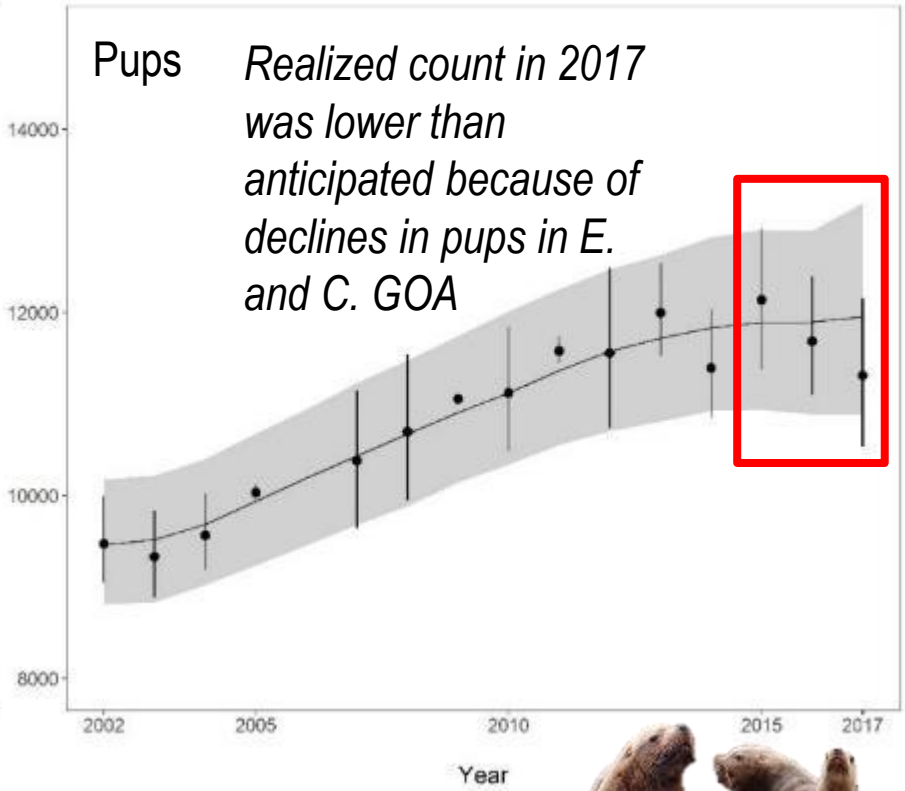
Surveyed from southeast Alaska and into the western Gulf of Alaska (through the Shumagin Islands), as well as up into the eastern Bering Sea.



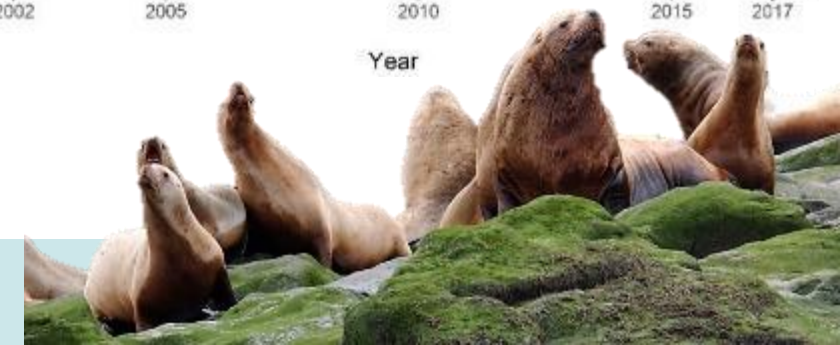
Western DPS trend since low point in 2002

Overall, between 2002 and 2017, the wDPS non-pups were increasing 2.14%/yr and pups 1.78%/yr. This is a lower rate of increase than what we reported in our previous tech memo analyzing data up to 2015 (Fritz et al 2016):





**Shown from 2002, the year of the lowest pup and non-pup abundance in the wDPS



NOAA FISHERIES

Steller sea lion (wDPS)

PUPS - Decline in Gulf of Alaska from 2015-2017

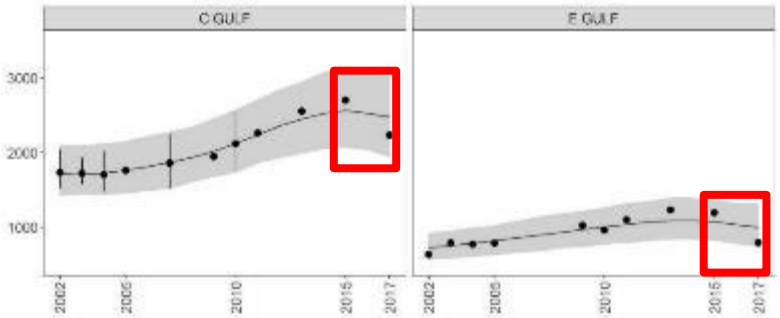
Seal Rocks
Wooded (Fish)
Chiswell
Outer (Pye)
Ushagat
Sugarloaf
Marmot
Twoheaded
Chowiet
Chirikof
Graves Rocks
White Sisters
Biali Rocks
Hazy
Forrester

E GULF
-33%

Southeast Alaska (eDPS)
-6%

C GULF
-17%

W GULF
1%
(from 1999-2015 Increased 3.67%/y)



NOAA FISHERIES

Steller sea lion (wDPS)

NON-PUPS - Decline in Gulf of Alaska from 2015-2017

Seal Rocks
Wooded (Fish)
Chiswell
Outer (Pye)
Ushagat
Sugarloaf
Marmot
Twoheaded
Chowiet
Chirikof

Graves Rocks
White Sisters
Biali Rocks
Hazy
Forrester

E GULF
-17%

Southeast Alaska (eDPS)
-12%

C GULF
14%

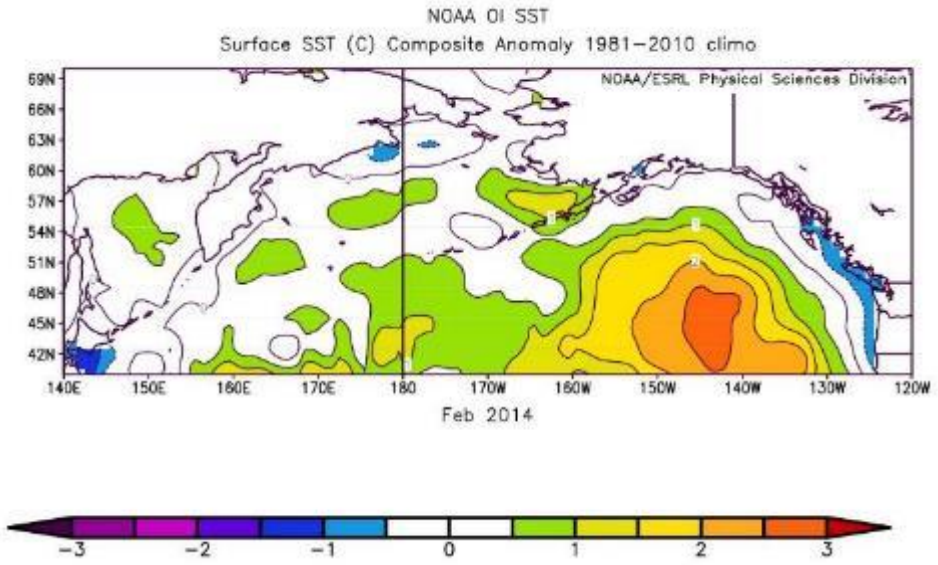
W GULF
3%
(normal rate of increase)

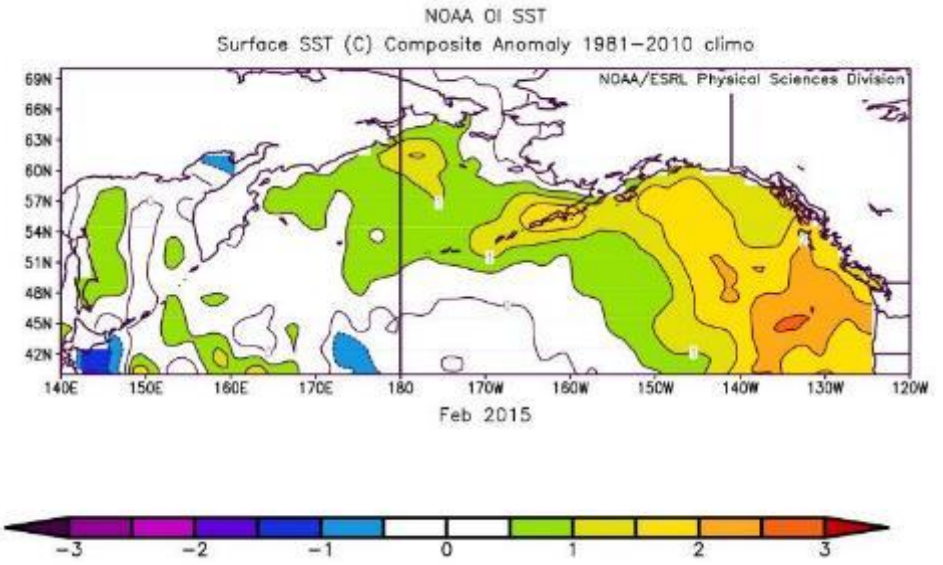
Atypical movement of ~1,000 sea lions E GULF to C GULF (not to SE AK or W GULF)

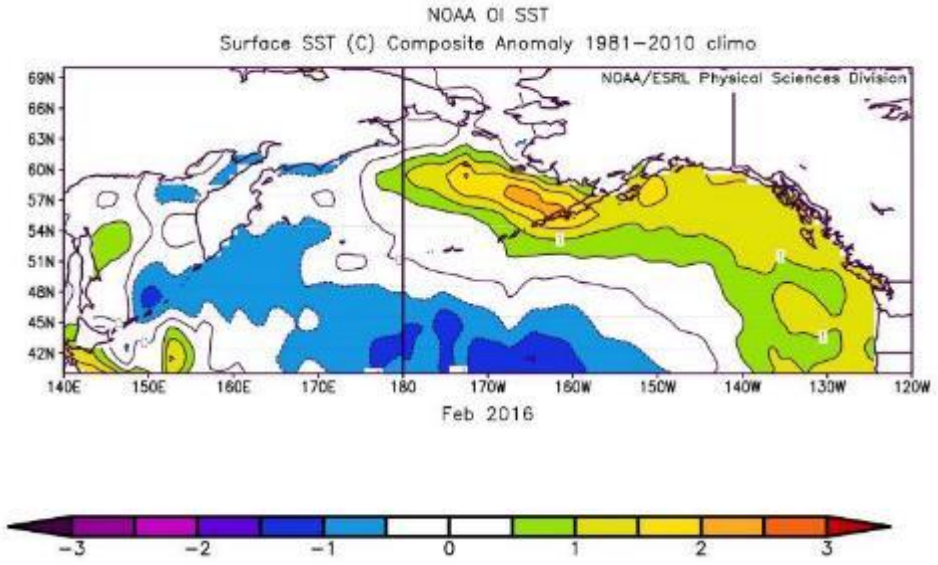
E/C GULF combined NP counts: similar from 2015 to 2017 despite 3.37%/y growth 2000-2015

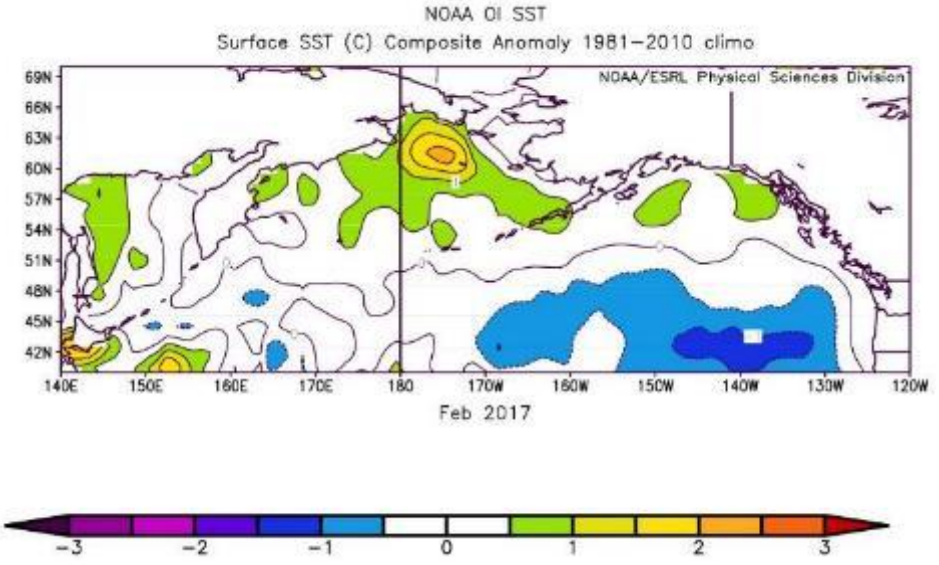
NOAA FISHERIES

What happened? (*Rapid communication within AFSC*)
North Pacific Warm water anomalies 2014 -2017

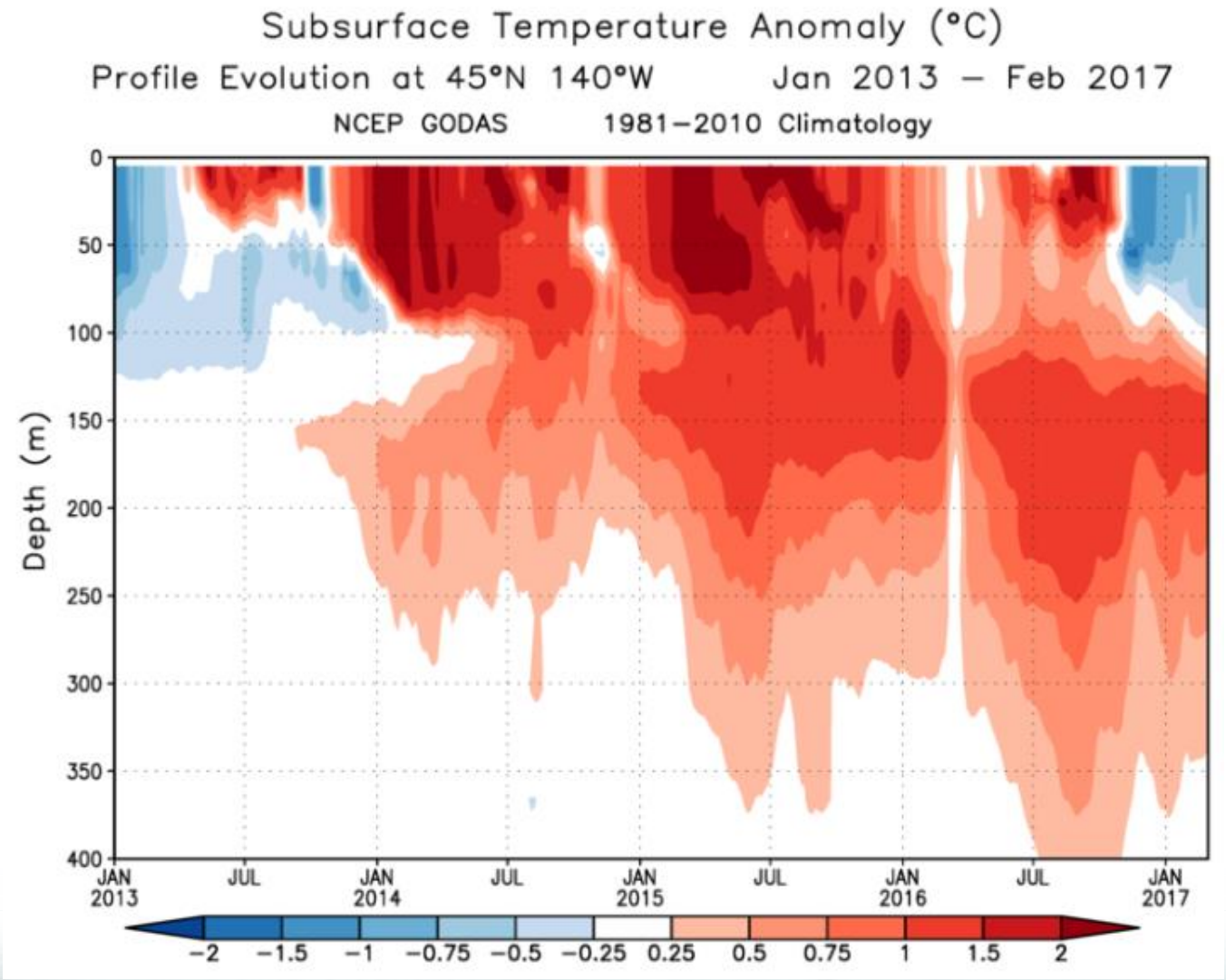








Marine Heat Wave of 2014-16 (*"unprecedented intensity and duration"*) N. Bond 5/18/18



AOOS Alaska Ocean Observing System

GULFWATCH ALASKA

The Seattle Times

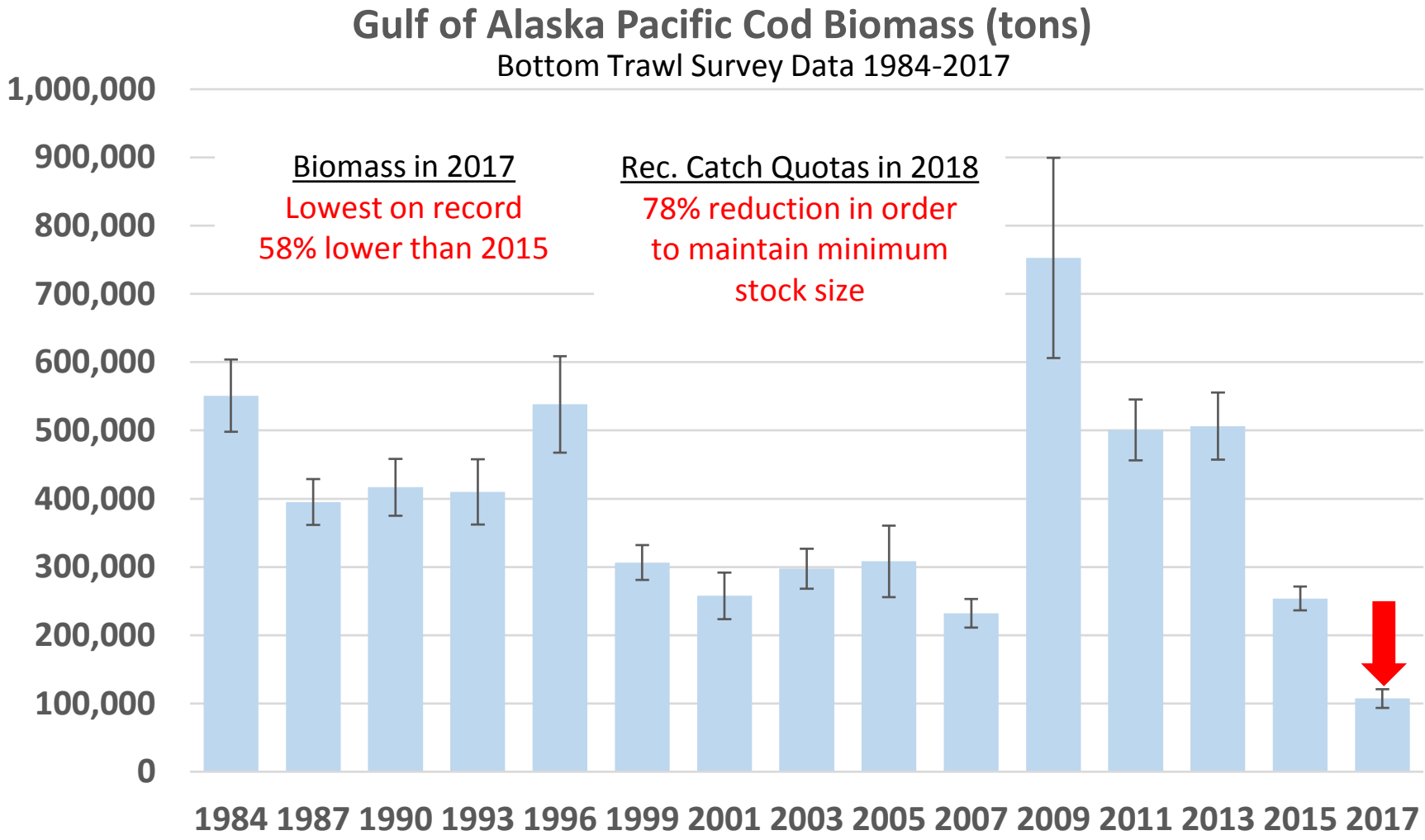
Nov. 4, 2017: Climate change preview? Pacific Ocean ‘blob’ appears to take toll on Alaska cod

Gulf of Alaska Pacific cod populations appear to have nose-dived, a collapse fishery scientists believe is linked to warm water temperatures known as “the blob” that peaked in 2015

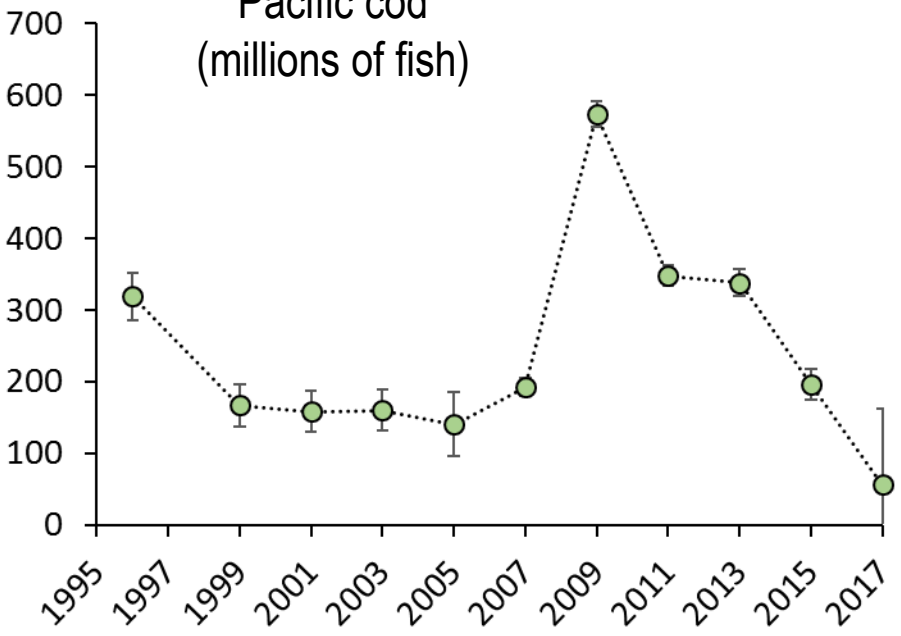
“Higher temperatures sped up the rate at which young cod burned calories while reducing the food available for the cod to consume.”

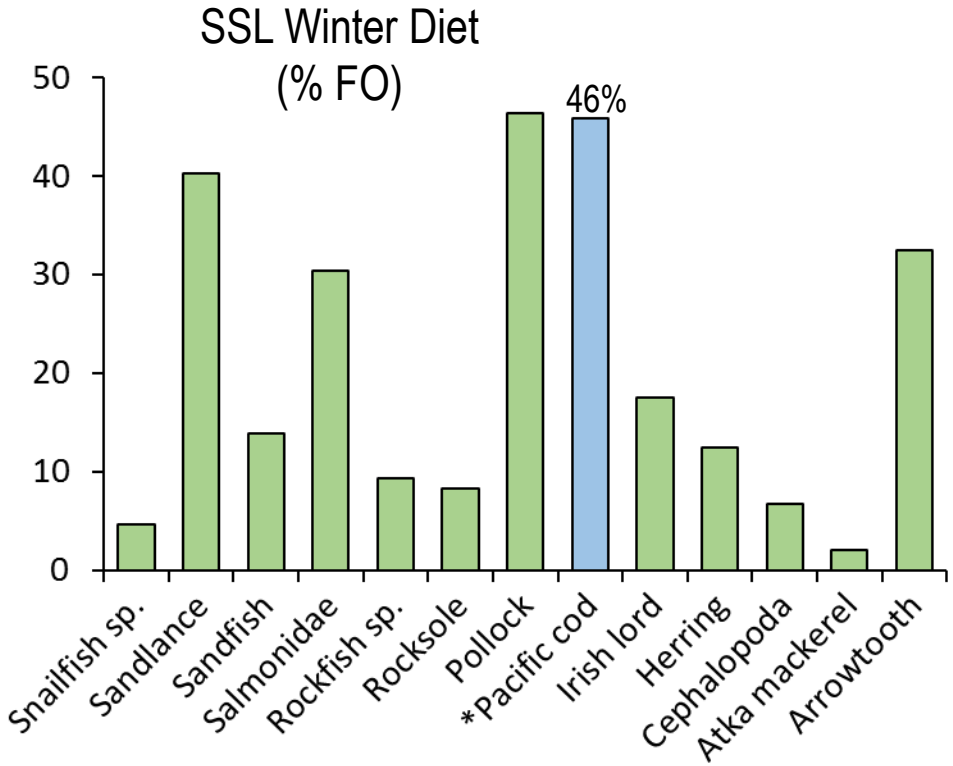
“The blob began to take hold in 2014, and within a year had raised temperatures as much as 7 degrees F in some surface waters of the Gulf of Alaska. In deeper waters, where cod feed, the temperature rose by more than 1 degree F”. *S. Barbeaux, AFSC*

Warm Water in the Gulf of Alaska 2014-2015 and Decreased Abundance of Pacific Cod



Gulf of Alaska Impacts - North Pacific Warm water anomalies 2014 -2017



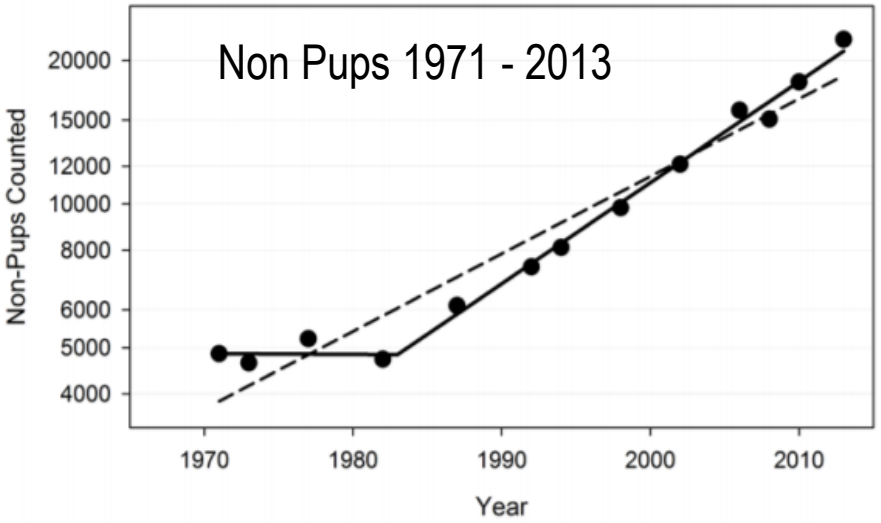


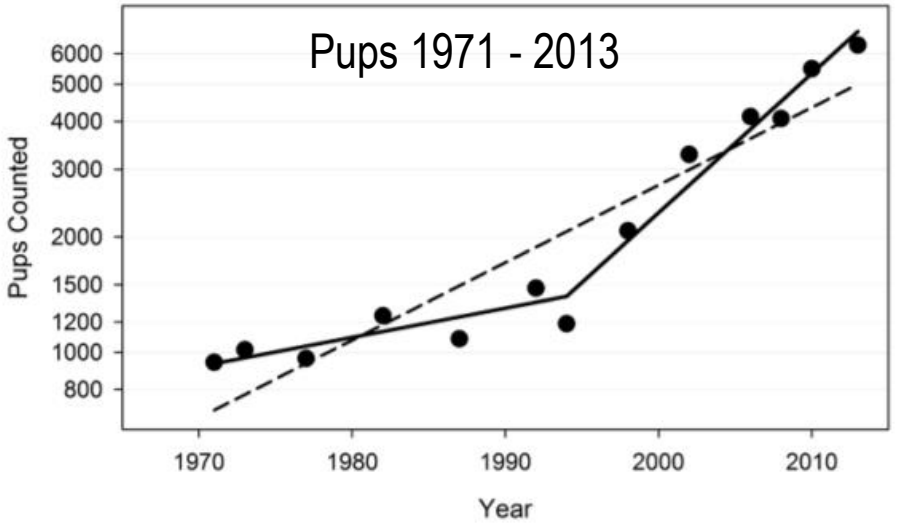
Between 2015 and 2017 Pacific cod declined ~70% (AFSC bottom trawl surveys)

cod is 45.9% FO in SSL winter diet in Gulf of Alaska

British Columbia Steller Sea Lions

- 1971-2013 – Non pups increased an average of 3.8%/ year. Pups increased 4.8%
- Most Recent Survey 2013: 22,135 non-pups, 6,317 pups.
- Estimated population on B.C rookeries 32,900 (31,200-33,900).

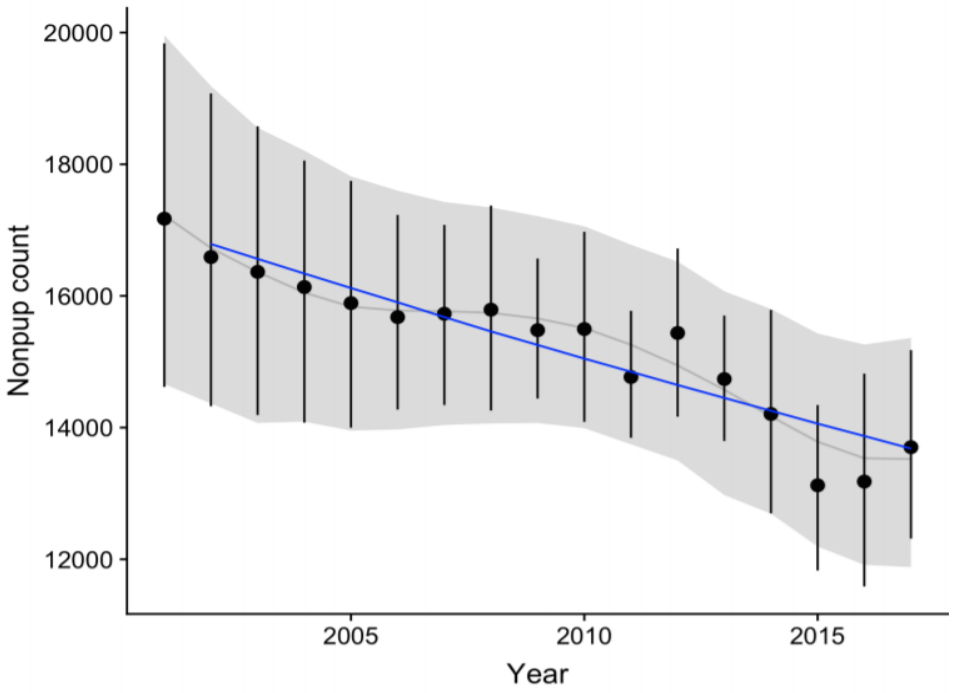


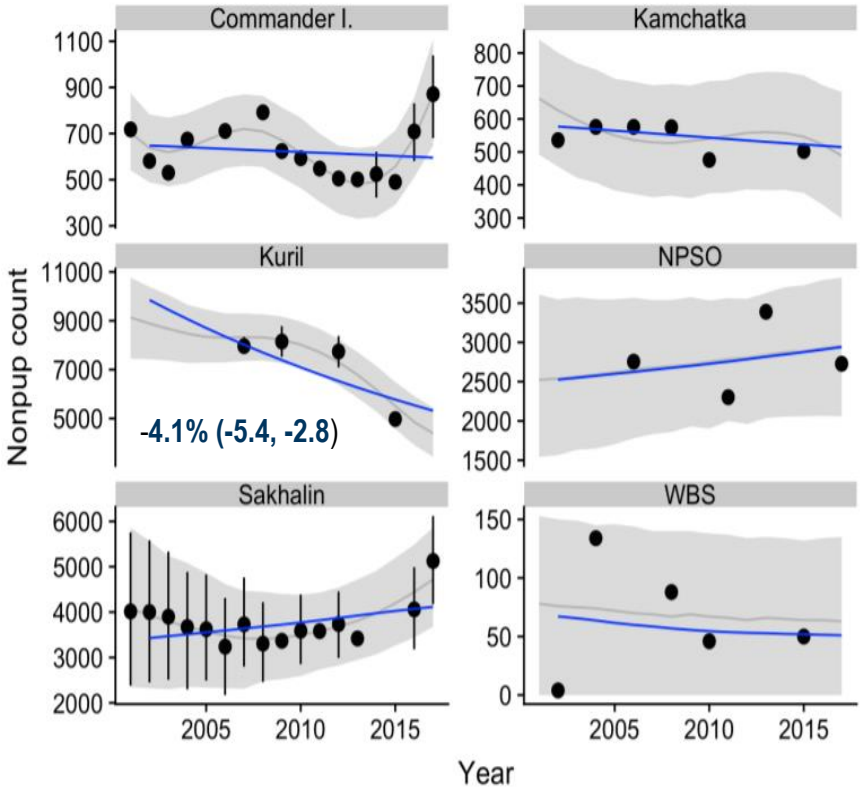


Olesiuk, P.F. 2018. Recent trends in Abundance of Steller Sea Lions (Eumetopias jubatus) in British Columbia. DFO Can. Sci. Advis. Sec. Res. Doc. 2018/006. v + 67 p.

Steller sea lion non-pup counts in Russian Far East 2002 - 2017

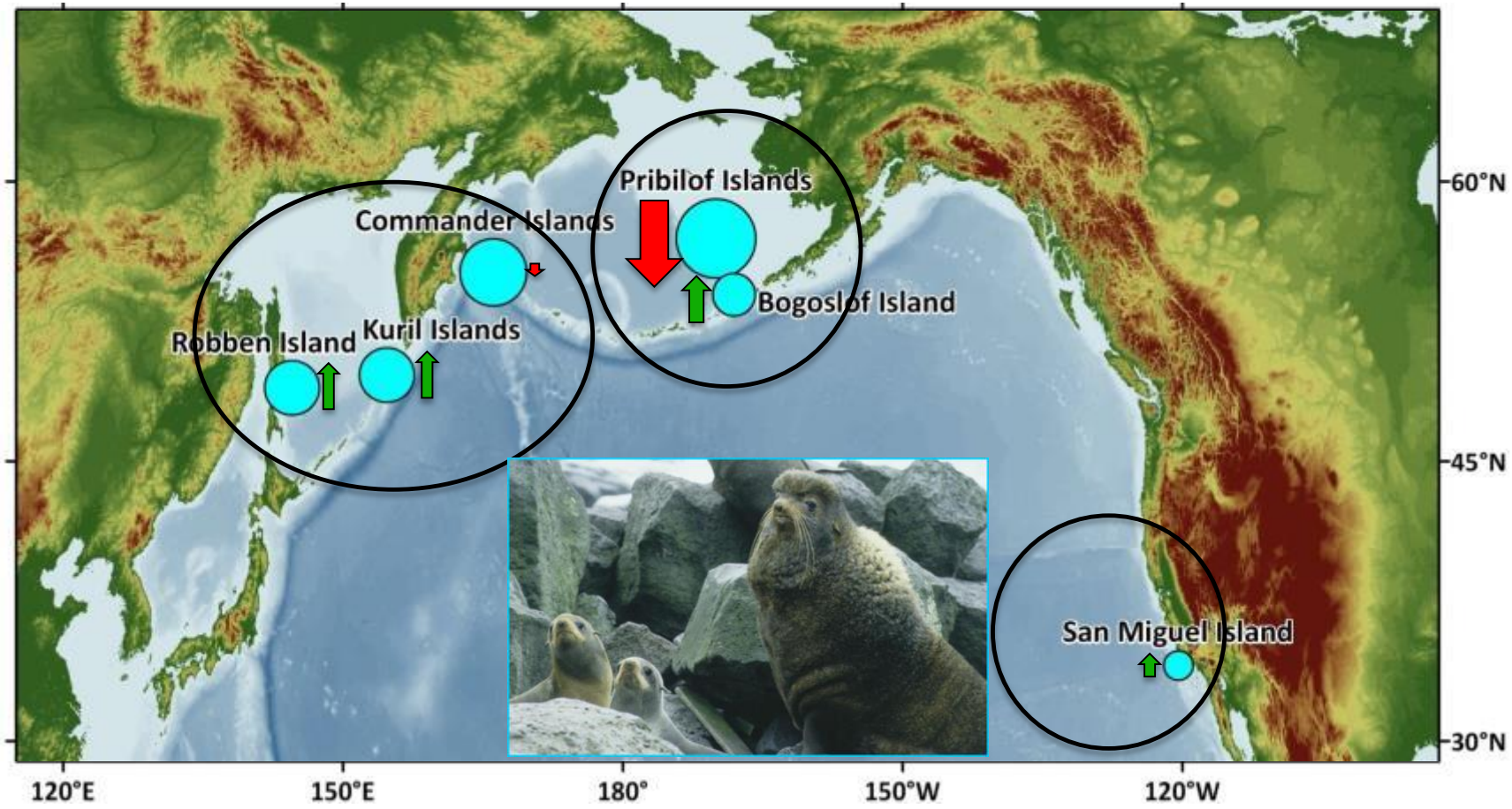
Overall, the Asian stock of non-pup counts significantly decreased an average of -1.3% y-1 (-2.6%y-1 , -0.1%y-1) from 2002-2017. Resulting in an estimated -21% (-38%, -1%) decrease in nonpup counts over the 15 year span





NOAA FISHERIES

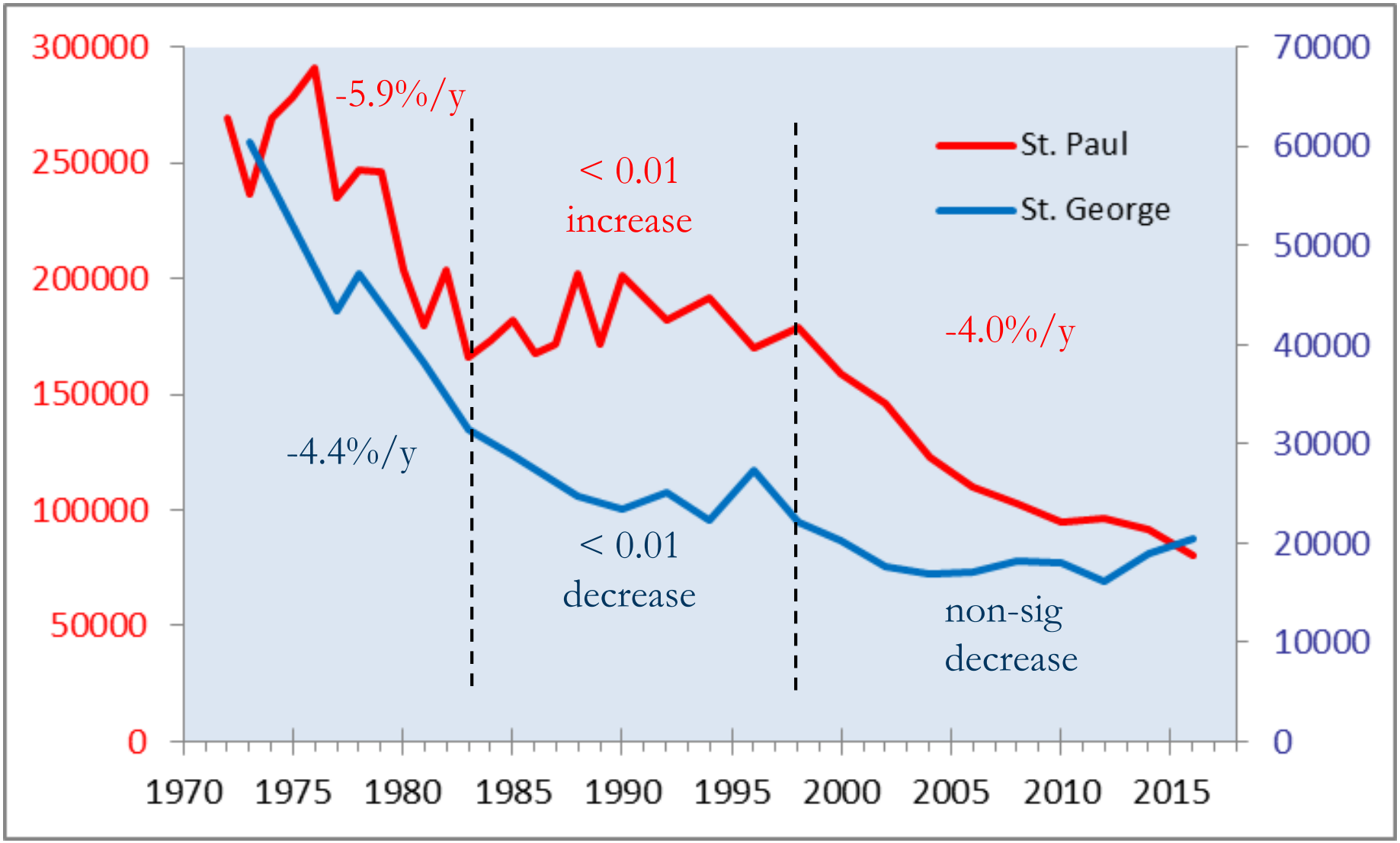
Northern fur seal abundance, stock structure, trends



- ~1,100,000 northern fur seals in North Pacific
- Two stocks in US: Eastern Pacific, California; mixed during winter migration
- Eastern Pacific stock designated as “depleted” under the MMPA (1988)
- Regional variation in population trends

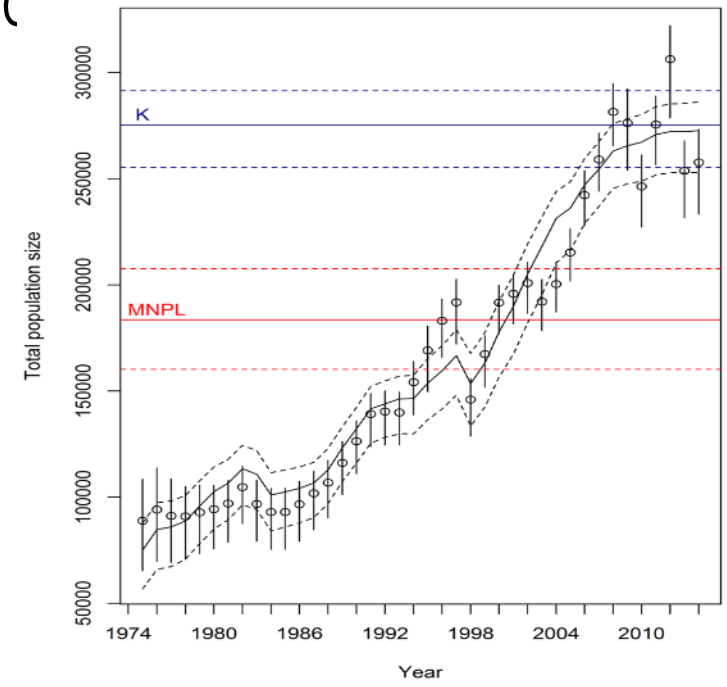
Northern fur seal pup production – Pribilof Islands

Overall pup production declined 8.6% since 2014. SP down 12% since 2014, SG up 8.6%.



California Sea Lion Recovery, MNPL and K

1. California sea lion assessment (Laake et al 2018 J. Wildl. Mgt. DOI:10.1002/jwmg.21405)
   - Reconstruct population growth using 38 years of pup births and 28 years of age-specific survival rates through 2014; fit to generalized logistic model to:
   - Determined MNPL (183,482) and K (275,298)
   - Breeding range expansion to Año Nuevo and Farallon Islands; over 1,000 pups each in 2017 (M. Lowry, SWFSC)



California Sea Lion UME

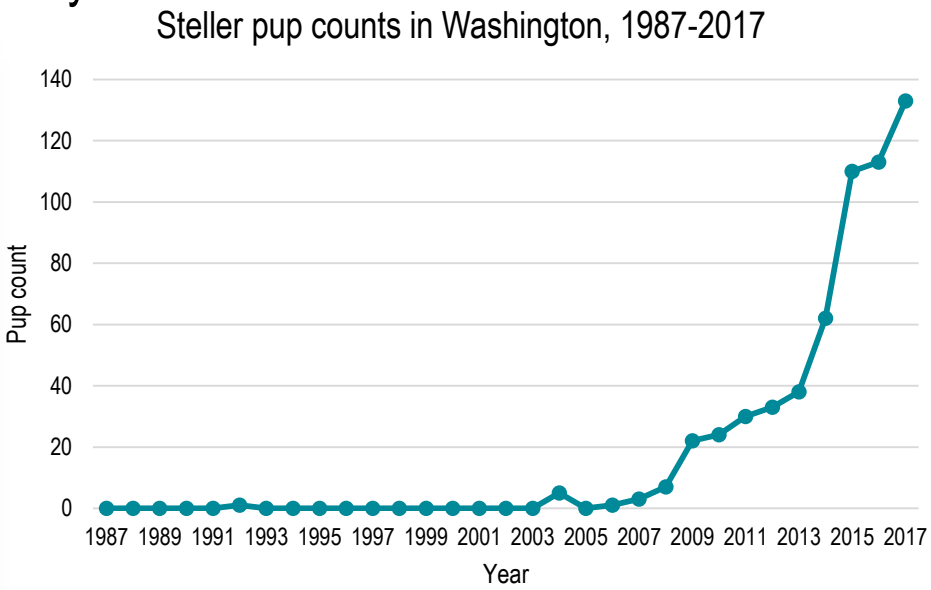
California sea lion population Unusual Mortality Event (UME: 2013-2017) linked to unusual oceanographic conditions

- Began in 2013 with mass pup strandings
- Intensified in 2014 and 2015 due to ocean heat wave (aka Blob)
- Continued in 2015 and 2016 during El Niño
- 2013-2015 pup cohorts experienced record low growth rates that resulted in low survival and decreased total population abundance

Recovery: 2017 pup births back to long-term average; exceptionally high growth rates to 7 months of age

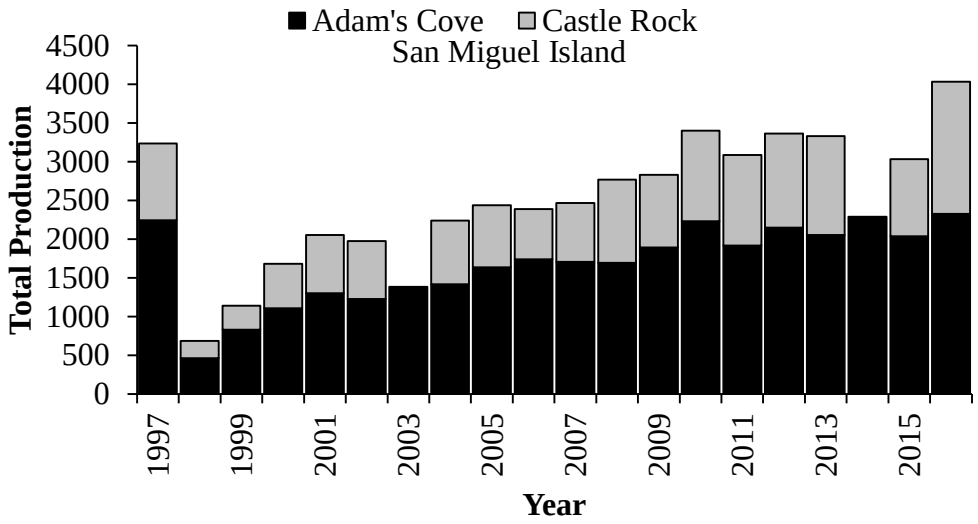
Steller Sea Lion Post-Delisting Eastern DPS in Oregon and Washington

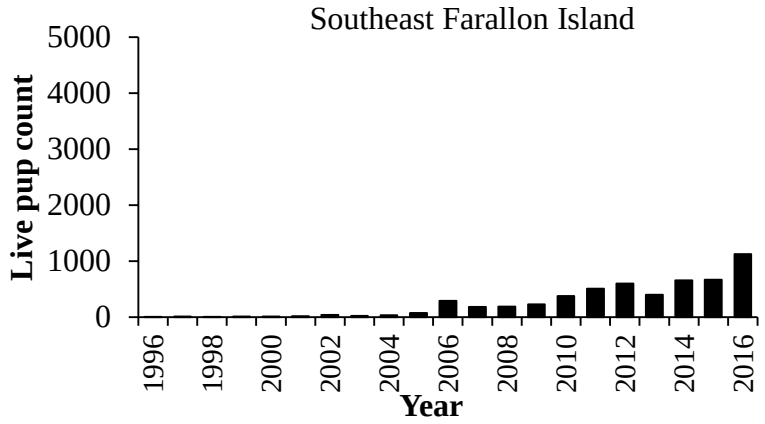
- Delisted 2013
- Pre-delisting survival to age of recruitment: N. California/Oregon population comparable to rest of EDPS (Wright et al. 2017 J. Mamm. 98:885-894)
- Plan to Estimate survival during post-delisting period through 2019
- New rookery established on Washington coast (Carroll Island & Sea Lion Rocks – 133 pups)where none was historically known



California Stock Northern Fur Seals

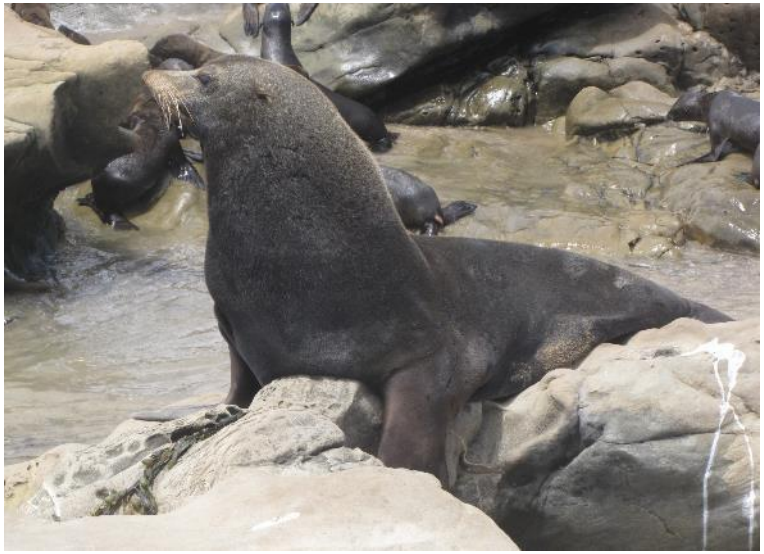
- Breed on San Miguel and Farallon Islands, California
- SMI colony established ~ 1964 w/ tagged immigrants from Russian and US Bering sea populations
- Farallons colony established 1996 w/ tagged immigrants from San Miguel Island





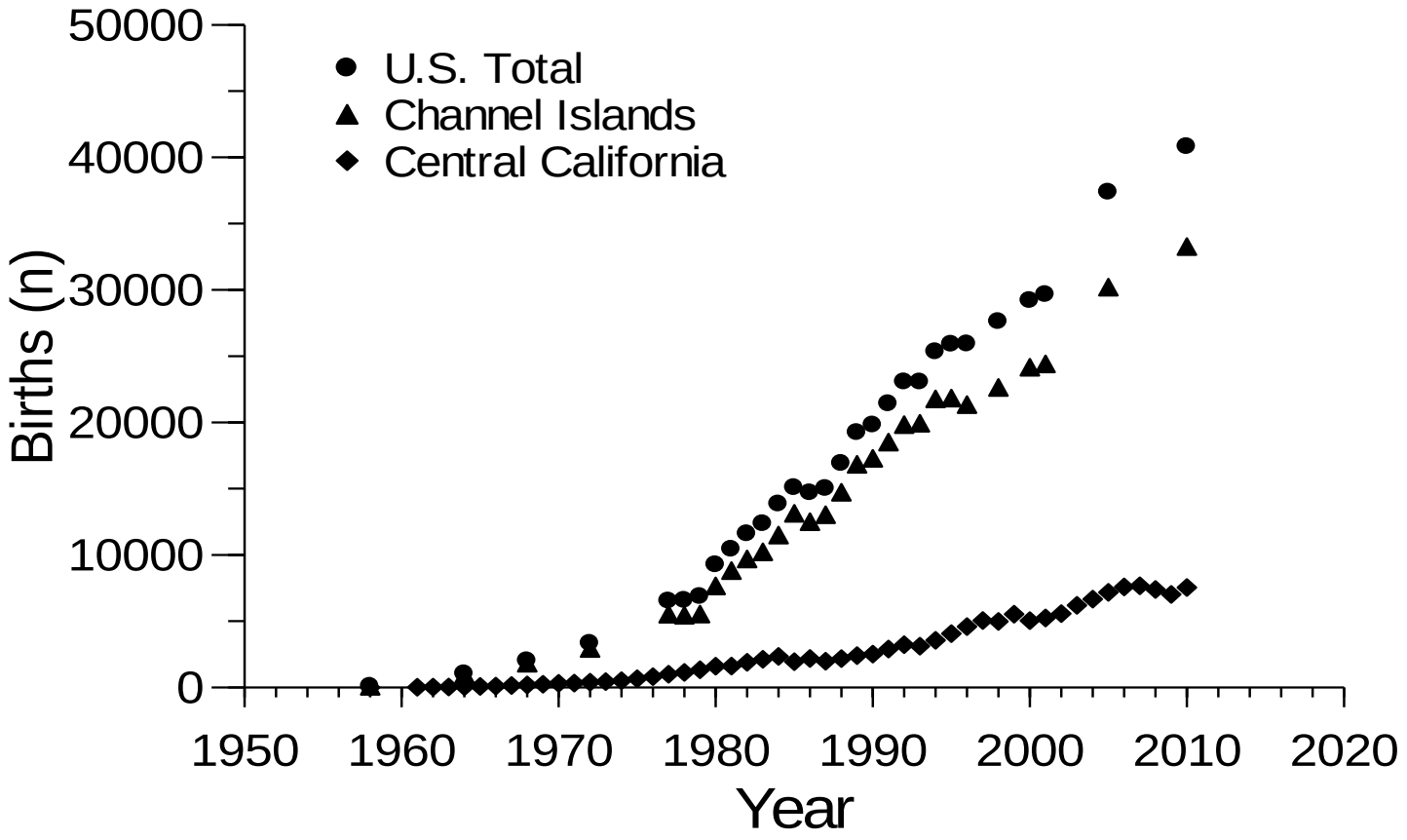
Guadalupe Fur Seal

- Abundance estimate in 2010 is ~20,000 animals in Mexico at Guadalupe Island and San Benito Islands (Carretta et al 2017. Pac SSR). Slowly increasing & spreading. Temporary decreases influenced by El Nino events.
- Small numbers of animals on San Miguel Island, California with 2-3 pups born annually
- Hybridization occurring with California sea lions



Northern Elephant Seal

- 3.8% / year 1988 – 2010. ~40,684 pups at 11 rookeries in 2010.
- Total U.S. Population 2010: 179,000
- Total U.S. and Mexico 2010: 210,000 – 239,000



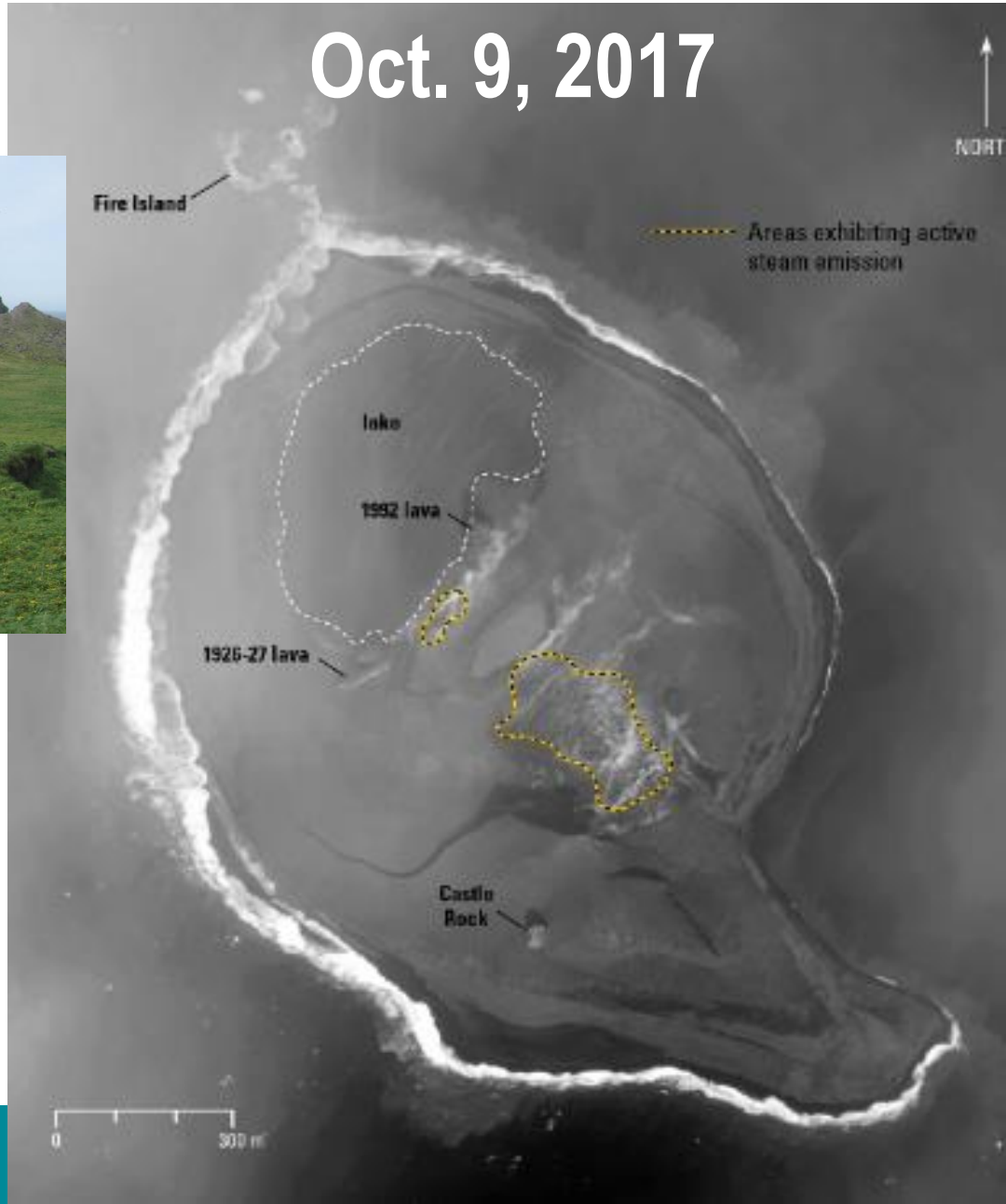
M. Lowry, et al. 2014: Aquatic Mammals 2014, 40(1), 20-31,

Aug.a 26, 2017. D. Withrow

An eruption began at Bogoslof at 16:51 AKDT July 4 (00:51 UTC, July 5) that lasted 13 minutes and was detected in seismic, infrasound, and satellite data. Winds are generally to the southeast, and initial satellite data suggest the cloud may be as high as 32,000 ft asl. AVO is raising the Aviation Color Code/Alert Level to RED/WARNING.

Before Dec. 2016

Oct. 9, 2017



NOAA FISHERIES

Pre-eruption Bogoslof Island
Area = 0.29 km^2

Bogoslof Island after 36 eruptive events since Dec. 12, 2016
Area = 0.98 km^2