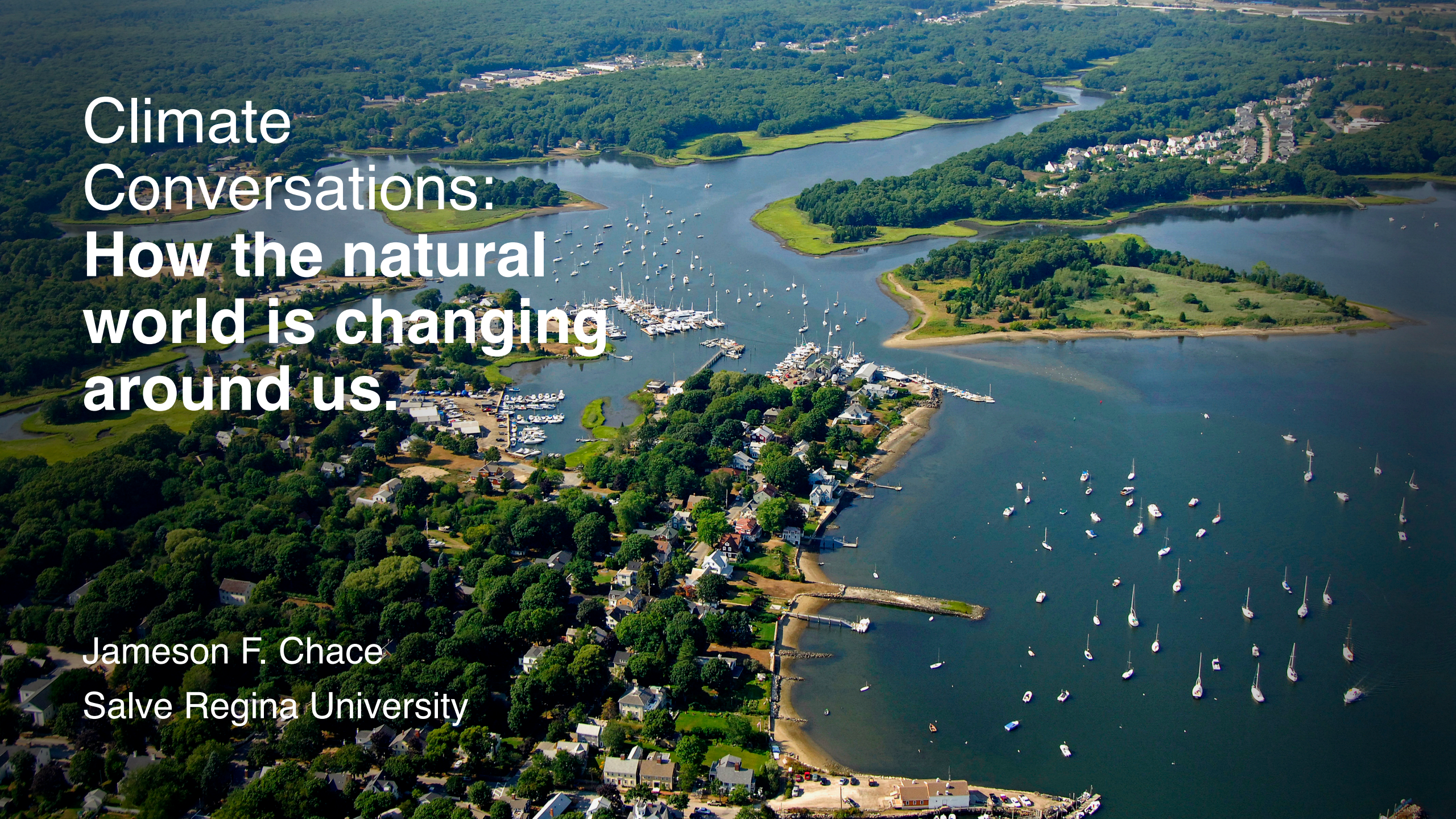


Climate Conversations: **How the natural world is changing around us.**

Jameson F. Chace
Salve Regina University

In North America, 2.9 billion breeding adult birds have been lost since 1970, including birds in every ecosystem

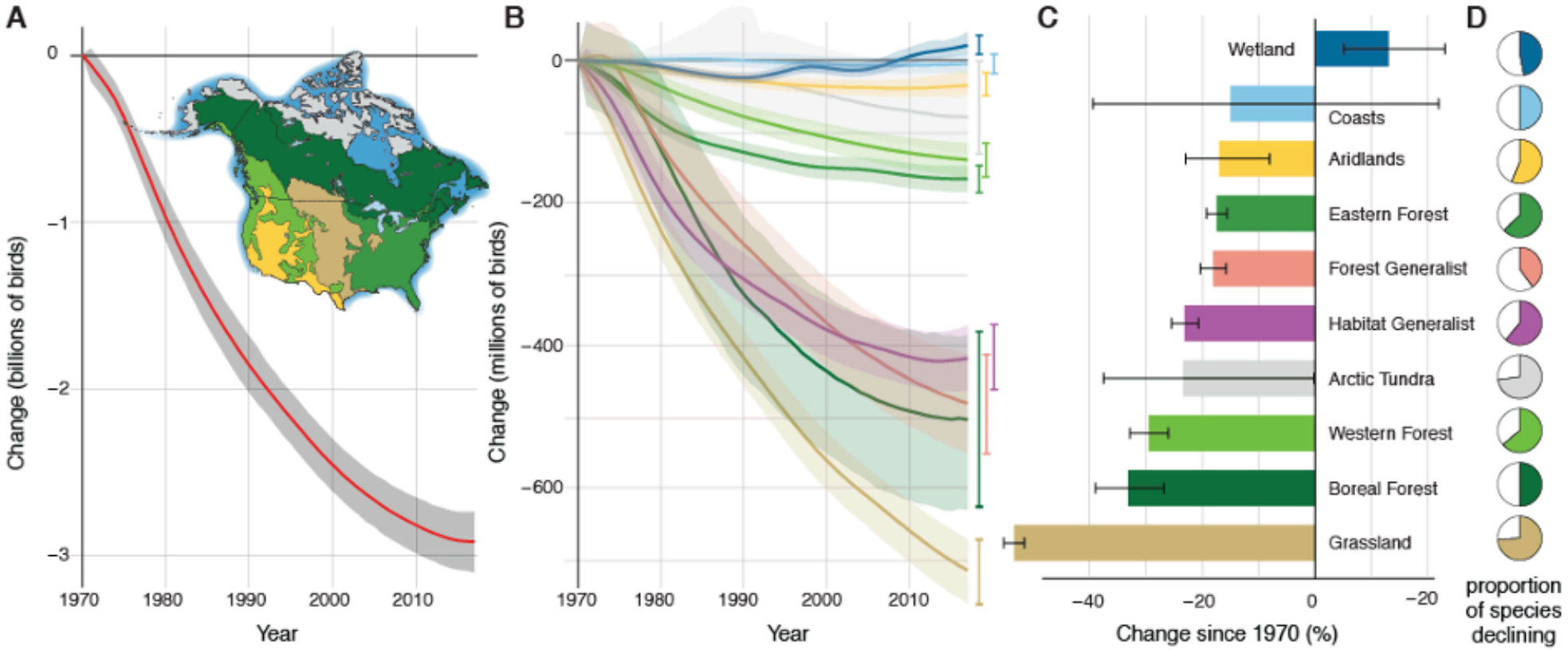
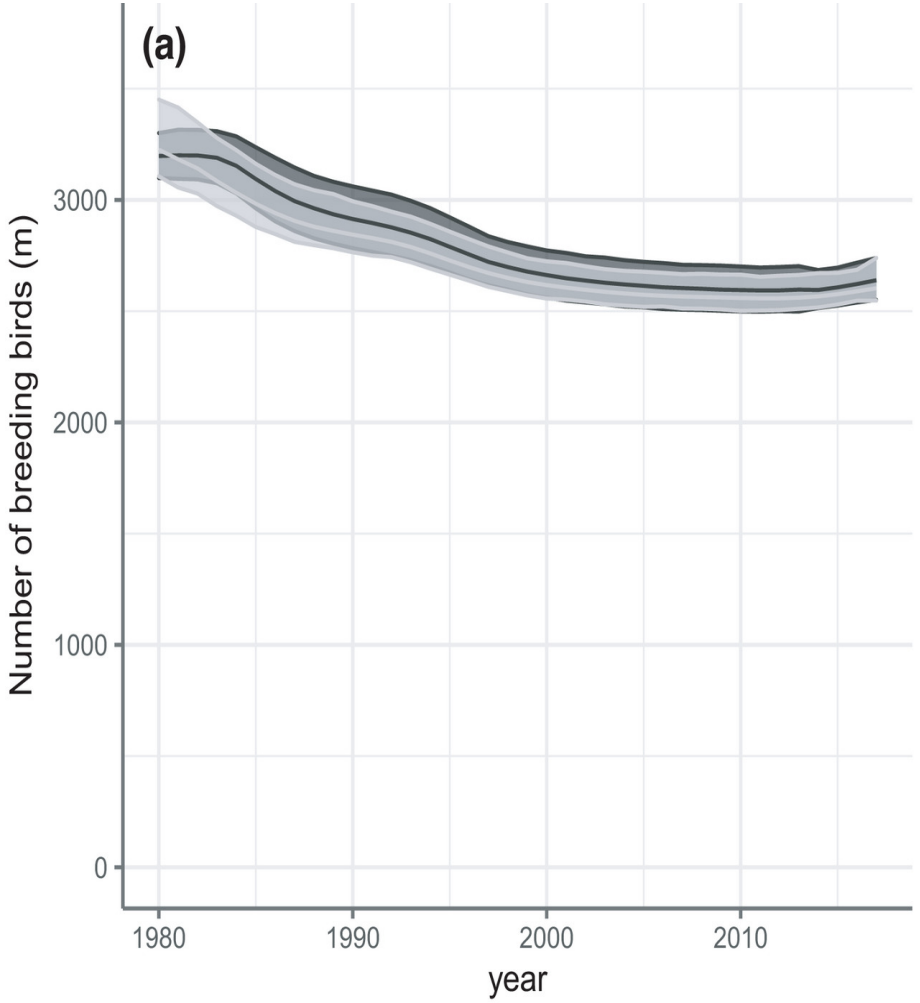


Fig. 1. Net population change in North American birds. (**A**) By integrating population size estimates and trajectories for 529 species (*18*), we show a net loss of 2.9 billion breeding birds across the continental avifauna since 1970. Gray shading represents ± 95% credible intervals

Rosenberg et al. 2019. Decline of North American Avifauna. Science 366 (6461):120-124.

Estimate a decline of 17–19% in the overall European breeding bird abundance since 1980: a loss of 560–620 million individual birds.

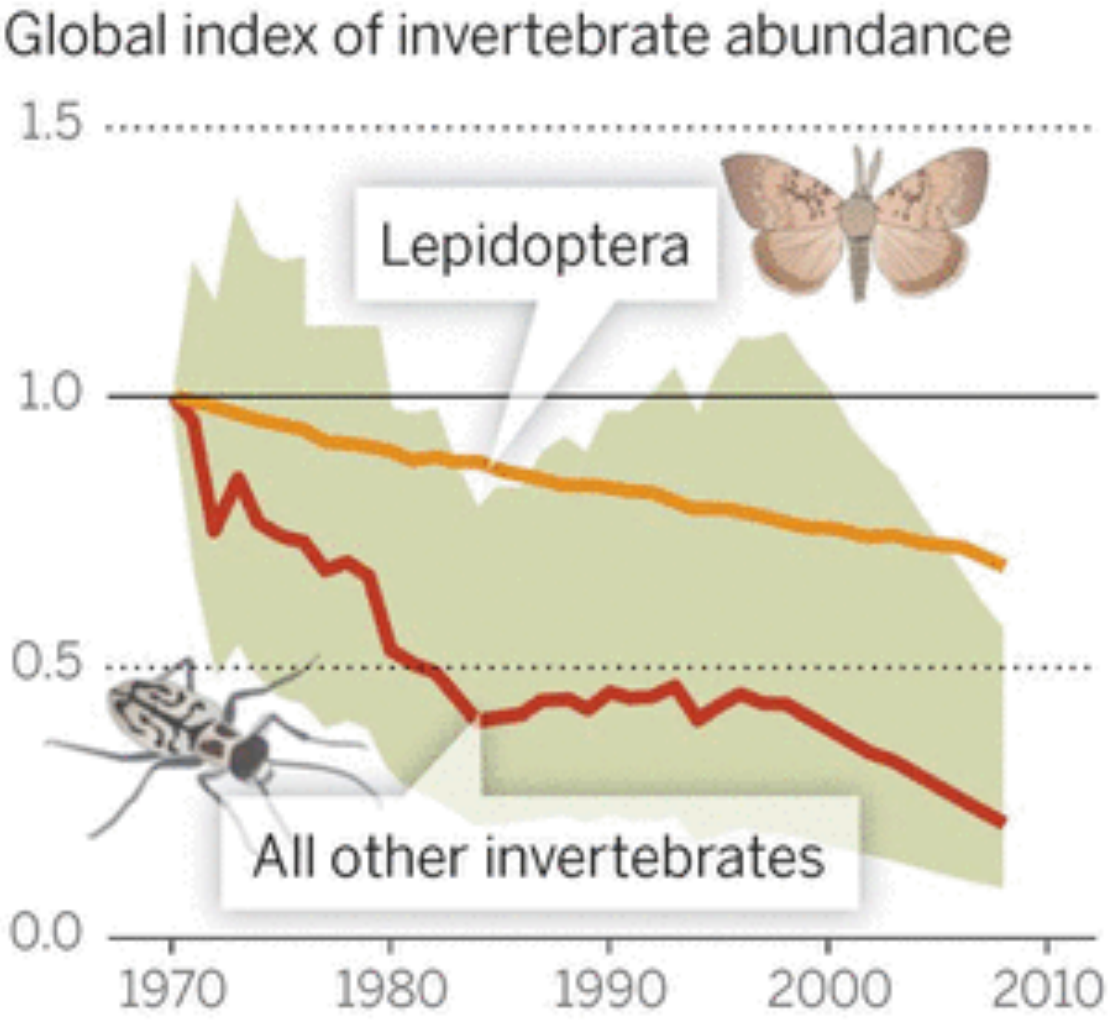


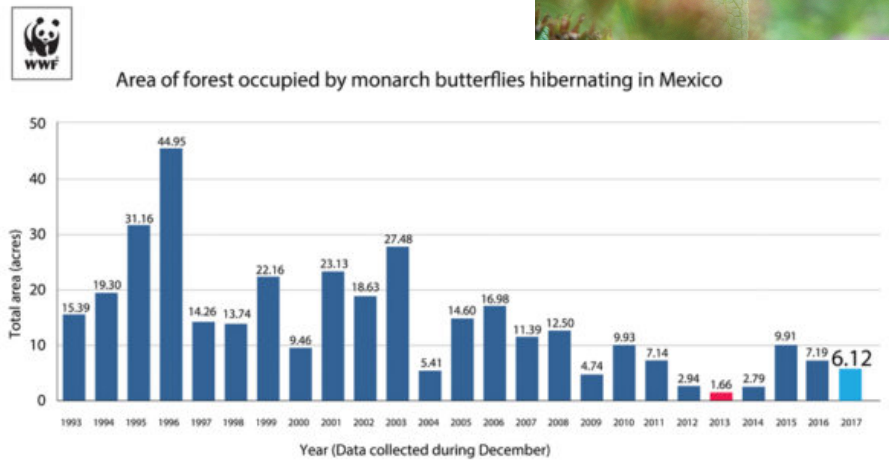
Grey Partridge, 82% decline

Meadow Pipit, 63% decline

Burns et al. 2021. Abundance decline in the avifauna of the European Union reveals cross-continental similarities in biodiversity change. Ecology and Evolution 11:16647-16660

According to global monitoring data for 452 species, there has been a 45% decline in invertebrate populations over the past 40 years.





Dirizo et al. (2014) Science: Defaunation in the Anthropocene

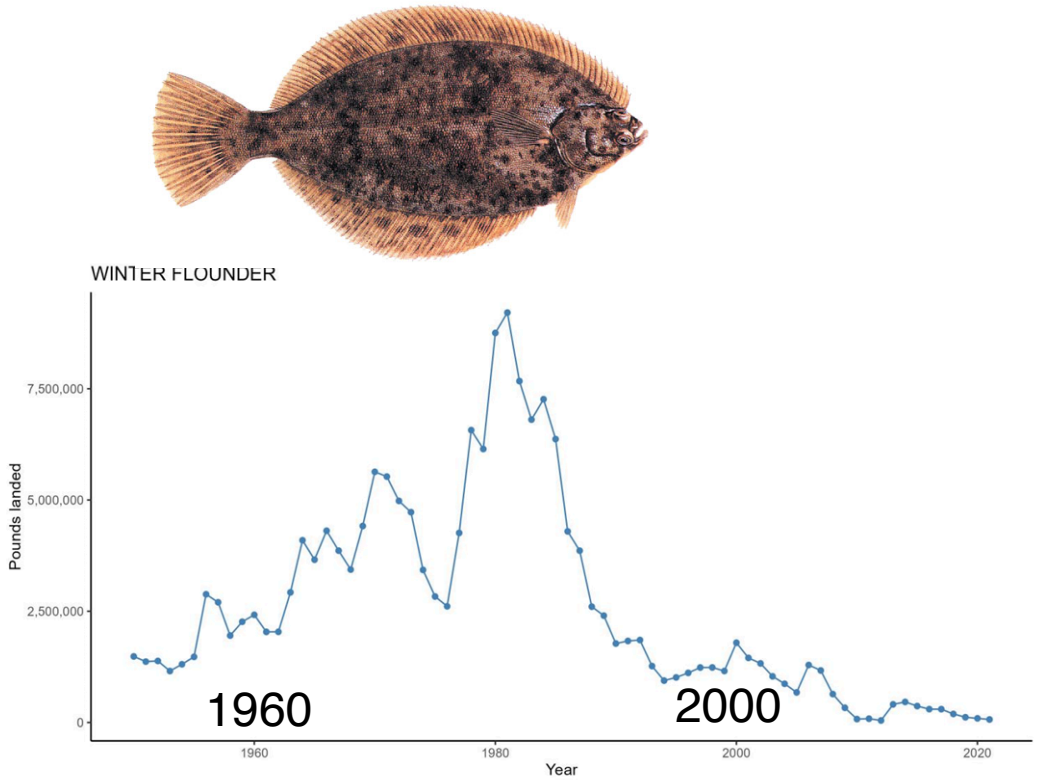


FIGURE 17. COMMERCIAL LANDINGS OF WINTER FLOUNDER FROM 1950 TO 2021

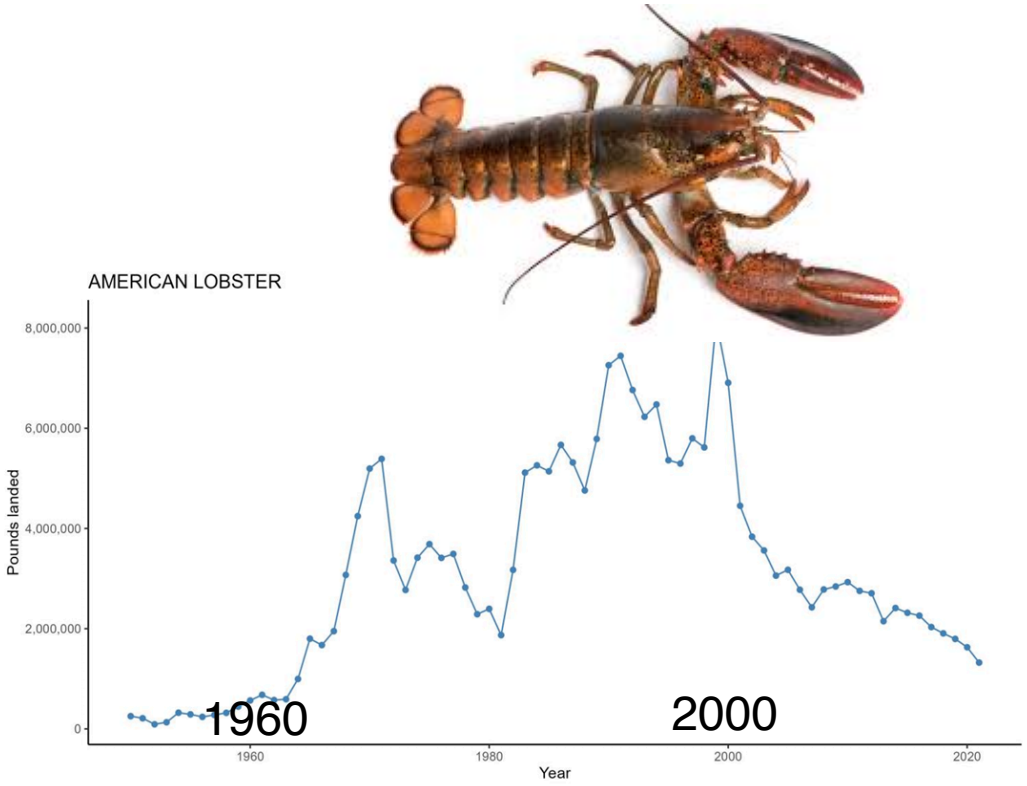


FIGURE 20. COMMERCIAL LANDINGS OF AMERICAN LOBSTER FROM 1950 TO 2021

Juvenile flounder avoid hypoxic conditions (<4 mg DO/ L) and warm water temperatures (>25 °C).

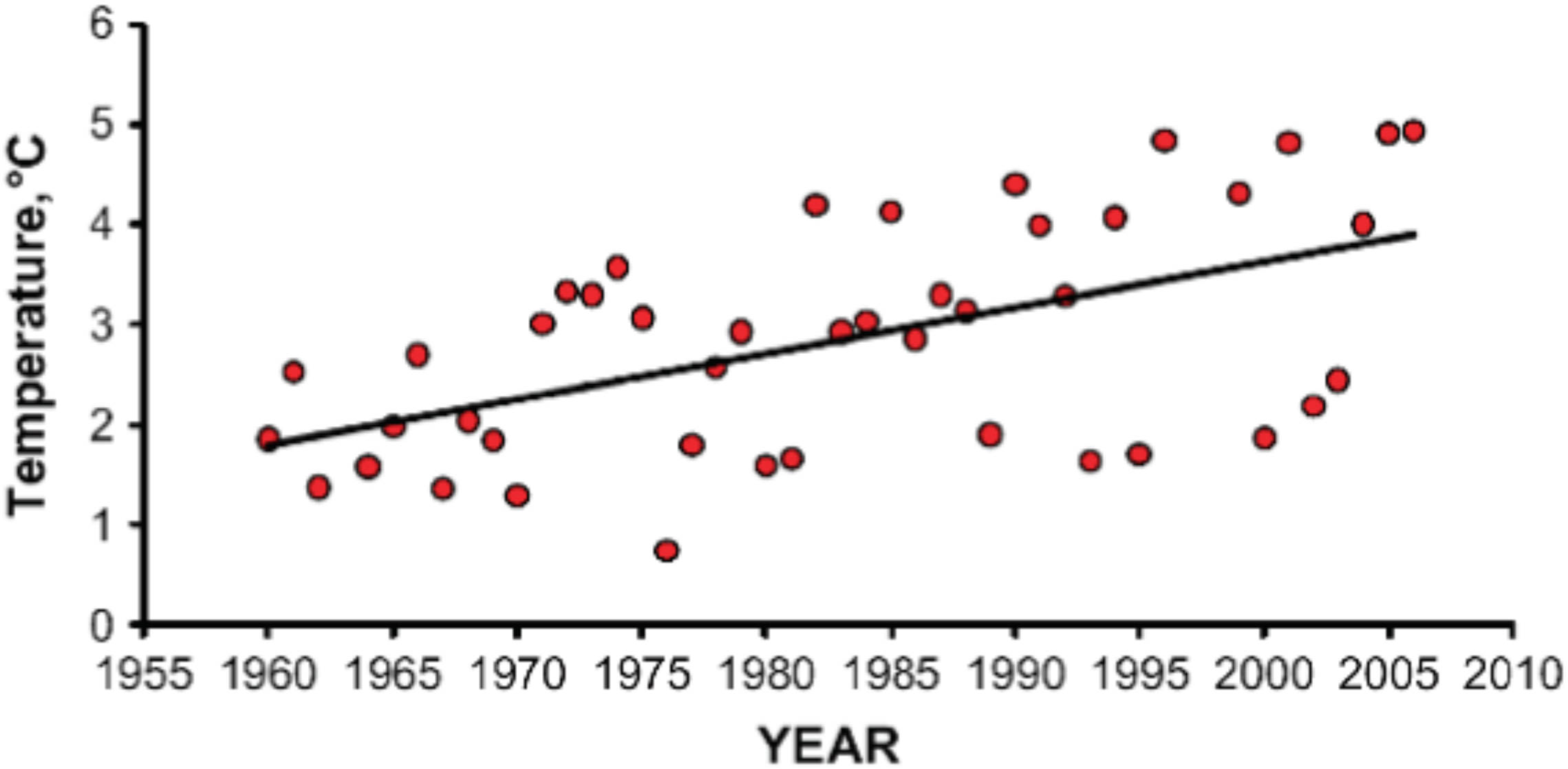
Taylor et al. 2016. Estuaries and Coasts 39: 1505–1525

Larvae are stressed or die at temperatures ≥ 24–36 °C, which will be more frequent in the future.

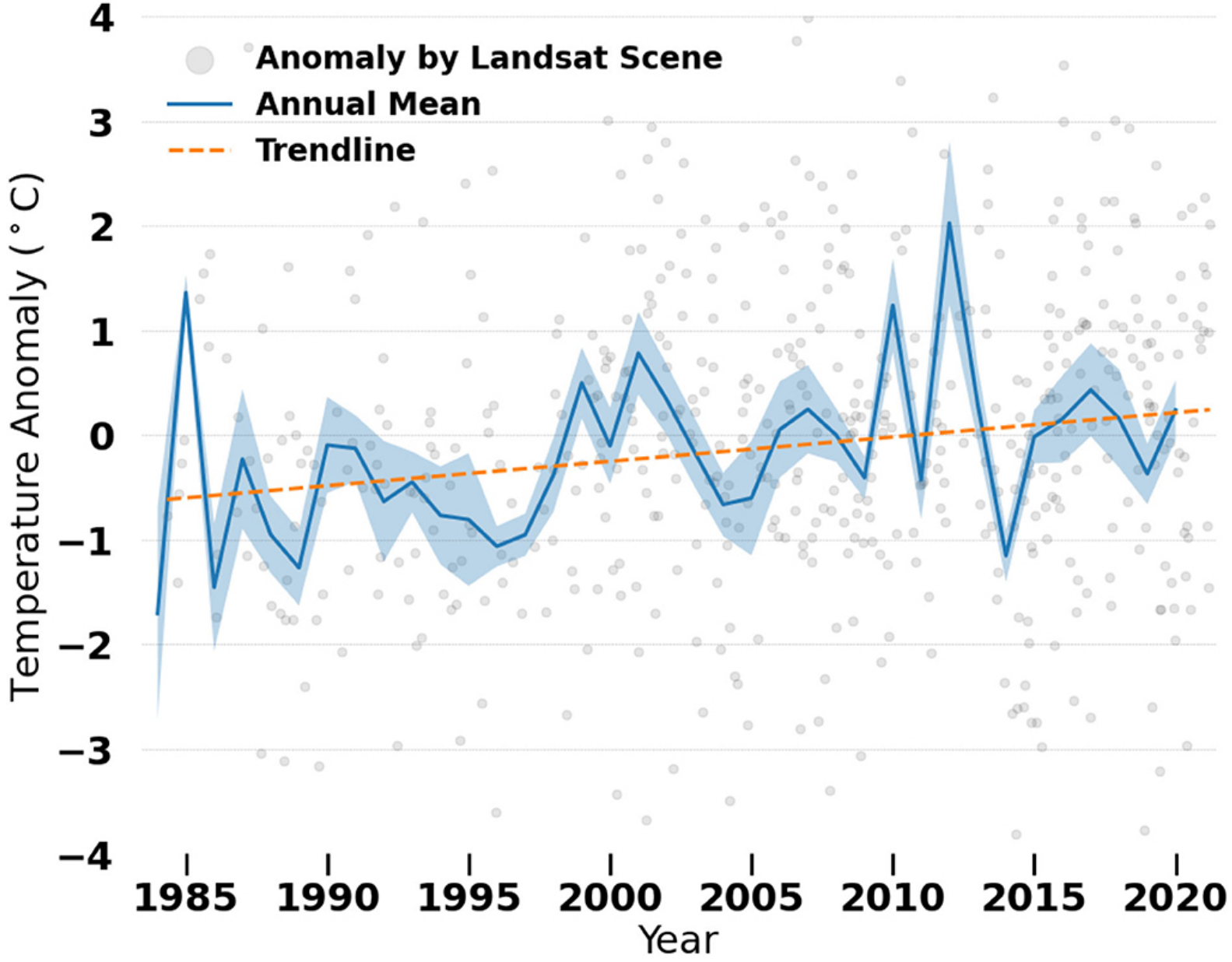
Moulting, growth, hatching, and settlement of larvae may be reduced or stop above 20–24 °C.

Quinn. 2017. Fisheries Research, 186: 383-396.

RI DEM RHODE ISLAND ANNUAL FISHERIES REPORT: 2021



Mean surface winter water temperatures in the mid West Passage of Narragansett Bay, R.I.
0°C = 32°F and 6°C = 43°F (make more conversions)
(During December, January, and February near Fox Island). (Source: Nixon et al. 2009)



Benoit and Fox-Kemper (2021) Front. Mar. Sci. Time series of seasonally-detrended surface temperature anomaly over Narragansett Bay with the annual mean and a linear trendline taken before averaging.

The Lobster's Shifting Range

Since the late 1960s, the American lobster's range has already shifted substantially.

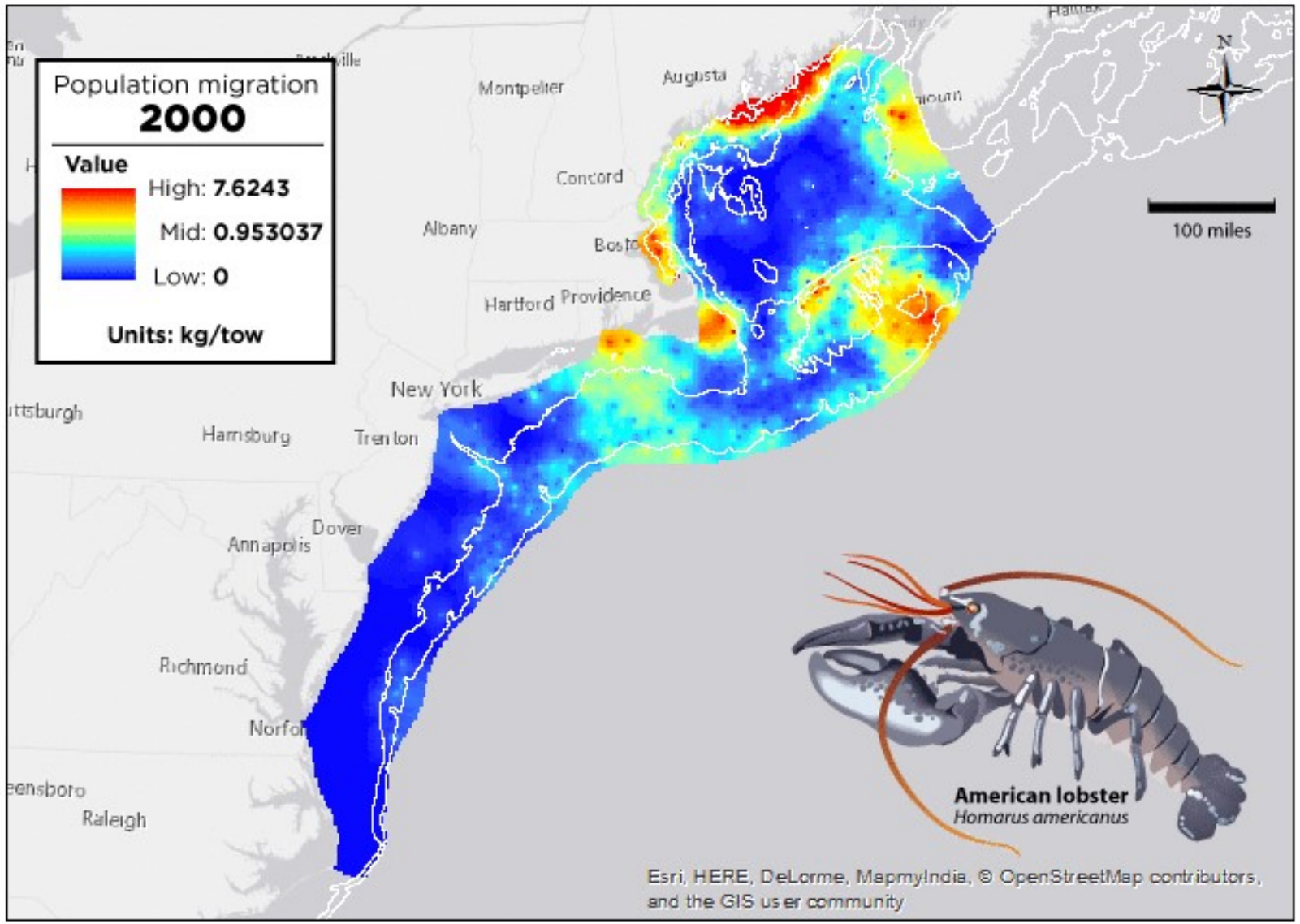
<u>Options:</u>

Acclimation

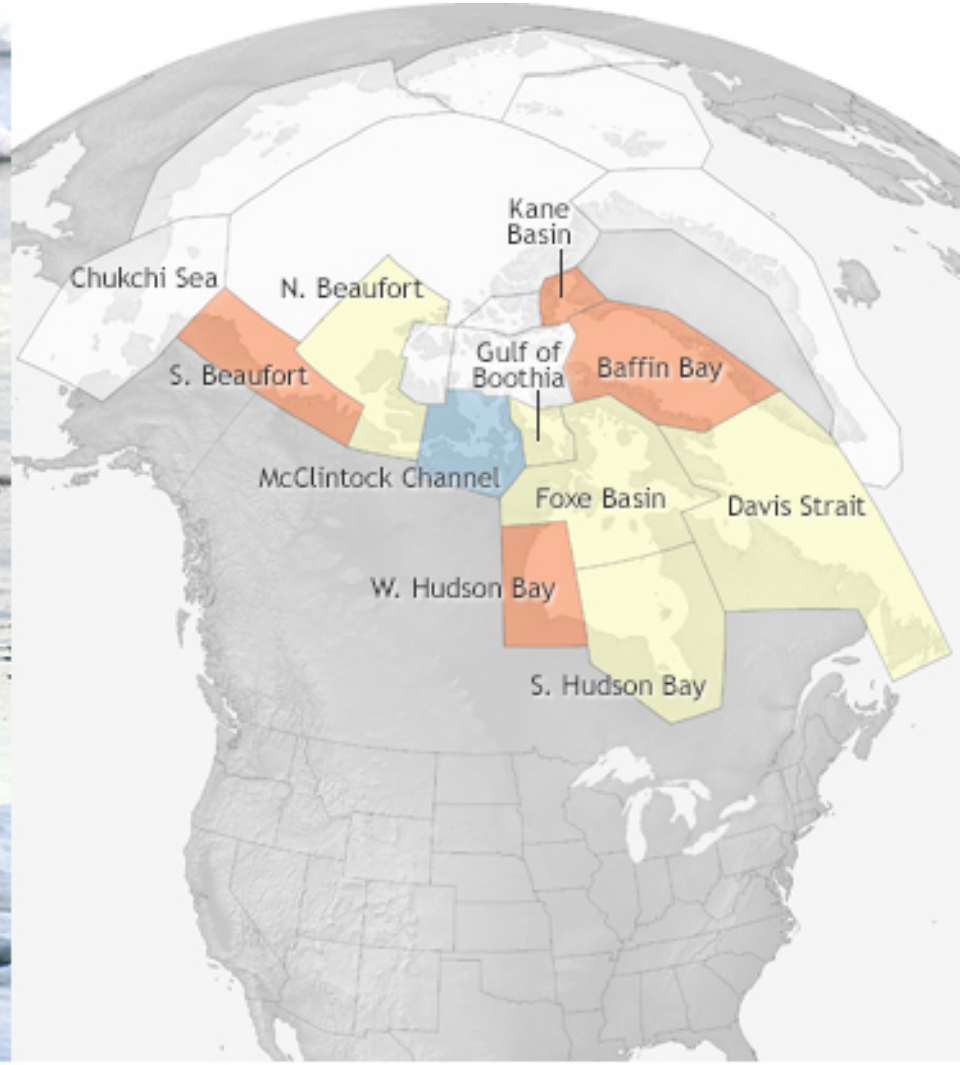
Adaptation

Migrate

Locally Extinct



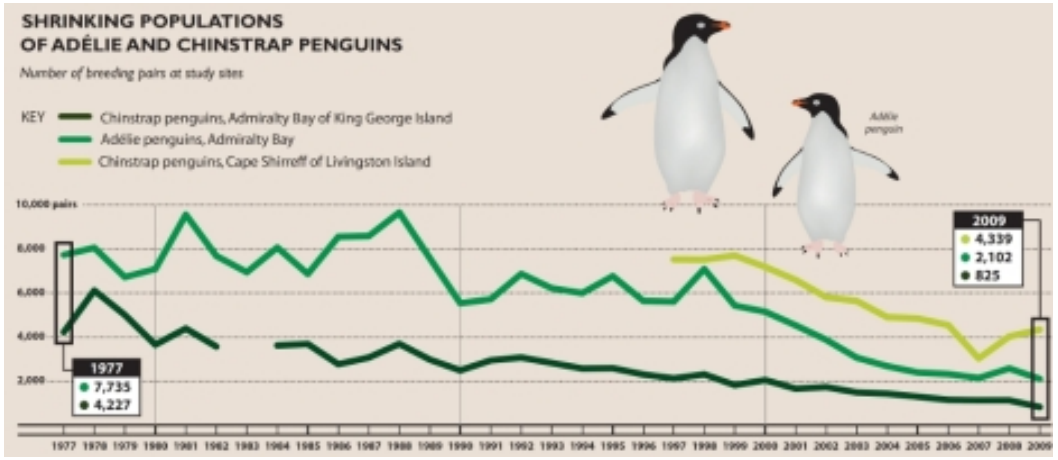
Climate Change – Dead Ends: no where to go



Polar bear population trends as of 2013

unknown | declining | stable | increasing

Longer foraging bouts leads to population declines



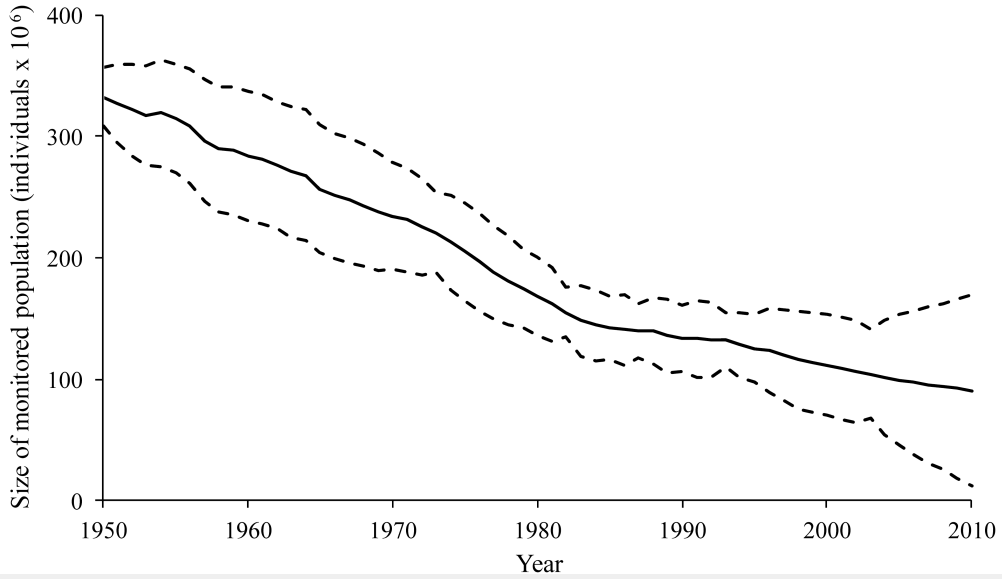
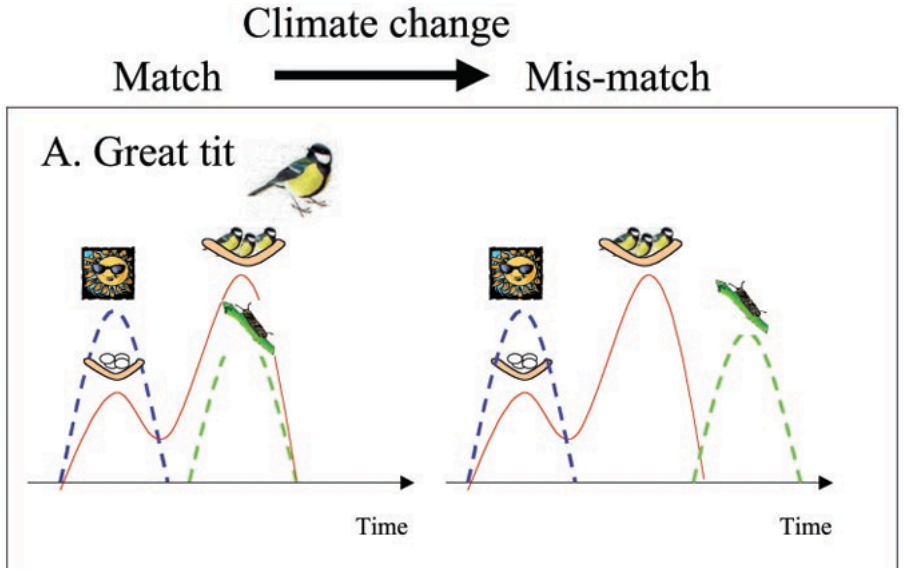


Fig 2. Population trend, 1950–2010, of the world's monitored seabirds, estimated by multivariate autoregressive state-space (MARSS) modeling.

Paleczny et al. 2015. Population Trend of the World's Monitored Seabirds, 1950-2010. PLoS ONE 10(6): e0129342.

Phenological Mismatch



Stenseth and Mysterud. 2002. Climate, changing phenology, and other life history traits: Nonlinearity and match–mismatch to the environment. PNAS 99(21): 13379–13381

Climate Change – When there is no vertical migration available

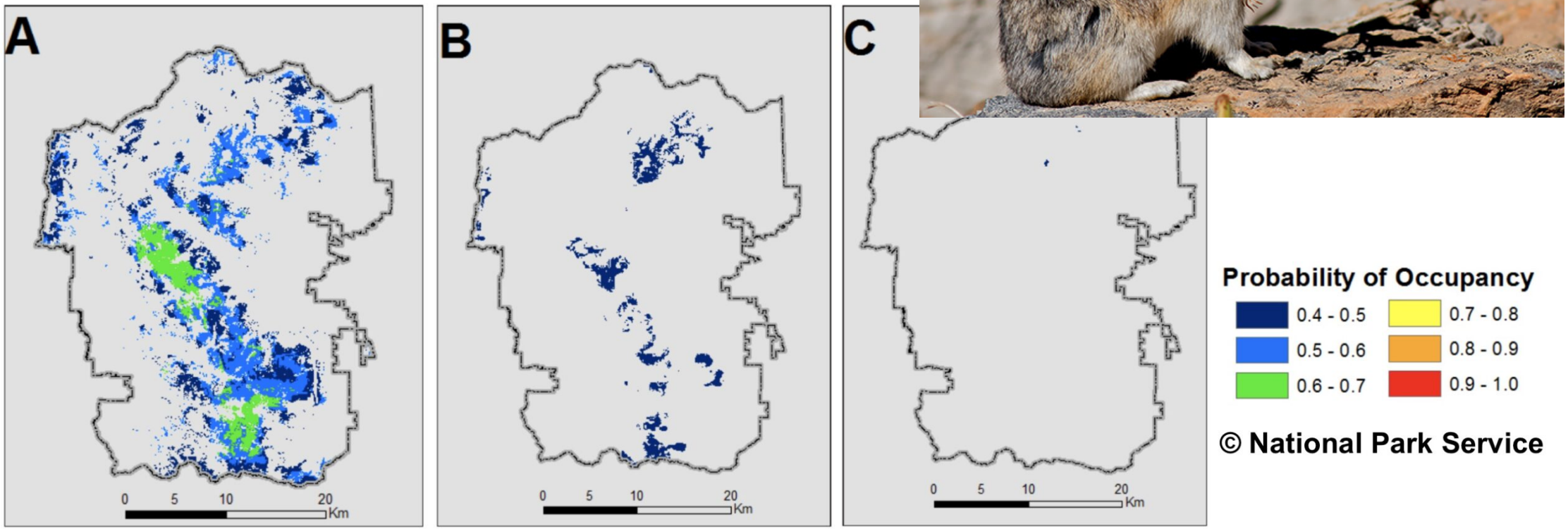
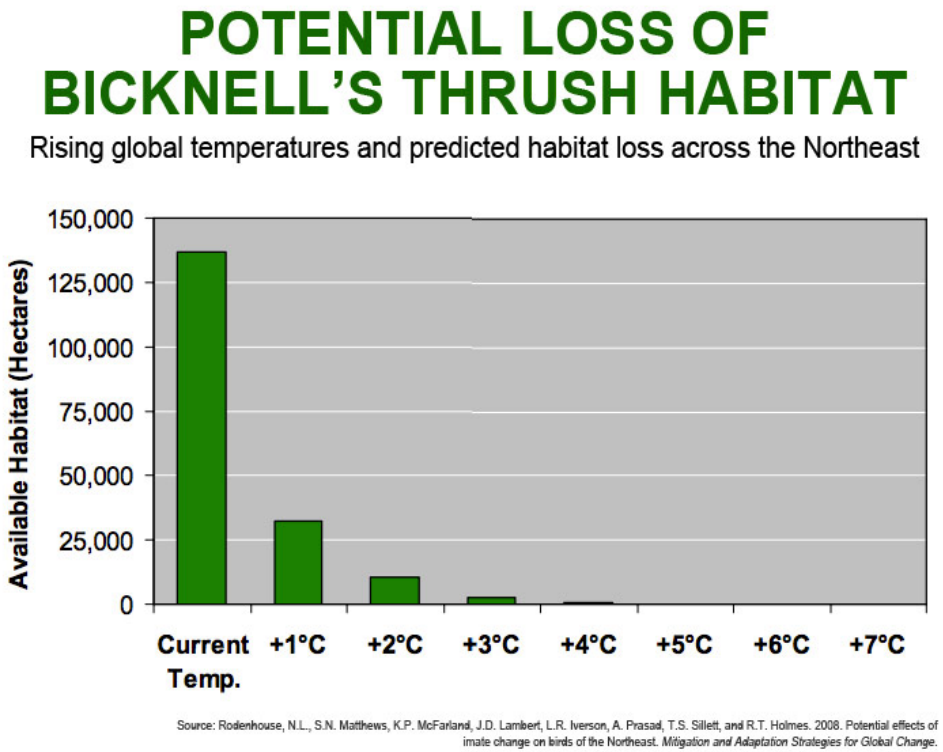


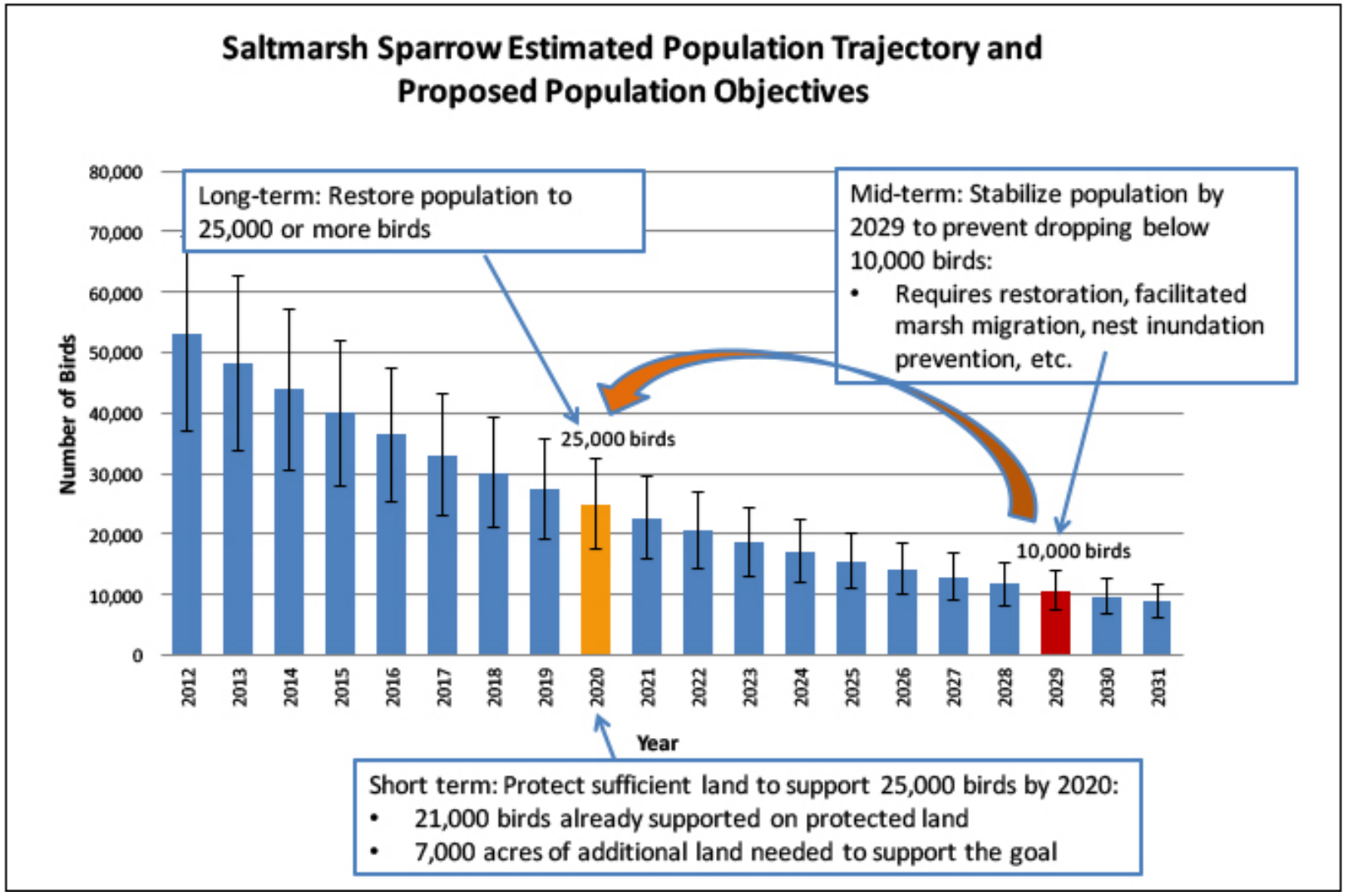
Figure 2. Current occupancy (A) and two future (2071-2099) occupancy scenarios (B, C) in Rocky Mountain National Park. Future scenarios are based on two different models of potential human-driven carbon emissions. The pika population shows precipitous declines in both distribution and occupancy probability. By 2099, pika are predicted to be restricted to less than 20% of their current distribution (B) or nearly extirpated (C).

Climate Change – Northeast – no vertical migration available for Bicknell's Thrush

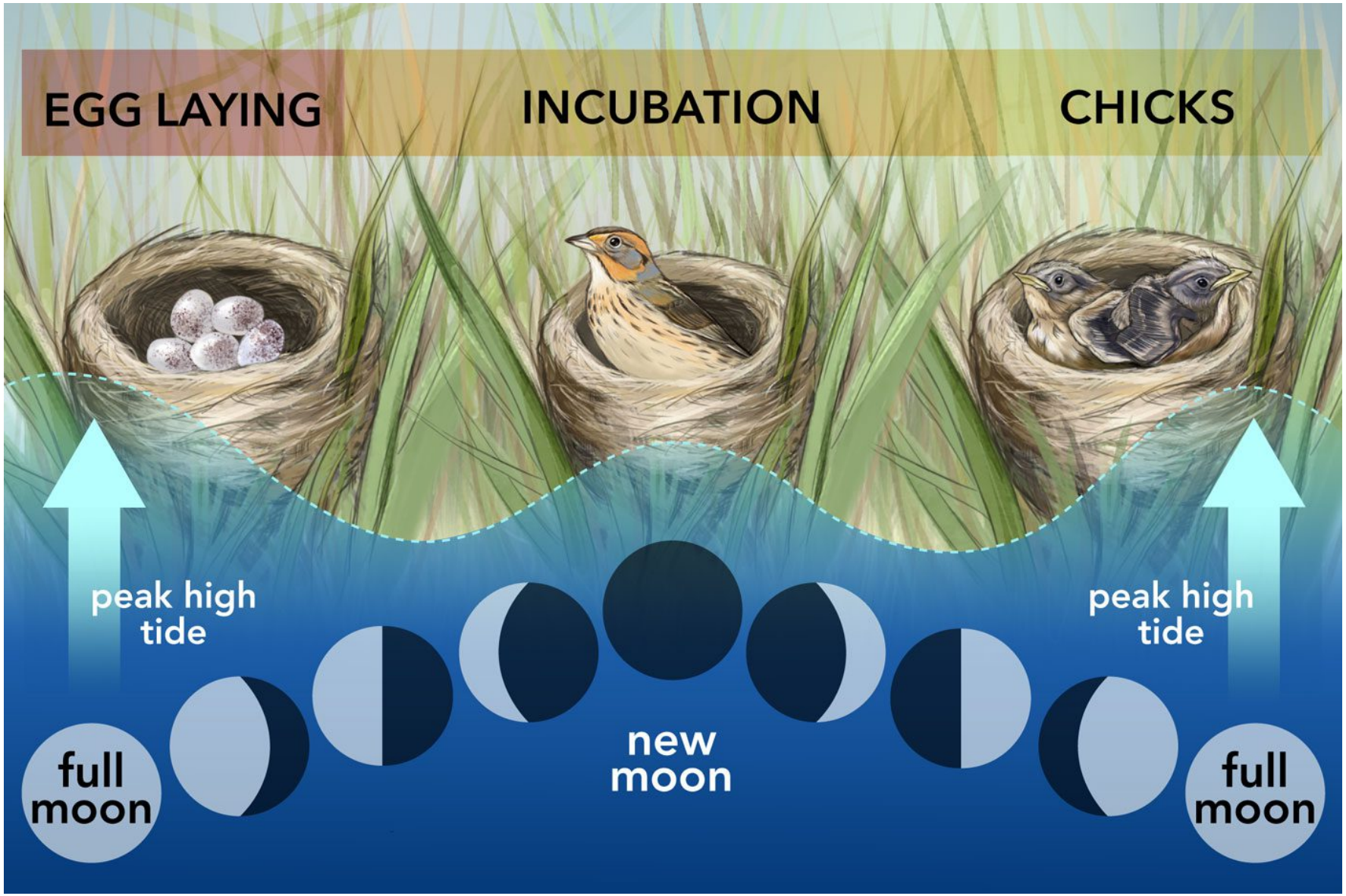


Saltmarsh Sparrov

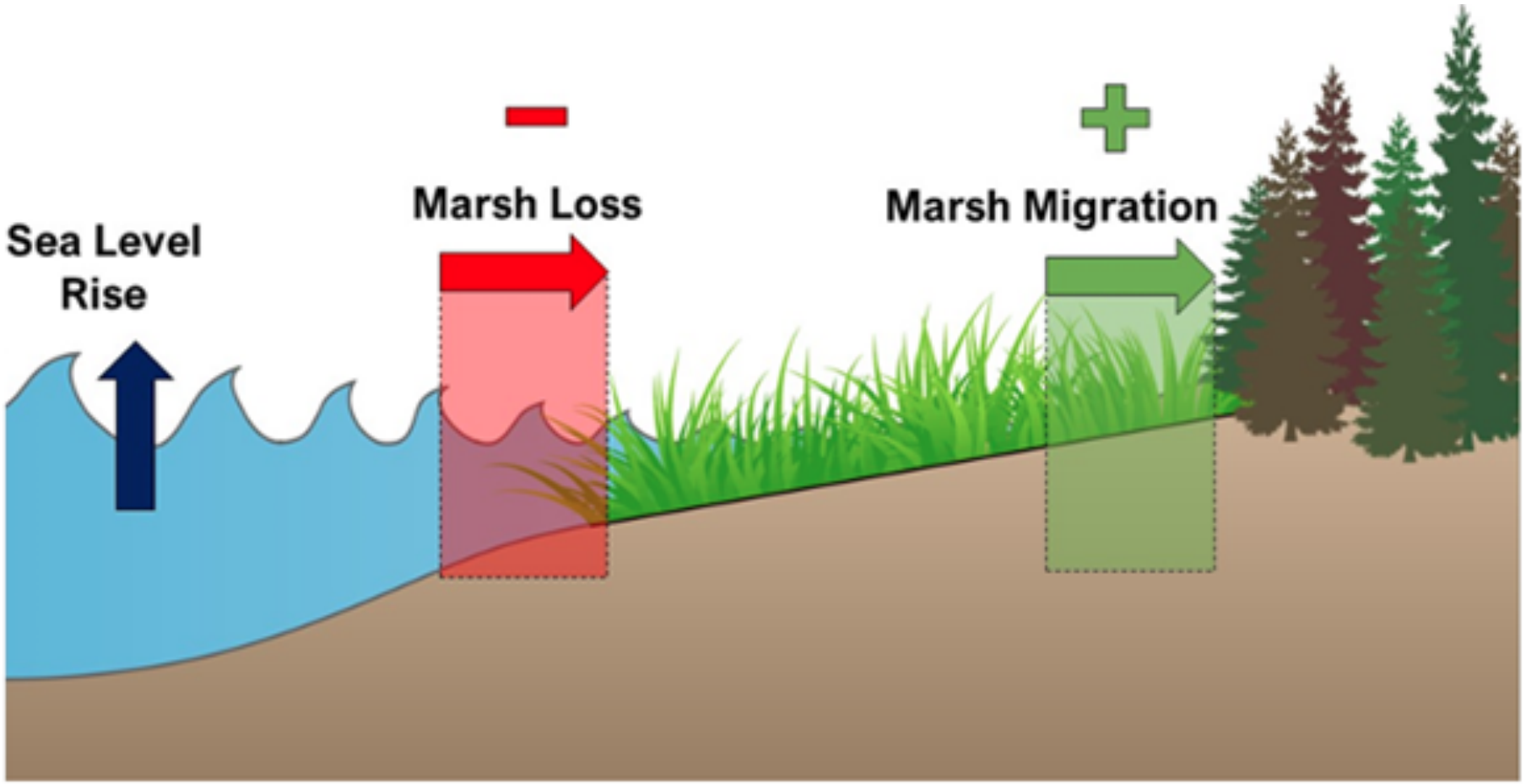
Saltmarsh Sparrow

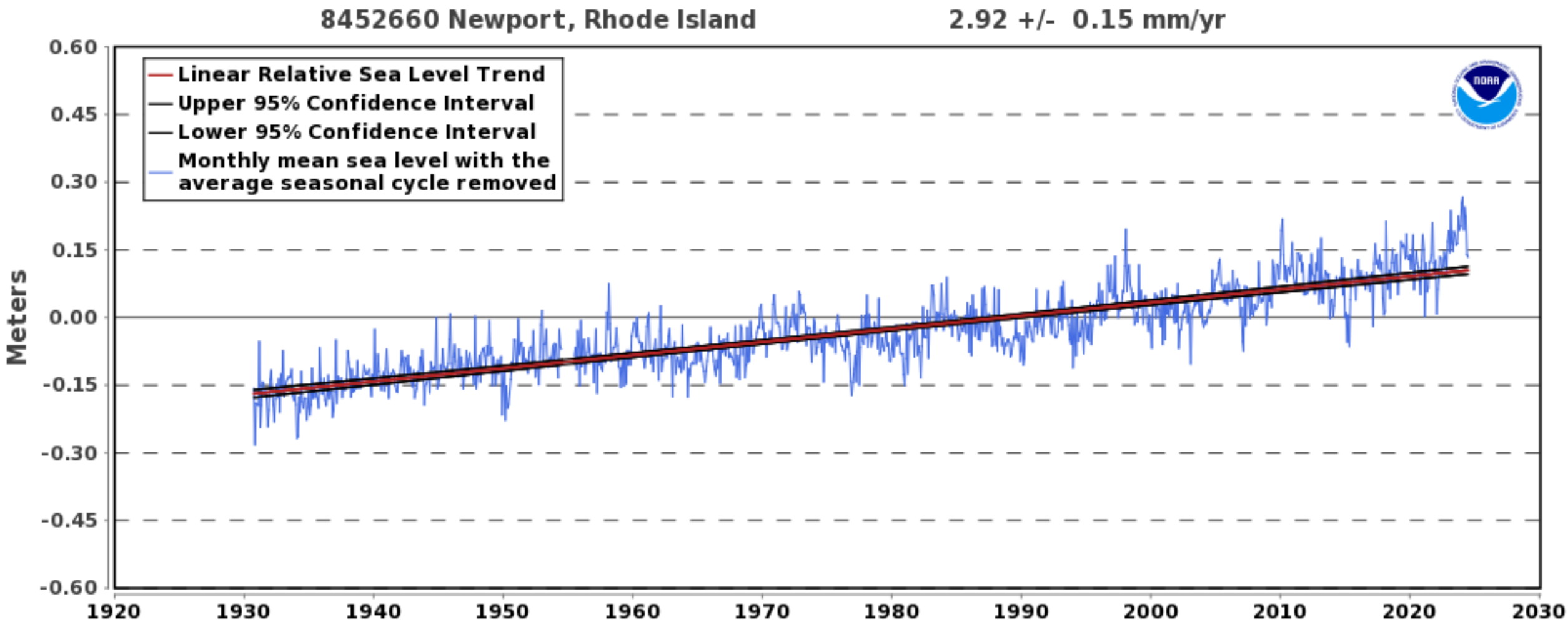


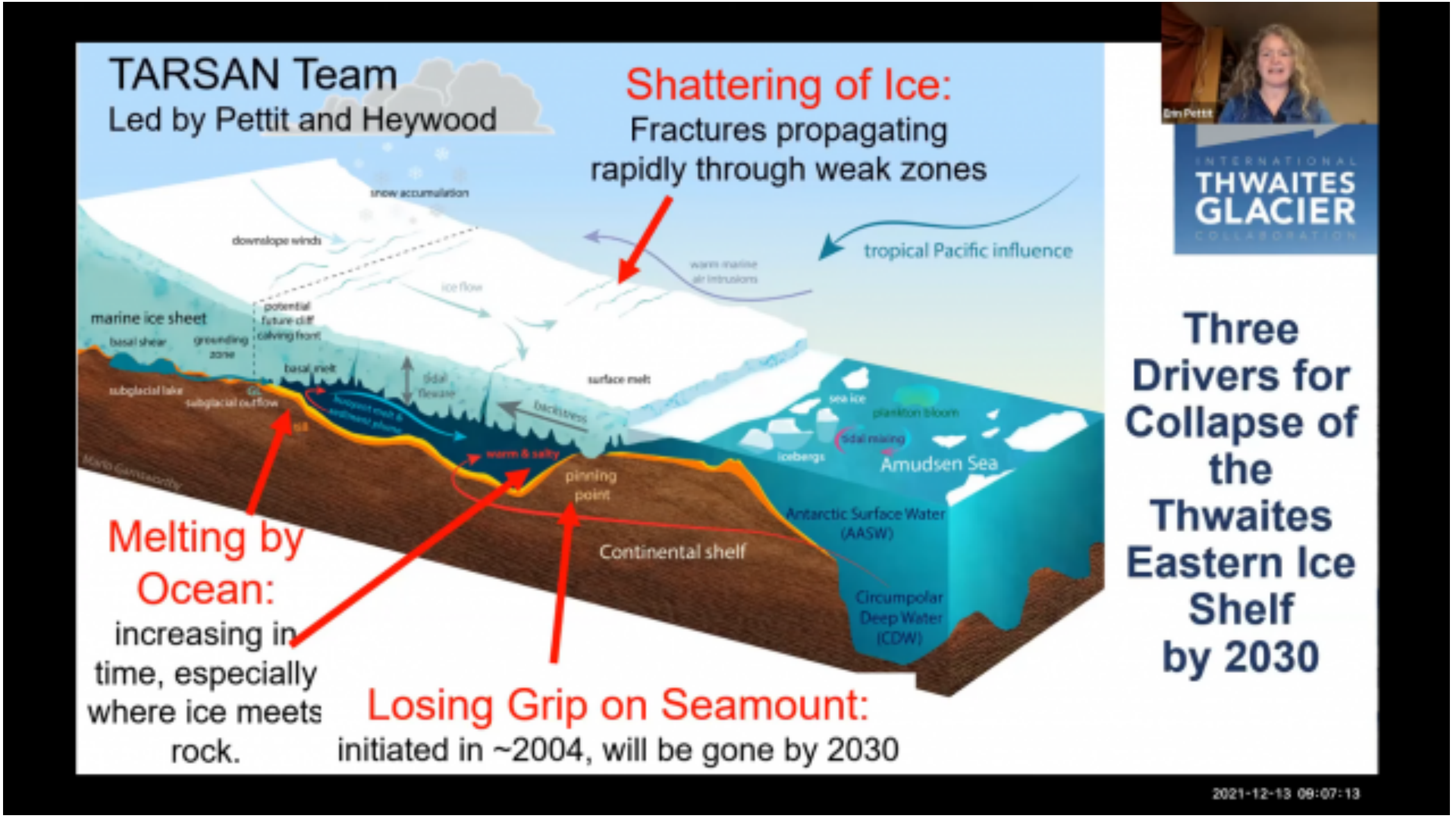
Great Bay National Estuarine Research Reserve



Vertical Migration of Marshes




8452660 Newport, Rhode Island
2.92 +/- 0.15 mm/yr
Linear Relative Sea Level Trend
Upper 95% Confidence Interval
Lower 95% Confidence Interval
Monthly mean sea level with the average seasonal cycle removed
Meters
0.60
0.45
0.30
0.15
0.00
-0.15
-0.30
-0.45
-0.60
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
2030


TARSAN Team
Led by Pettit and Heywood
Shattering of Ice:
Fractures propagating rapidly through weak zones
tropical Pacific influence
Three Drivers for Collapse of the Thwaites Eastern Ice Shelf by 2030
Melting by Ocean:
increasing in time, especially where ice meets rock.
Losing Grip on Seamount:
initiated in ~2004, will be gone by 2030
Erin Pettit
INTERNATIONAL THWAITES GLACIER COLLABORATION
snow accumulation
downslope winds
ice flow
warm marine air intrusions
marine ice sheet
basal shear
grounding zone
potential future calving front
basal melt
subglacial lake
subglacial outflow
tidal flexure
surface melt
backstress
warm & salty
pinning point
sea ice
plankton bloom
tidal mixing
icebergs
Amudsen Sea
Antarctic Surface Water (AASW)
Continental shelf
Circumpolar Deep Water (CDW)
2021-12-13 09:07:13

Other Marsh Species trapped between a rising sea level and urban development

Beyond conversations ….

- Support Climate Mitigation Efforts
- Protect Habitat, especially where we support marsh migration.
  - Support your land trusts
- Keep common birds (and other species) common
  - Windows
  - Cats Indoors
  - Habitat – native plants
  - Avoid Pesticides