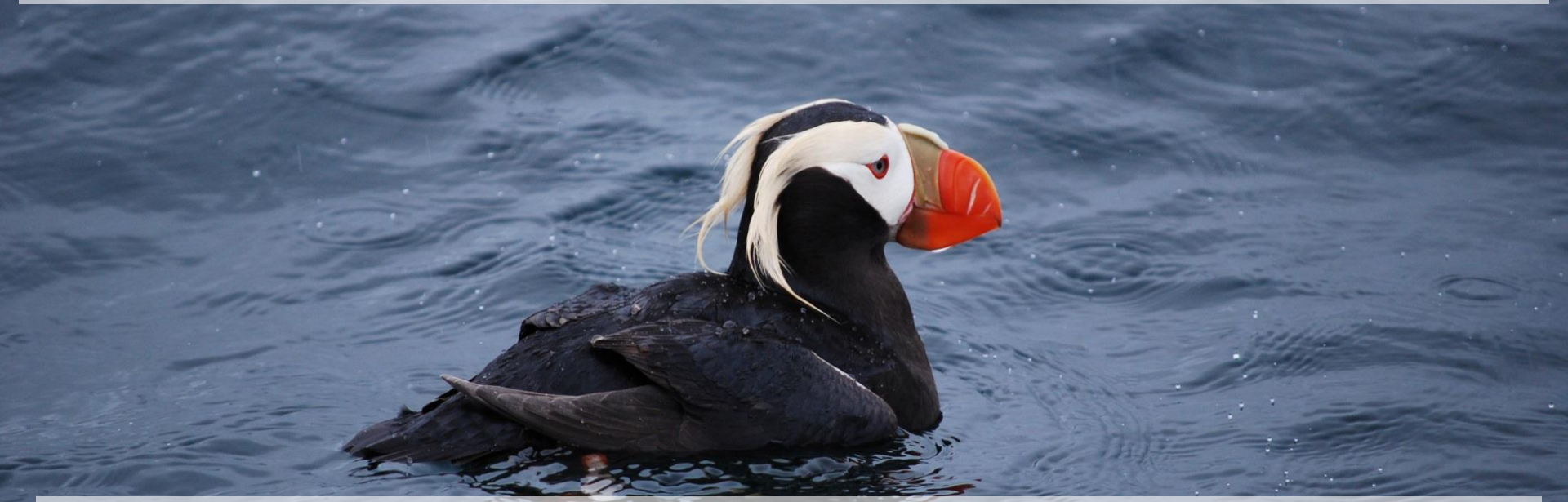
Alaska's Ocean Sentinels: Seabirds as Ecosystem Indicators

2019 Update



LEO Network 18 February 2020

USFWS Alaska Migratory Birds Management – Robb Kaler
Alaska Maritime NWR – Heather Renner, Don Dragoo, Brie Drummond, Arthur Kettle, Nora Rojek, Marc Romano & AMNWR field staff
COASST –Hillary Burgess, Tim Jones & Julia Parrish

Robb Kaler [robert_kaler@fws.gov]

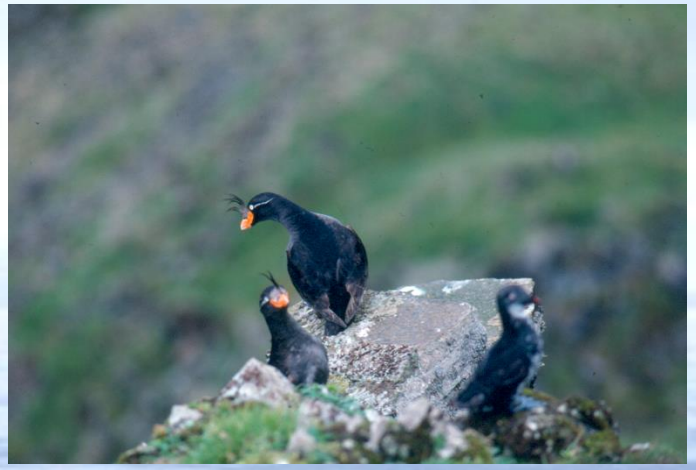
USFWS Migratory Bird Management, Anchorage Alaska

Since 2015, I have coordinated the FWS' response to unusual seabird mortality events in Alaska. Documenting the duration, geographic extent, and magnitude of seabird die-offs across Alaska's expansive coastline is impossible! Thanks to collaboration with the Coastal Observation And Seabird Survey Team (COASST), partner agencies, and community members in far-flung parts of Alaska, FWS has access to real-time, high quality and scientifically robust data on seabird die-offs across the North Pacific. The next decades will be critical in how coastal species and communities in Alaska adapt to a fast-changing environment. Rigorous citizen science programs, exemplified by COASST, provide crucial training and information that is otherwise unavailable.

Photos: Mike Baird, Patrick Connolly, Dan Cushing, Marty Reedy, Brian Sullivan, Gerrit Vyn, Wikimedia

Seabird Life History Traits

- Colonial (up to a few million)
- Delayed maturation (breed at 5-10 years old)
- Long-lived (e.g., 60+ year old albatross)
- Small clutch sizes (one egg common)
- Slow chick development (up to 60 days)
- Forage great distances (up to 1500 km)
- Low reproductive potential



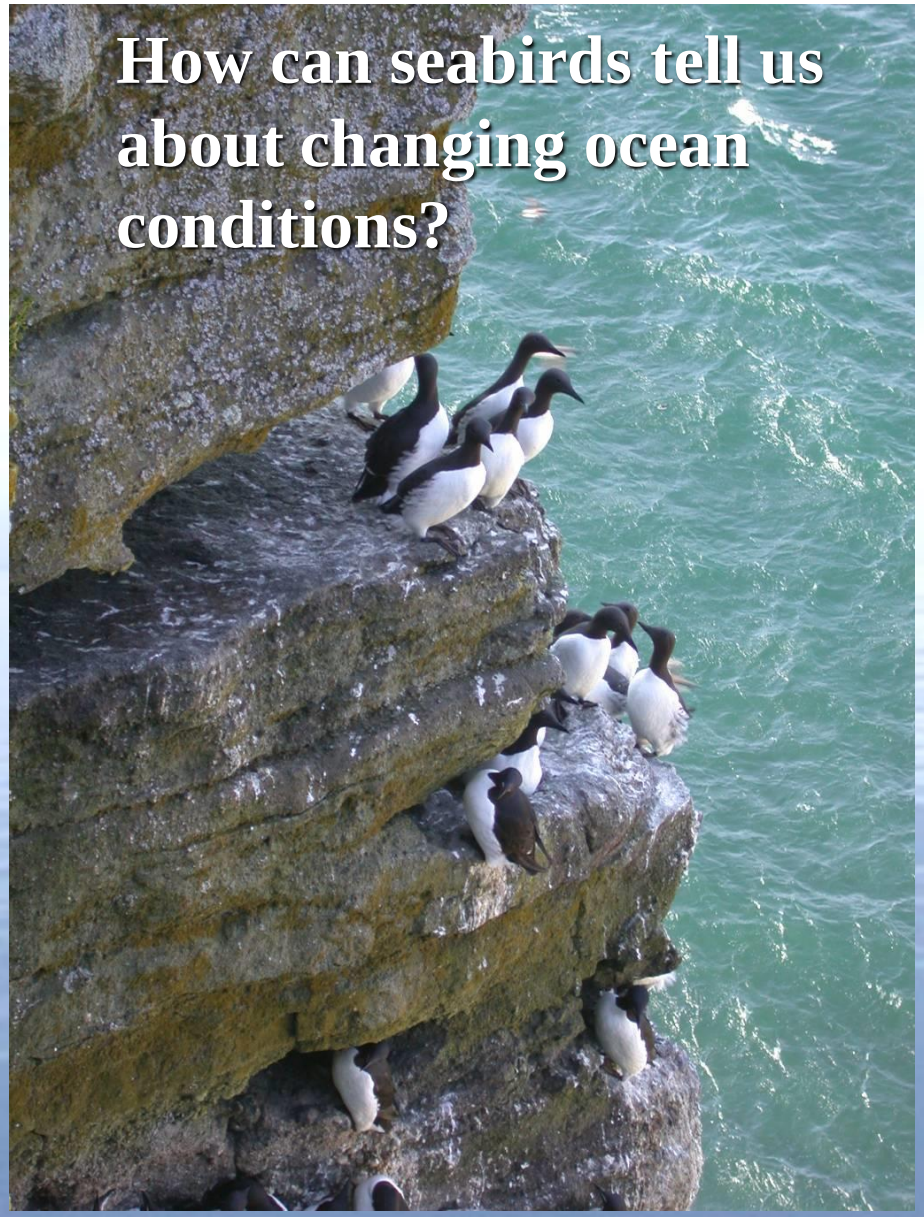
Seabirds live longer, breed later, and have fewer young than other birds

Seabird in Alaska

- **~75% of U.S. seabirds nest in Alaska**
- **~ 150 million seabirds in Alaska**
- **~ 38 species that nest in Alaska**
- **~ 1300 colonies in Alaska with several sites have over 1 million birds!!**

Photos: Mike Baird, Patrick Connolly, Dan Cushing, Marty Reedy, Brian Sullivan, Gerrit Vyn, Wikimedia

Monitoring Alaska's Seabirds



- Indicators of ecosystem health
- Depend on ocean for food
- Spend most of their life on ocean
- Easy to see and monitor at breeding sites

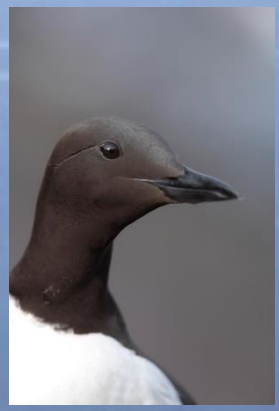
Common prey of seabirds in Alaska

Pacific Sandlance
- Occupy subtidal & nearshore habitat
- Good year/bad years

Capelin
- Cold-water association
- Numbers down after 1976 Regime Shift

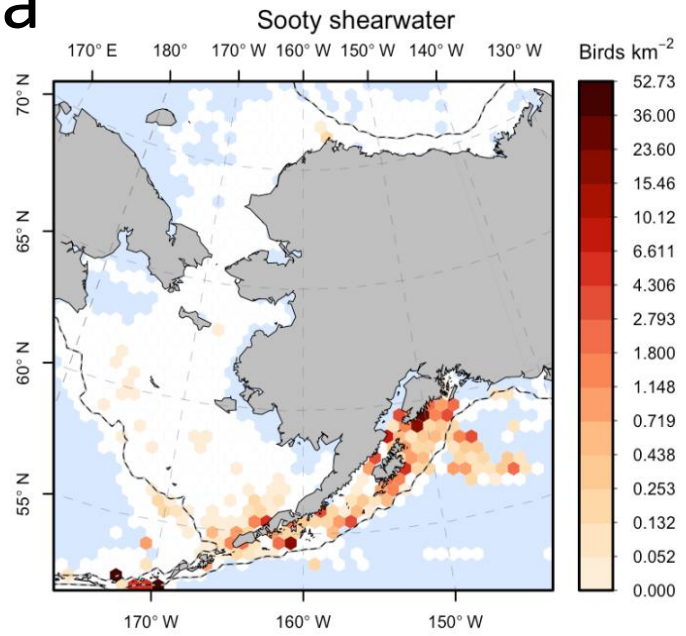
Juvenile Walleye Pollock
- Lower quality prey
- Numbers up after 1976 Regime Shift

Euphausiids (Thysanoessa spp.) and Copepods (and small zooplankton)
- Might make up a large portion of winter diets of many seabirds (foraging over the continental shelf)

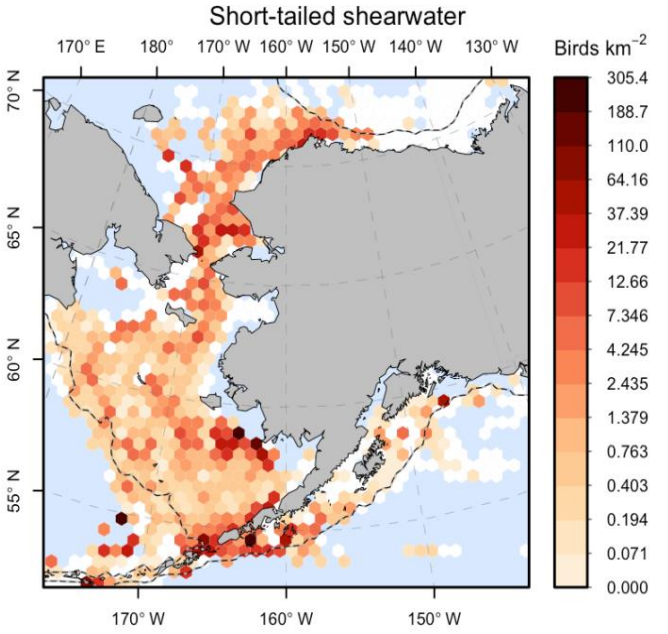


<u>Example of metabolic rate</u>: Common Murre (1050g) need to consume 10-30% of their body mass daily (90-300 fish/day)

Non-breeding Seabirds Bering Sea



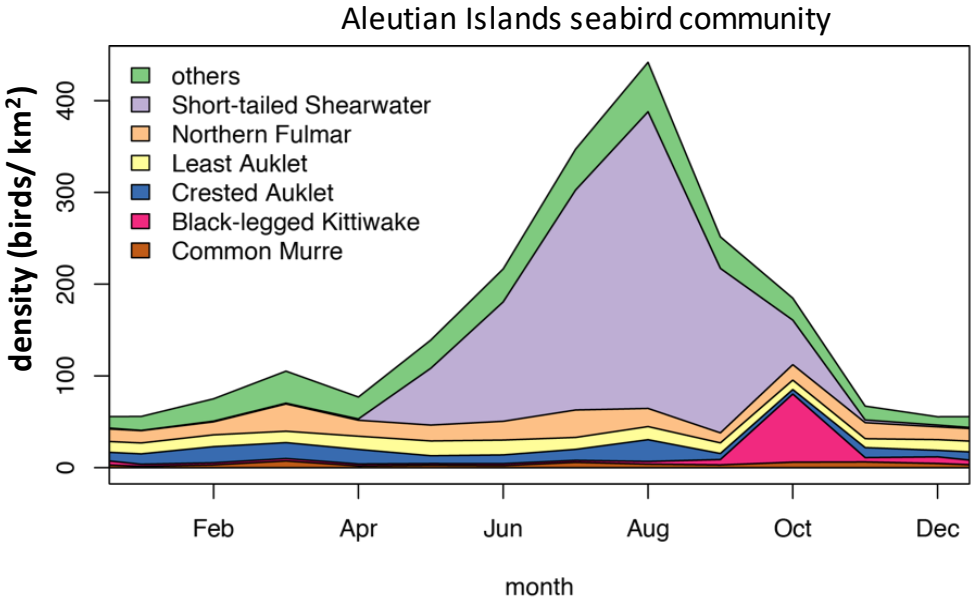
- 2 species of shearwaters
  - Sooty & Short-tailed
- Shearwaters breed in southern hemisphere & travel to Alaska to feed
- Often are seen in large forage flocks
- Surface feeding: crustaceans, squid, fish

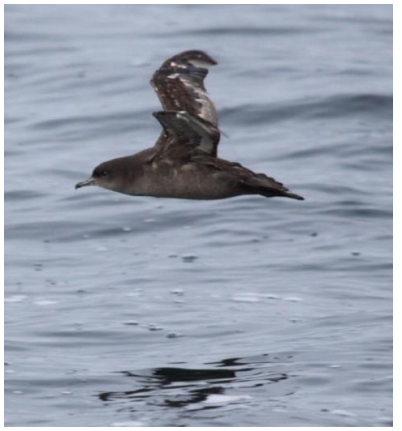


At-Sea Monitoring Alaska's Seabirds

Seasonality of Seabirds

change communities





Short-tailed Shearwater migration to Alaska

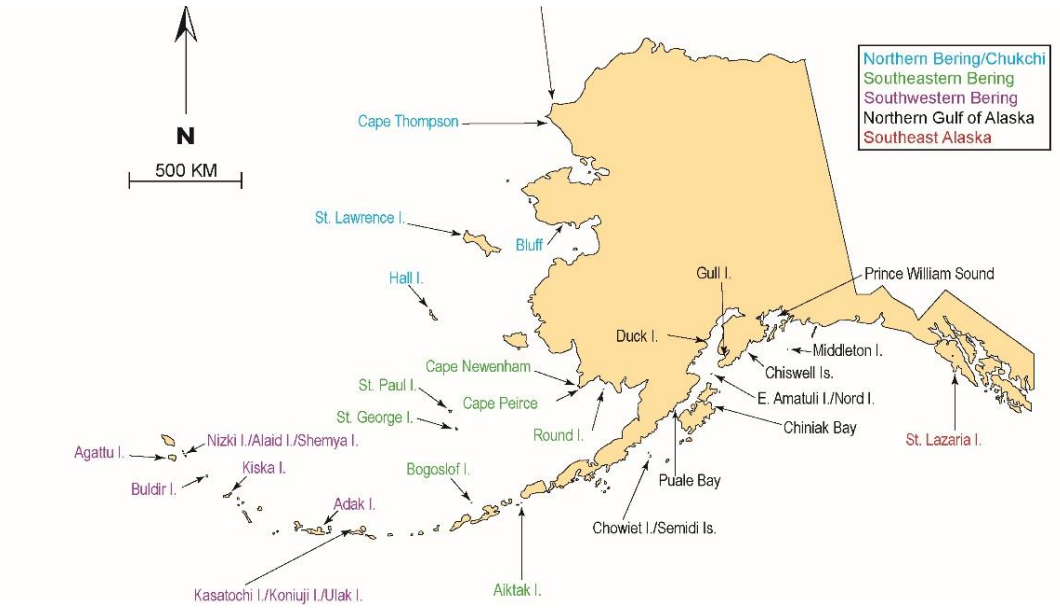
Colony Monitoring Program

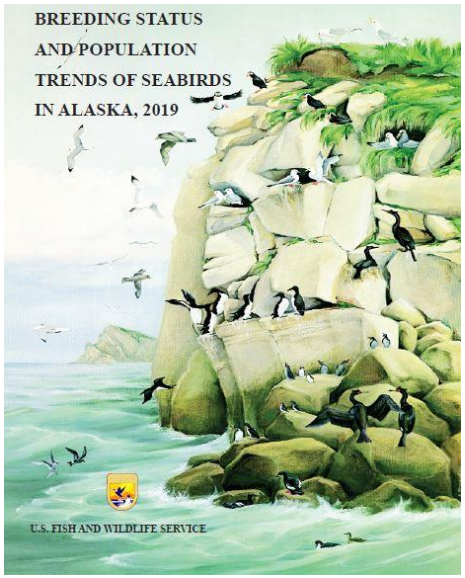
Colony monitoring includes:

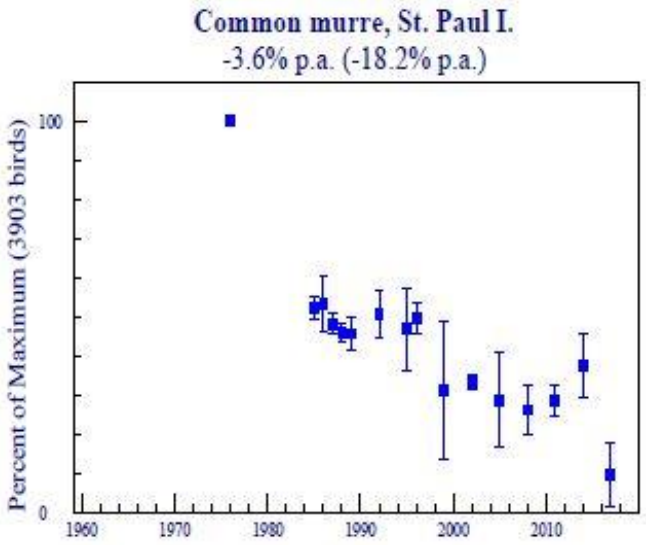
- Population trends
- Reproductive success
- Diets
- Phenology
- Adult survival

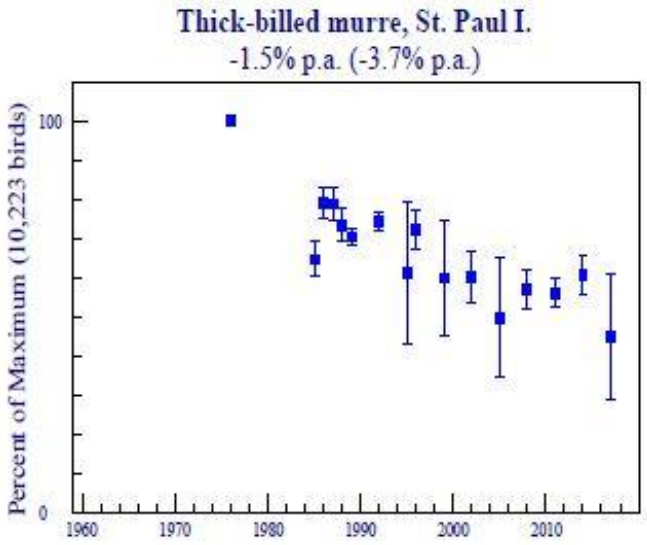
Monitoring sites include:

- Annual
- Intermittent (3-10+ years)

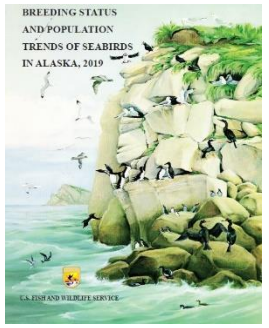








Colony Monitoring continued



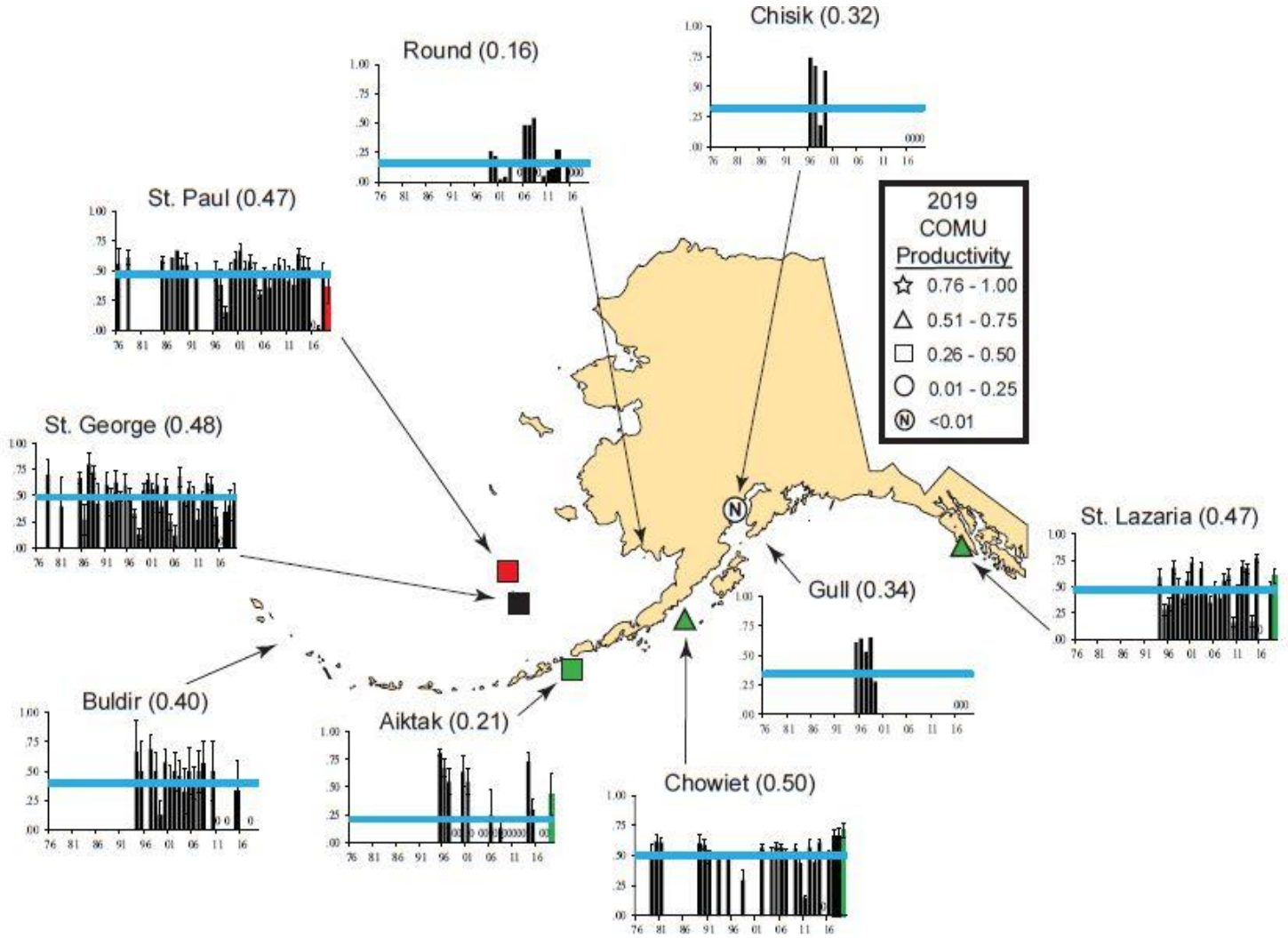
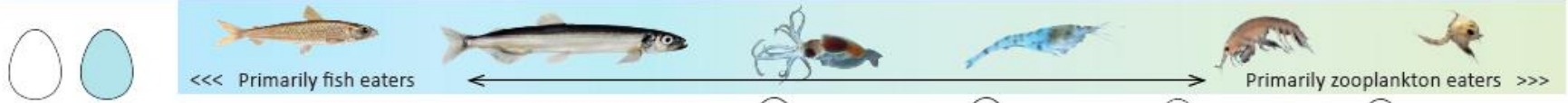


Figure 3. Productivity of common murres (chicks fledged/nest site) at Alaskan sites. Lack of bars indicates that no data were gathered in those years. Zeros indicate complete breeding failure. Blue line is the mean productivity at the site (value in parentheses; current year not included). Color of graph bar and map symbol indicates how current year's success compared to the site mean (red is >20% below, black is within 20% and green is >20% above site mean). Error bars represent ± 1 standard deviation.

Alaska Maritime National Wildlife Refuge

2017 Seabird Report Card

Region	Annual monitoring site	Red-faced cormorants	Glaucous-winged gulls	Common murres	Thick-billed murres	Horned puffins	Tufted puffins	Red-legged kittiwakes	Black-legged kittiwakes	Fork-tailed storm-petrels	Leach's storm-petrels	Parakeet auklets	Least auklets
Chukchi Sea	Cape Lisburne												
Bering Sea	St. Paul												
Bering Sea	St. George												
Aleutian Islands	Buldir												
Aleutian Islands	Aiktak												
Alaska Penin.	Chowiet												
Gulf of Alaska	East Amatuli												
Gulf of Alaska	St. Lazaria												



Eggs represent overall productivity relative to the long-term average.
White eggs indicate productivity derived from monitoring data;
colored eggs indicate productivity based on anecdotal observations.

(52) = 2% Way above average! = 40% Average or above = 40% Below average = 15% Complete failure

Alaska Maritime National Wildlife Refuge

2018 Seabird Report Card

Region	Annual monitoring site	Red-faced cormorants	Glaucous-winged gulls	Common murres	Thick-billed murres	Horned puffins	Tufted puffins	Red-legged kittiwakes	Black-legged kittiwakes	Northern fulmar	Fork-tailed storm-petrels	Leach's storm-petrels	Parakeet auklets	Least auklets
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Aleutian Islands	Buldir													
	Aiktak													
Alaska Penin.	Chowiet													
Gulf of Alaska	East Amatuli													
	St. Lazaria													

<<< Primarily fish eaters

Primarily zooplankton eaters >>>

Eggs represent overall productivity relative to the long-term average.
White eggs indicate productivity derived from monitoring data;
colored eggs indicate productivity based on anecdotal observations.

(54) = 22% Way above average! = 28% Average = 31% Below average = 19% Complete failure

Alaska Maritime National Wildlife Refuge

2019 Seabird Report Card

Region	Annual monitoring site	Red-faced cormorants	Glaucous-winged gulls	Common murres	Thick-billed murres	Horned puffins	Tufted puffins	Red-legged kittiwakes	Black-legged kittiwakes	Northern fulmar	Fork-tailed storm-petrels	Leach's storm-petrels	Parakeet auklets	Least auklets
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	St. Lazaria													

Eggs represent overall productivity relative to the long-term average.
White eggs indicate productivity derived from monitoring data;
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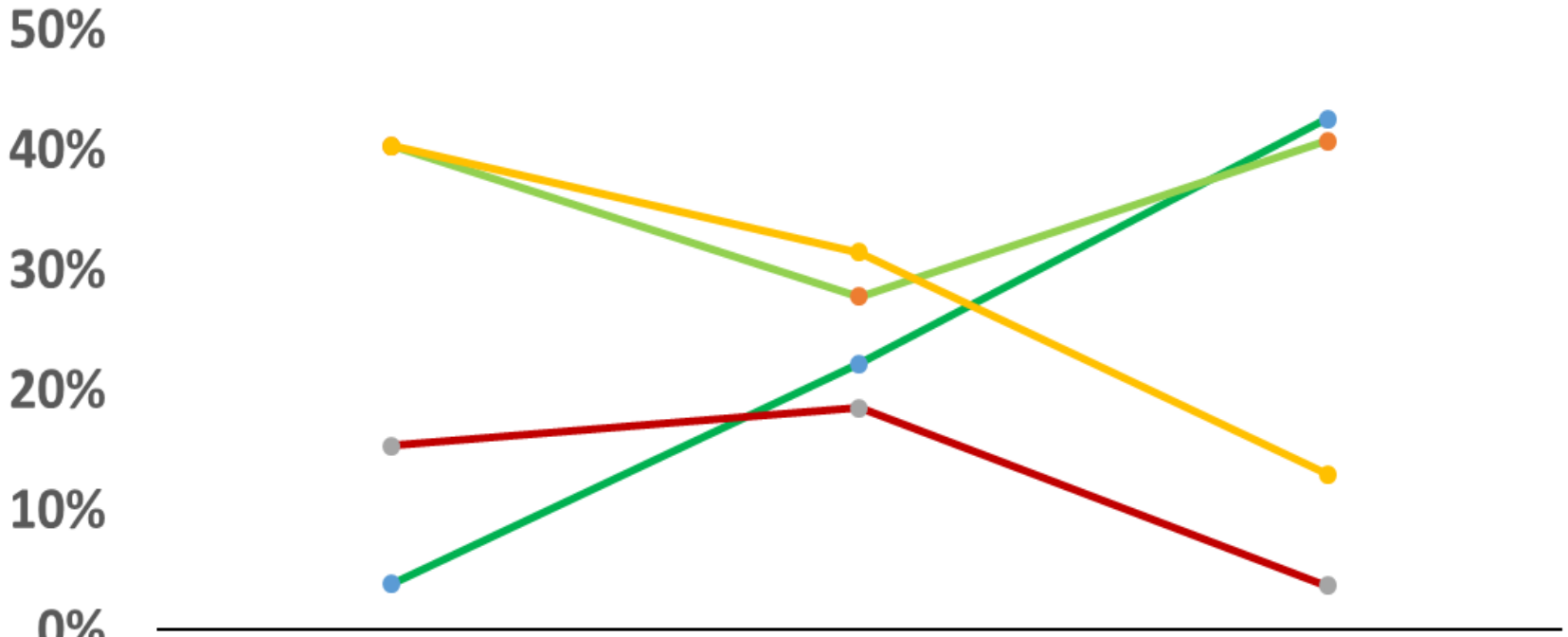
(54) = 43% Way above average! = 41% Average = 13% Below average = 4% Complete failure

AMNWR Seabird Report Card 2017-2019



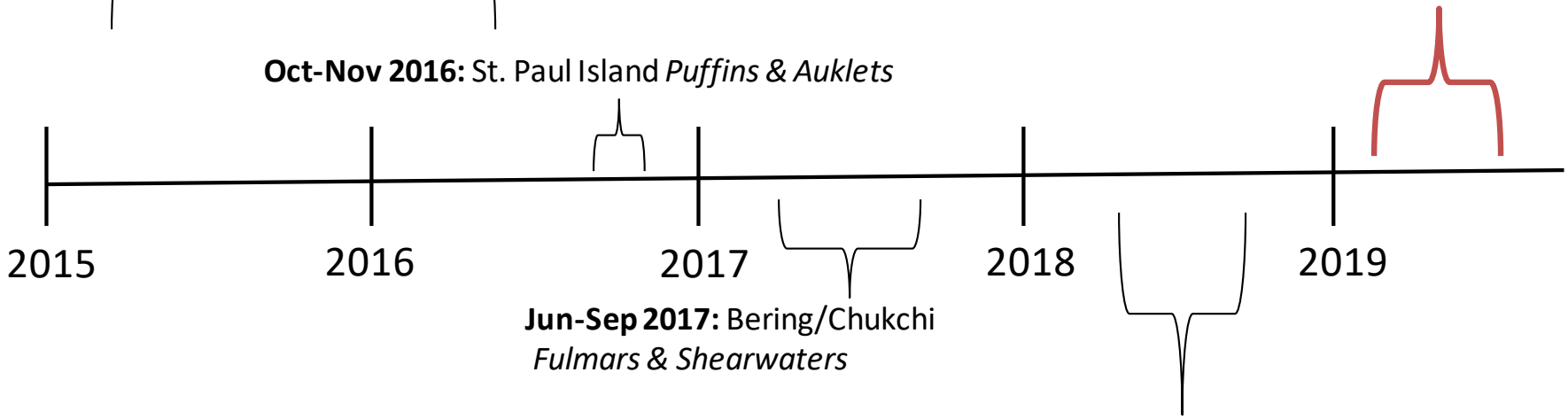
	2017 (52)	2018 (54)	2019 (54)
great	4%	22%	43%
good	40%	28%	41%
bad	40%	31%	13%
fail	15%	19%	4%

Alaska Seabird Die-offs: 2015 to Present

May 2015-June 2016: Gulf of Alaska *Common Murres*

May-Oct 2019: Bering/Chukchi, East Aleutians & Bristol Bay *Shearwaters, Murres, Puffins, Auklets*

Oct-Nov 2016: St. Paul Island *Puffins & Auklets*



Jun-Sep 2017: Bering/Chukchi *Fulmars & Shearwaters*

May-Aug 2018: Bering/Chukchi, St. Paul, Utqiagvik, Lower Cook Inlet *Murres, Fulmars, Shearwaters, Puffins, Auklets*

What Happened?

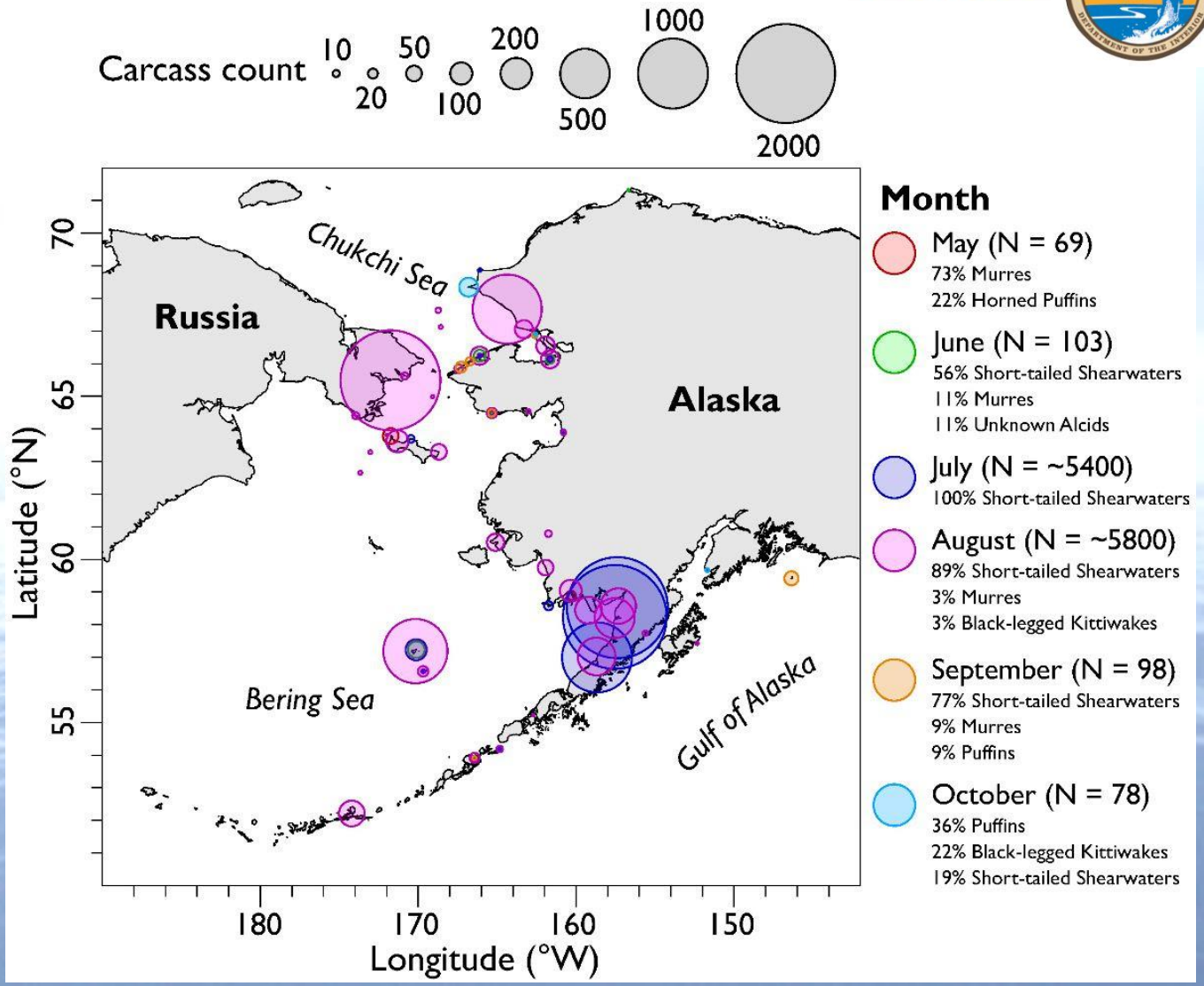
May 2019, the FWS received reports of dead and dying murres and puffins in the northern Bering and Chukchi seas.

Late July - early August, thousands of short-tailed shearwaters washed up on Bristol Bay region beaches.

By mid-August, the shearwater die-off extended along coastal Alaska north to Chukotka Peninsula of Russia.

Late August, die off is widespread (including Russia coasts), primarily shearwaters, but also puffins, murres, auklets

More than 9000 carcasses were counted



2019 Alaska Carcass Examination Results

- Seabird carcasses from multiple locations have been sent to **USGS National Wildlife Health Center** for examination and testing.
- Results of 43 carcasses examined indicate **starvation as the cause of death; however, in SE Alaska** exposure to saxitoxin (biotoxin associated with Paralytic Shellfish Poisoning, PSP) was linked to a localized die-off of breeding tern in June.
- With the exception of the PSP detected in SE AK, analyses of tissues by **USGS Alaska Science Center for the presence of harmful algal bloom toxins** (saxitoxin, domoic acid) was **not been detected in samples analyzed from the Bristol Bay north to the Bering Strait region**.
- For birds examined and tested during **previous seabird die-off (2015-2018) cause of death has consistently been starvation**; however birds have had trace levels of saxitoxin in their digestive tracts and while there is no evidence of acute toxicity as a cause of seabird deaths, it is possible that **exposure to saxitoxin may have been a contributing factor**.
- **No avian diseases** have been detected to date.
- **Harmful Algal Blooms and Food Safety & Human Consumption**: FWS cannot advise on this subject but emphasizes **best practices when handling harvested seabirds or waterfowl**. Do not consume sick or dying seabirds.

Why are birds starving?

Warm water effects?

- on metabolism of predator and prey
- on prey distribution and abundance
- on direct competition for prey

Harmful algal bloom effects?

- on birds, limiting ability to forage
- on lower trophic levels reducing prey species (from copepods to fishes)

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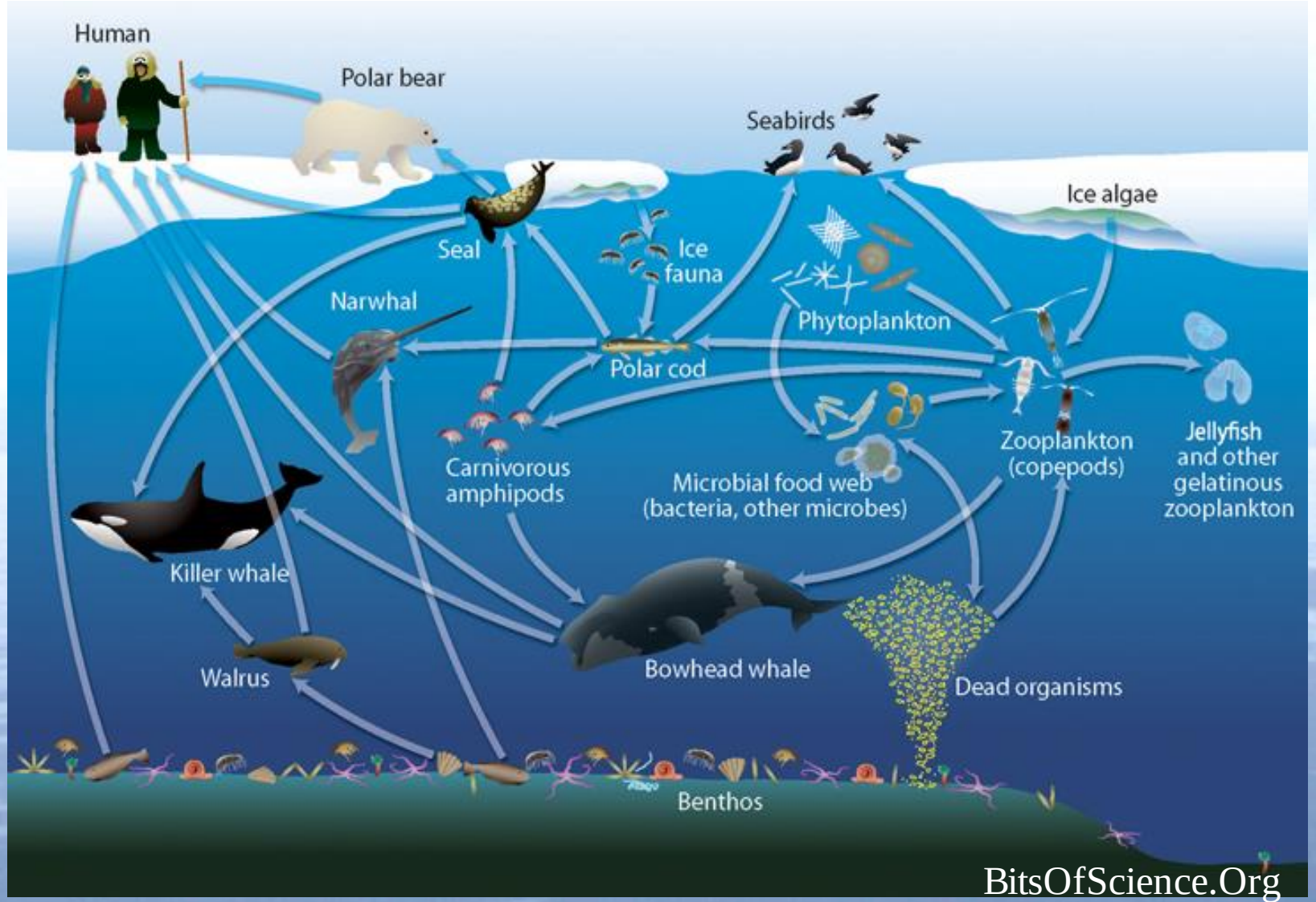
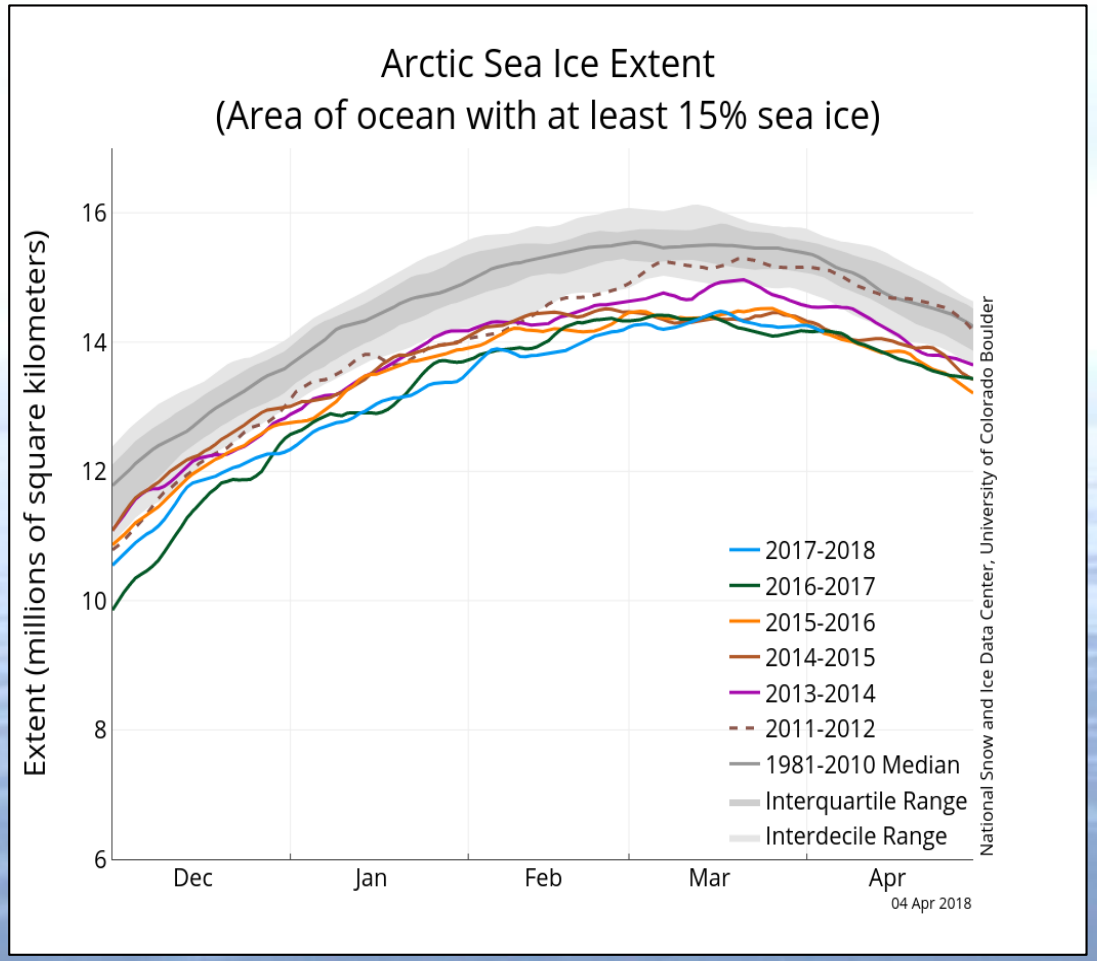
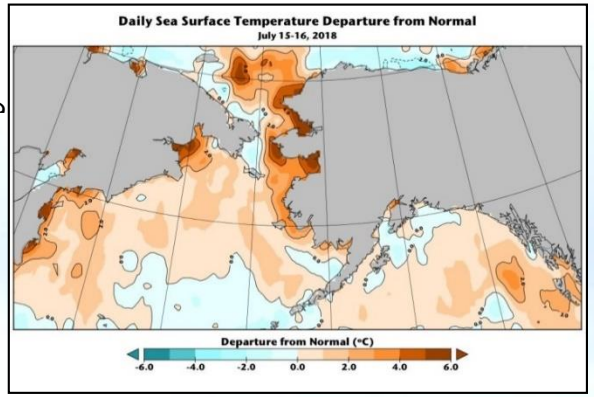
Arctic Ice Ecosytem



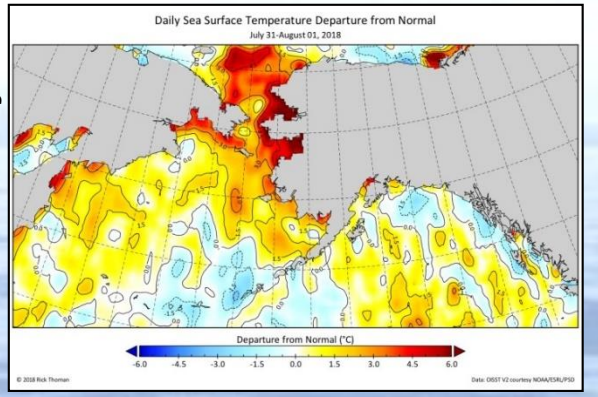
Sea Ice Extent and Sea Surface Temperatures



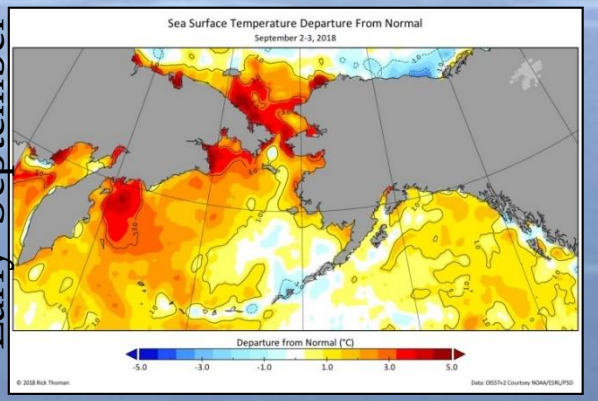
Mid-July

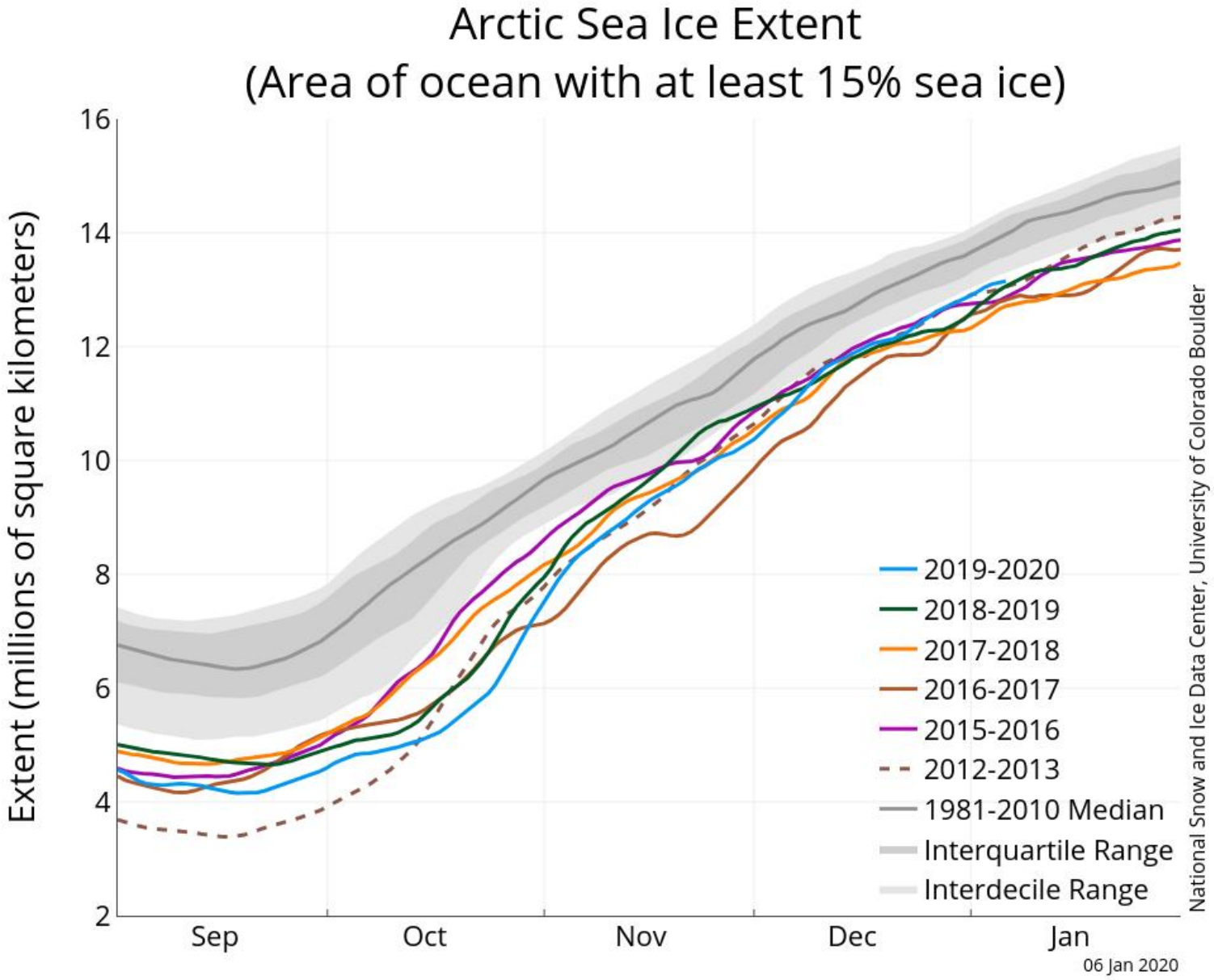


Late July

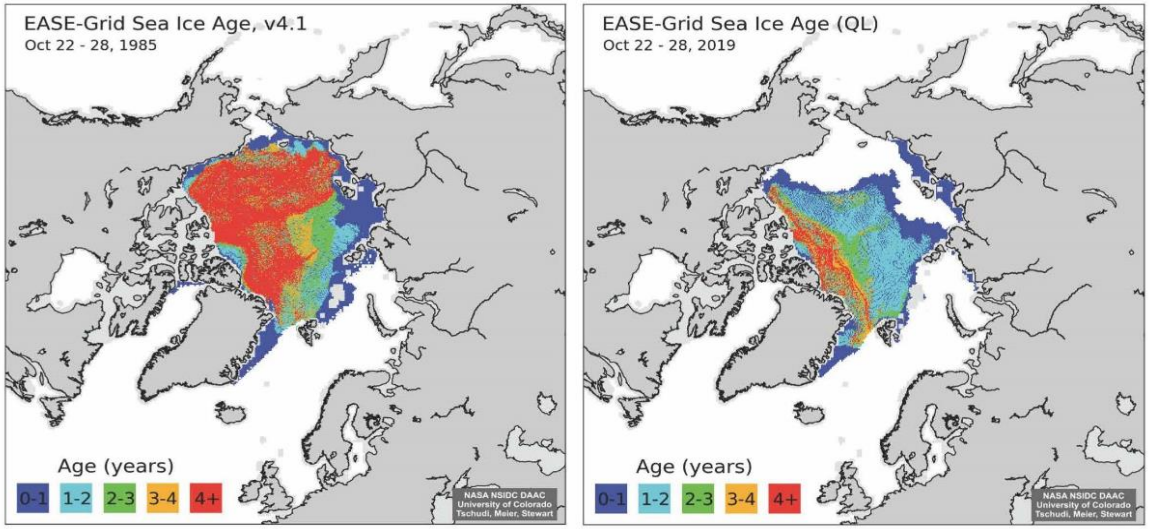


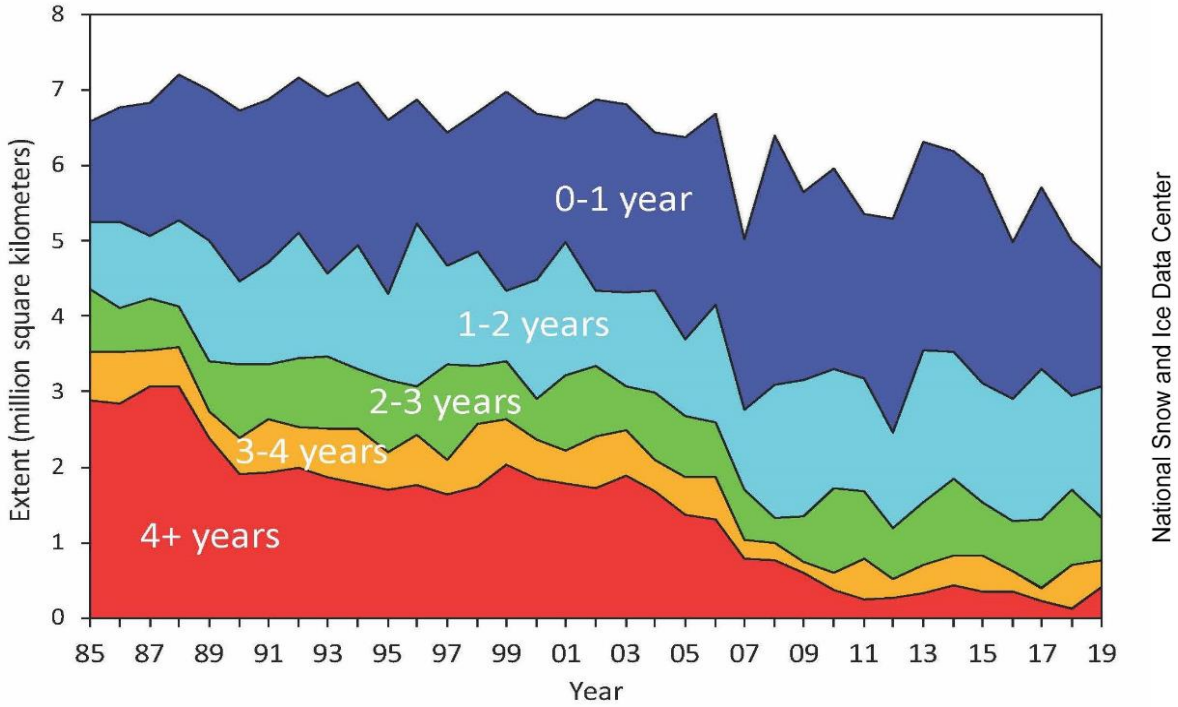
Early September




Arctic Sea Ice Extent
(Area of ocean with at least 15% sea ice)
Extent (millions of square kilometers)
16
14
12
10
8
6
4
2
Sep
Oct
Nov
Dec
Jan
2019-2020
2018-2019
2017-2018
2016-2017
2015-2016
2012-2013
1981-2010 Median
Interquartile Range
Interdecile Range
National Snow and Ice Data Center, University of Colorado Boulder
06 Jan 2020

Sea Ice Age
1985 - 2019



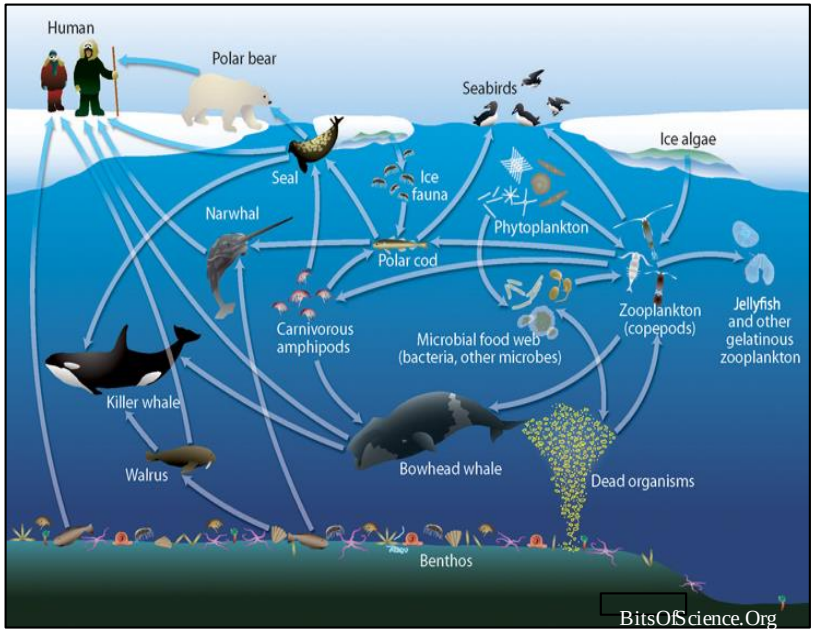


NOAA Survey Shows Shocking Lack of Thermal Barrier Between Northern and Southern Bering Sea

The Nome Nugget, 17 August 2018, By Sandra L. Medearis (based on Bering Strait Science, Lyle Britt, NOAA Alaska Fisheries Science Center

http://www.nomenugget.net/news/noaa-survey-shows-shocking-lack-thermal-barrier-between-northern-and-southern-bering-sea

- Lack of sea ice in winter of 2017 unprecedented with near open water
- First time in 37 years of surveys no cold water barrier (cold = 2°C water temperature)
- 2010 compared to 2017:
  - 6,000 percent increase in biomass of pollock
  - 900 percent increase in biomass of cod



The Nome Nugget

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HOME / NEWS / NOAA SURVEY SHOWS SHOCKING LACK OF THERMAL BARRIER BETWEEN NORTHERN AND SOUTHERN BERING SEA

View This Week's Paper Online

September 6, 2018

Photo courtesy NOAA Fisheries

GIVING TO SCIENCE—A large Pacific Cod specimen caught just south of Little Diomede Island is being weighed and measured prior to collection of otoliths (ear bones) for determining the age of the fish and its overall condition.

NOAA Survey Shows Shocking Lack Of Thermal Barrier Between Northern And Southern Bering Sea

BY: SANDRA L. MEDEARIS

NOAA Fisheries scientists conducting their annual trawl survey of the southern Bering Sea ecosystem survey found unprecedented conditions of warm ocean temperatures and significant changes in the cod and pollock numbers and conditions.

As a result, they received emergency funding to unexpectedly bring their trawl survey north

Weekly fare sale

Alaska Airlines

It's free!

Why are birds starving?

Warm water effects?

- on metabolism of predator and prey
- on prey distribution and abundance
- on direct competition for prey

Harmful algal bloom effects?

- on birds, limiting ability to forage
- on lower trophic levels reducing prey species (from copepods to fishes)

Harmful Algal Blooms (HABs)

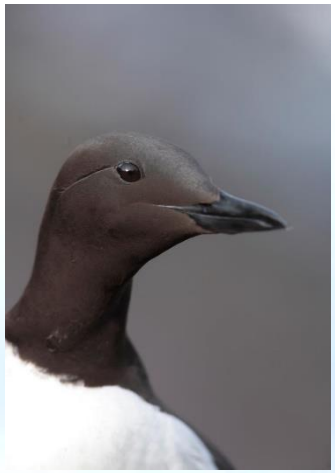
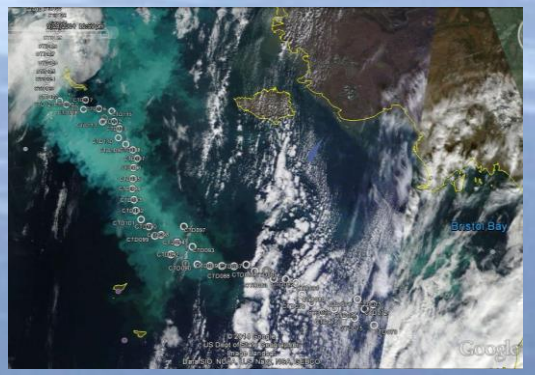


Photo: Cornelius Schlawe

Two primary HAB biotoxins of concern in Alaska

- Saxitoxin (STX): a potent neurotoxin responsible for paralytic shellfish poisoning (PSP)
- Domoic Acid (DA): an exitotoxin that causes seizures and neurologic distress



Historical documentation of both in Alaska, however:

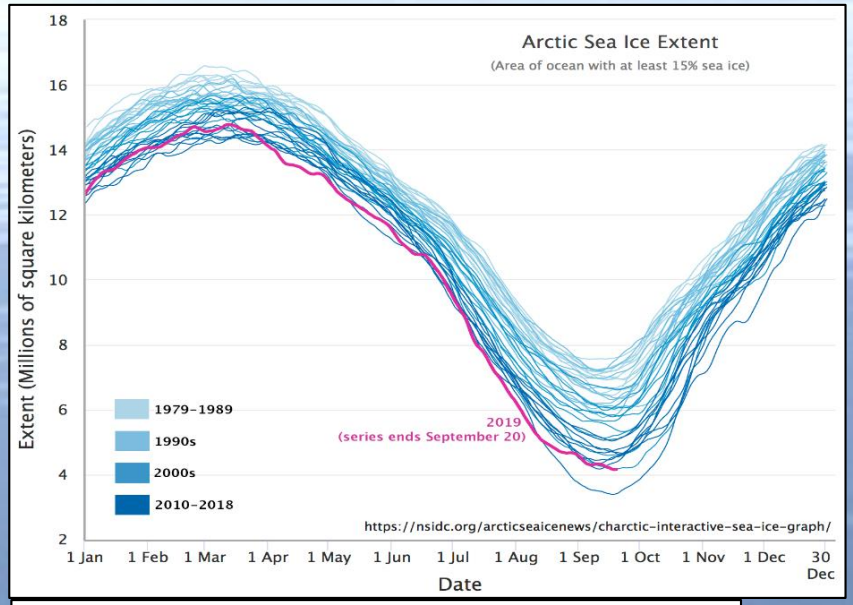
- Recent studies have documented STX and DA in Alaskan marine mammals and seabirds
- Wildlife and humans at risk? Coastal communities along the Bering and Chukchi seas which rely heavily on harvest on marine birds and mammals

Why do we care about HABs?

Illness/death in humans & wildlife

Economic impact

Food security & safety



Changing environmental conditions

Photo: Cornelius Schlawe

USGS science for a changing world **Alaska Science Center**

Future Directions for 2020

- Effects of sublethal STX exposure on bird behavior and physiology
- Tissue routing and interpretation from field collected samples
- Investigations of STX in marine food web in Alaska
- Biogeography of HABs in Alaskan seabirds

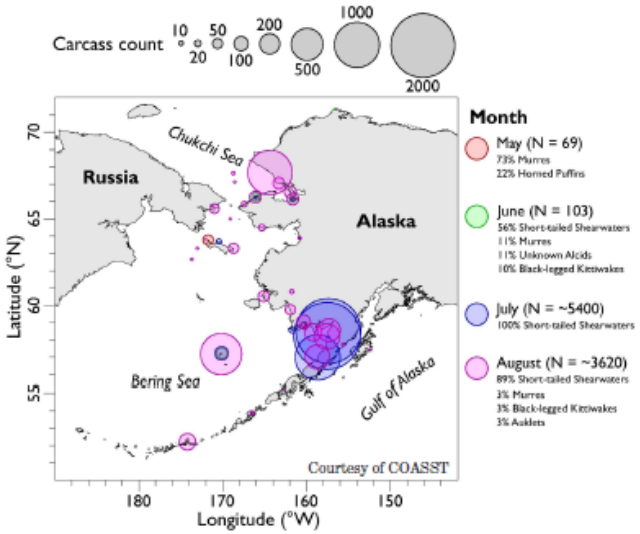
For more info on 2020 HAB projects, contact:
Sarah Schoen (sschoen@usgs.gov) &
Caroline Van Hemert (cvanhemert@usgs.gov)

USFWS Alaska Region,
Migratory Bird Management
1011 East Tudor Road, Anchorage AK 99503

Phone: 1-866-527-3358
Email: AK_MBM@fws.gov

U.S. Fish & Wildlife Service

2019 Alaska Seabird Die-off



What's Happening?

Beginning in May 2019, the U.S. Fish and Wildlife Service (USFWS) began receiving reports of dead and dying seabirds from the northern Bering and Chukchi seas, followed by reports in late June to early August of thousands of short-tailed shearwaters washed up on beaches in the Bristol Bay region. By mid-August, the shearwater die-off had extended along coastal Alaska north to the Chukotka Peninsula of Russia. Additional seabirds affected include puffins, murres, and auklets, but at much lower numbers than shearwaters.

What's Being Done?

The USFWS is coordinating with federal, state, tribal partners, and communities to collect reports and track the number of birds involved, geographic area affected, and duration of the die-off event. Seabird carcasses are being collected from multiple locations and sent to the U.S. Geological Survey (USGS) National Wildlife Health Center for examination and testing. Initial results indicate starvation as the cause of death in the Bering and Chukchi seas. However, in southeast Alaska exposure to saxitoxin (a biotoxin associated with Paralytic Shellfish Poisoning) was linked to a localized die-off of breeding terns in June. Saxitoxin has not been detected in samples analyzed from Bristol Bay north to the Bering Strait region. Tissues sampled during examination will be analyzed by the USGS Alaska Science Center for harmful algal bloom toxins and those results will be shared as they become available.

What Can I Do?

Report observations of sick or dead birds to regional partners:

- **North Slope:** Taqulik Hepa (907) 852-0350
- **Northwest Arctic:** Cyrus Harris (907) 442-7914
- **Bering Strait Region:** Brandon Ahmasuk (907) 443-4265 or Gay Sheffield (907) 434-1149
- **Yukon-Kuskokwim Delta:** Jennifer Hooper (907) 543-7470
- **Bristol Bay:** Gayla Hoseth (907) 842-6252
- **Pribilof Islands:** Lauren Divine (907) 891-3031
- **Unalaska:** Melissa Good (907) 581-1876
- **Aleutians:** Karen Pletnikoff (907) 222-4286
- **Or report by phone or email to the USFWS:** 1-866-527-3358 or AK_MBM@FWS.GOV


Short-tailed Shearwater
Courtesy of Bernardo Alps

Participate in monitoring efforts on your local beaches:
COASST provides training.
Visit www.coasst.org.

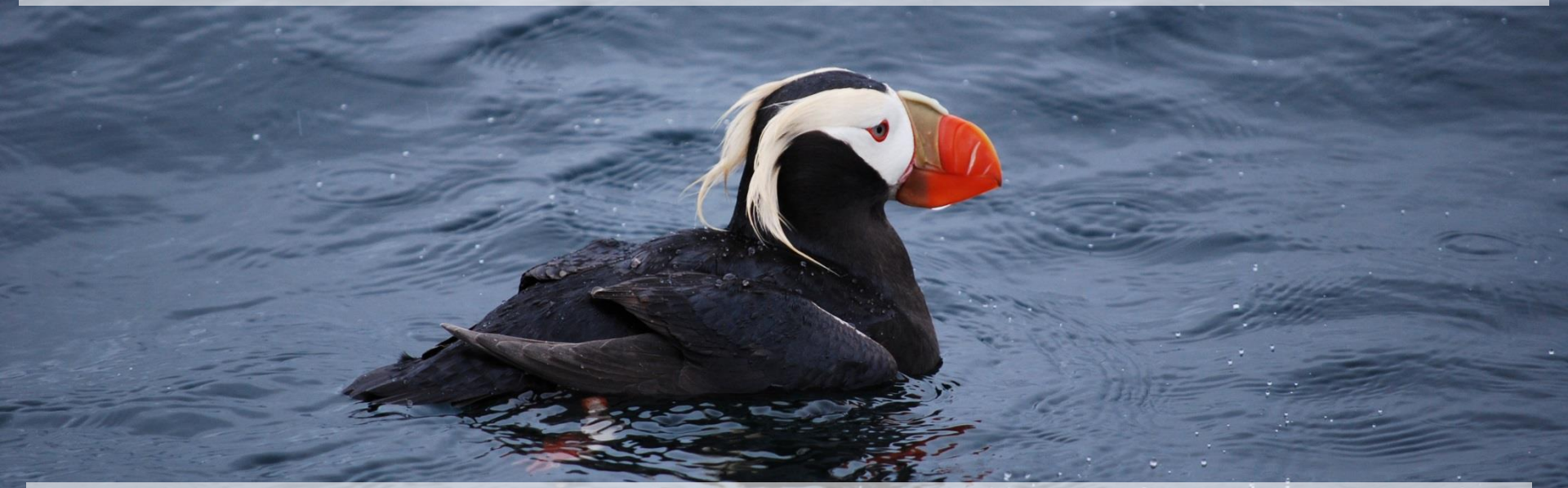
Information to report includes:

- Location, Time & Date observed
- Size of area observed (e.g. length of beach)
- Type & number of birds (count or estimate)
- Photos of sick/dead birds
- Video of unusual behavior (approachable, drooping wings)

Updated September 9, 2019

Alaska's Ocean Sentinels:
Seabirds as Ecosystem Indicators
2019 Update

THANK YOU



QUESTIONS

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USFWS Alaska Migratory Birds Management