

Upper Trophics

FISH, CRABS, BIRDS, MAMMALS...





H. Wayner

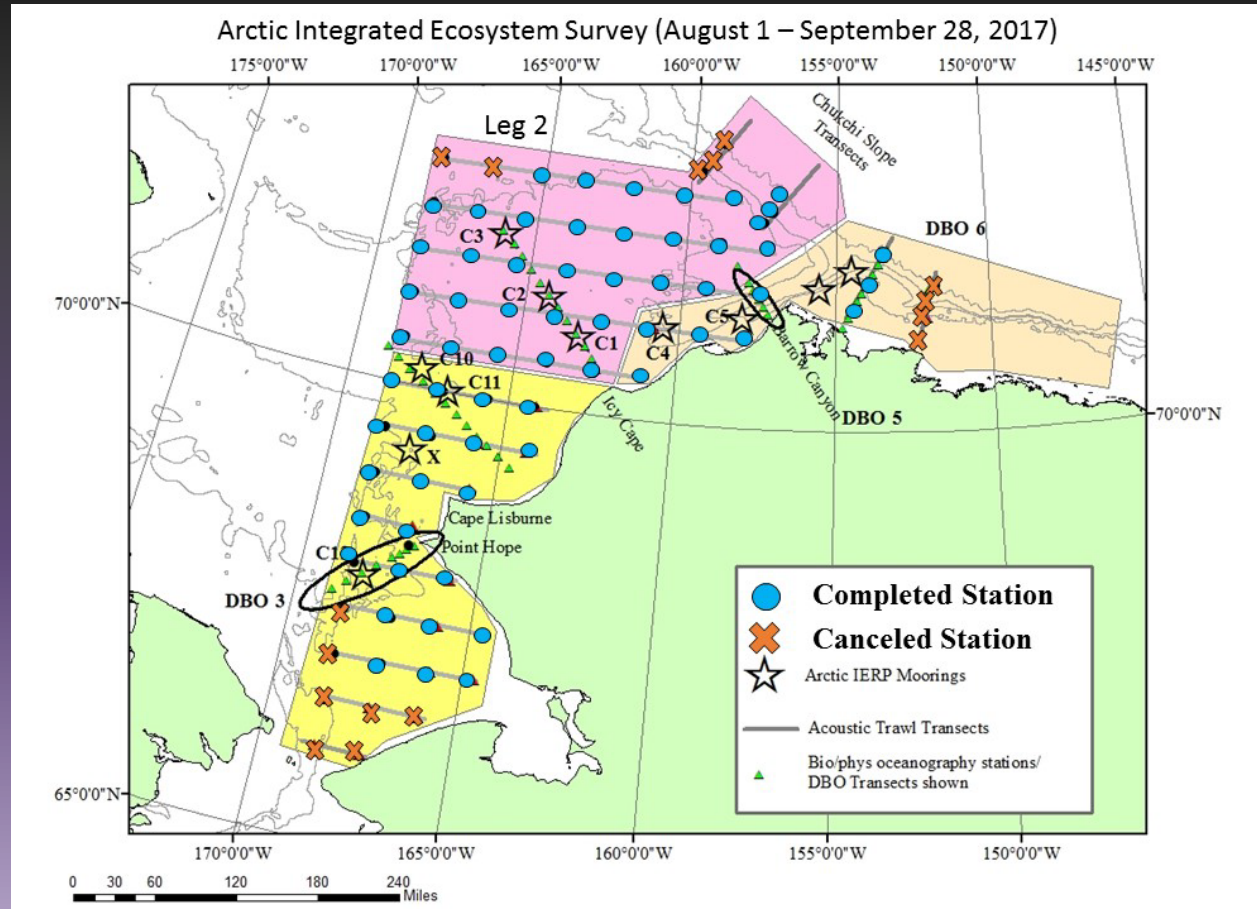
Fish and Crabs

ROBERT LEVINE, LIBBY LOGERWELL

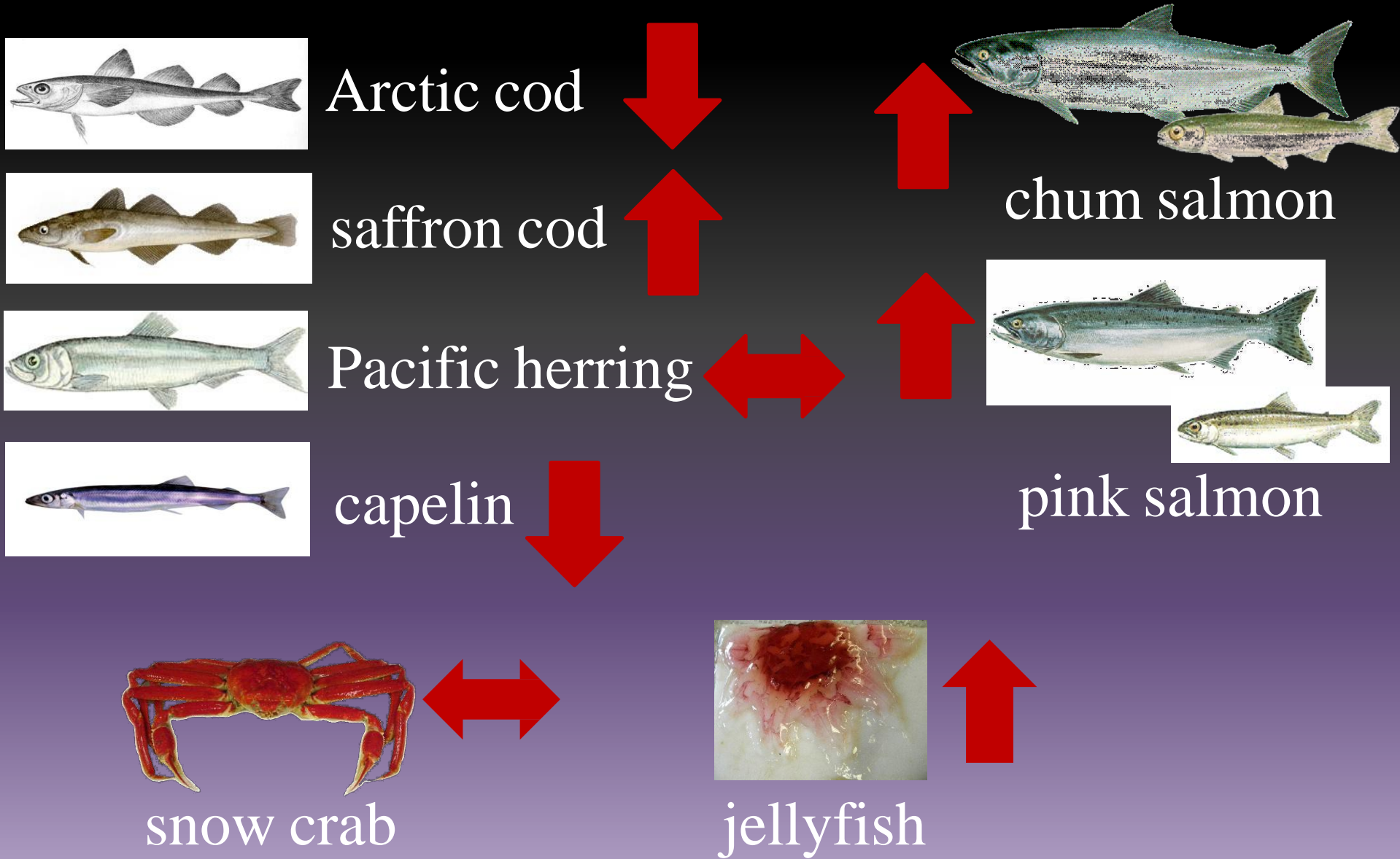
Robert Levine

Arctic Integrated Ecosystem Research Program

Late Summer Research Surveys: 2017 & 2019



How Will Warming Likely Affect Abundance of Fishes and Invertebrates?



Fish Sampling Gear

Surface (top 25 m)

Midwater

Bottom



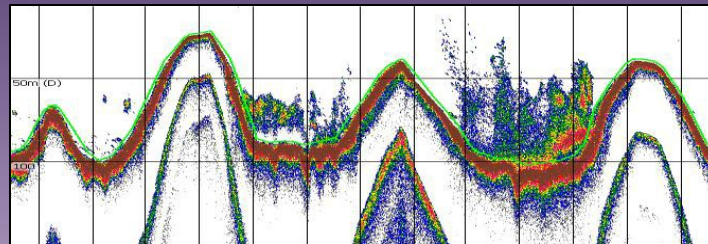
Nordic Trawl
(70 feet across)



Marinovich Trawl
(20 feet across)

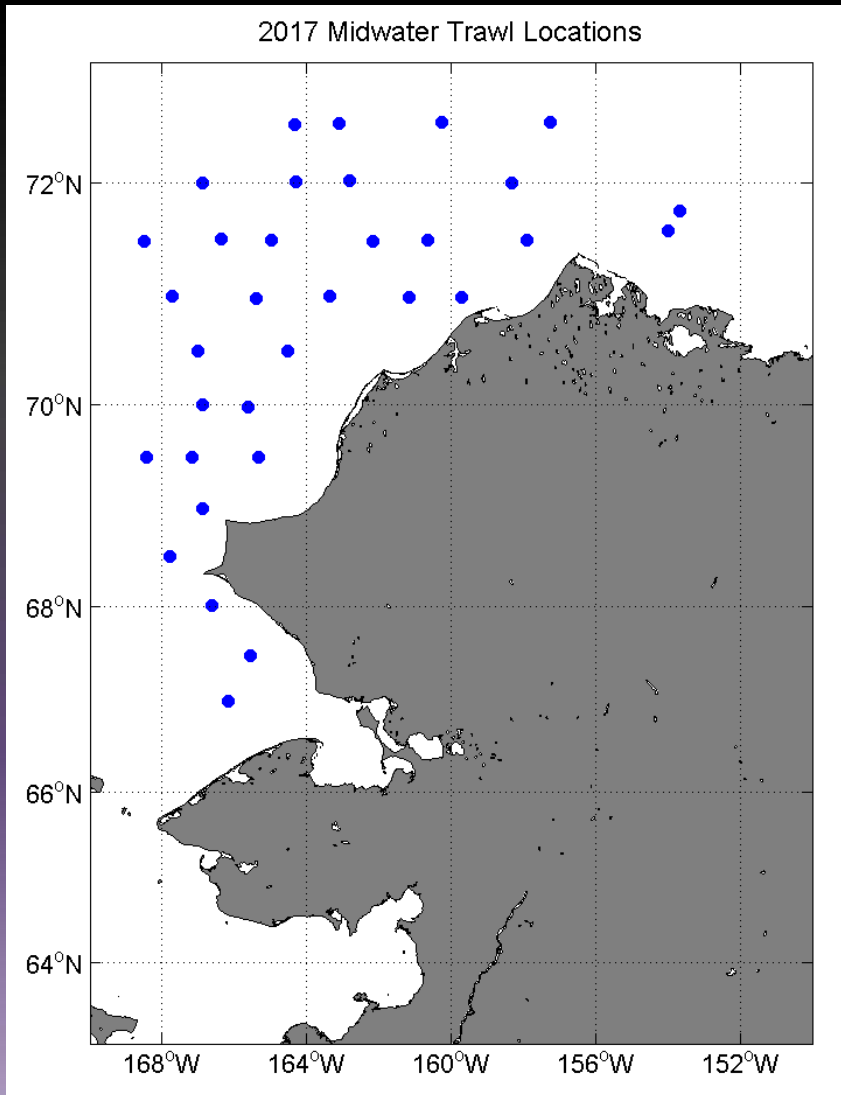


3 m Plumb Staff Beam Trawl
(9 feet across)



Acoustics to get abundance estimates for fishes and krill

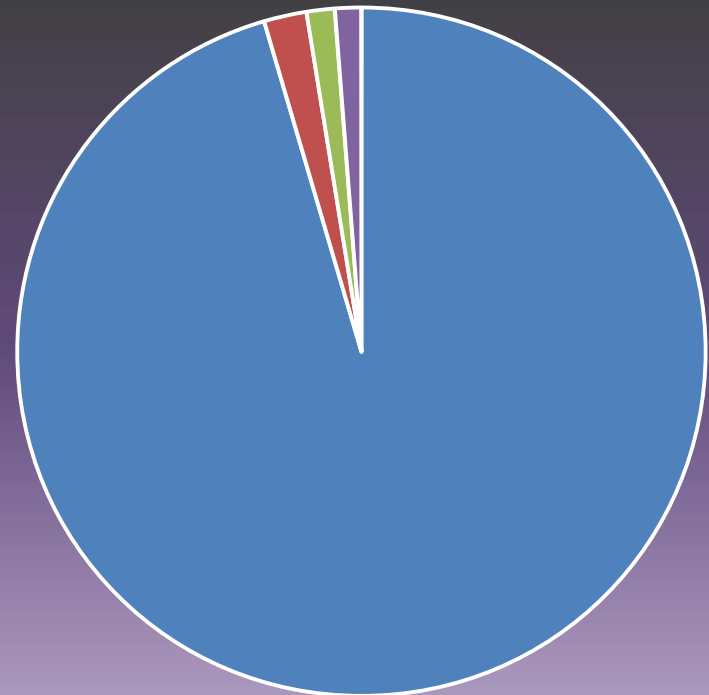
Age-0 Arctic cod dominate the fish community in the N. Chukchi



Midwater Fishes

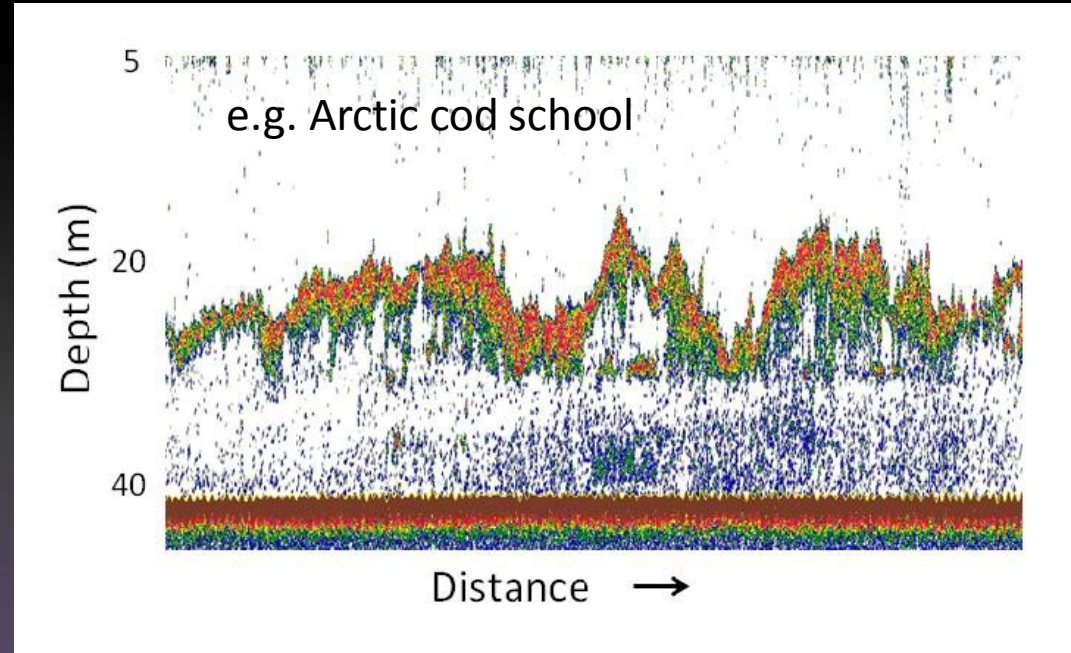
(% by number, n=33 hauls)

Arctic cod (age-0)	95.4%
Pricklebacks	2.0%
Capelin	1.3%
Other Fishes	1.2%

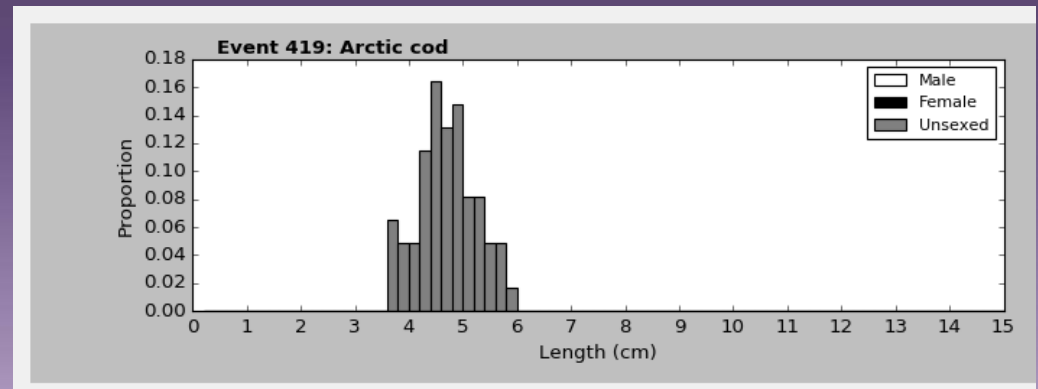


Age-0 Arctic cod are highly abundant in N. Chukchi in summer 2017

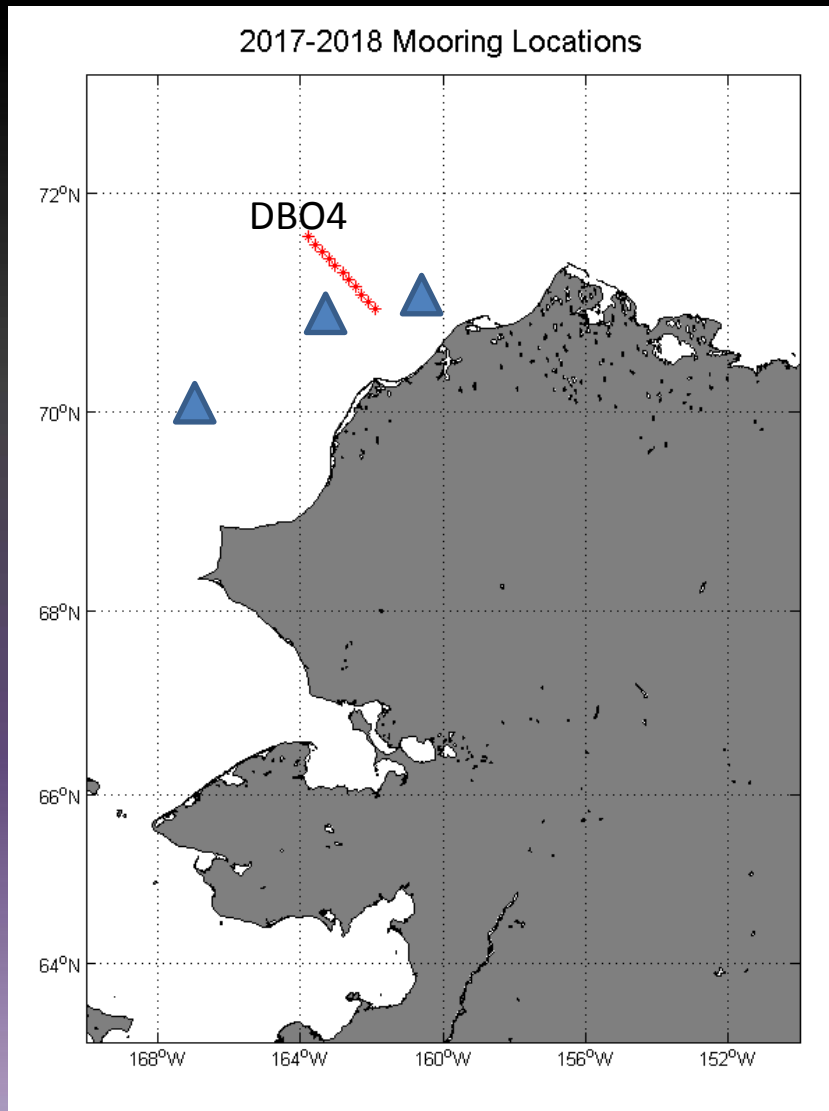
- Arctic cod backscatter high from 72.5 to 69.5 N.
- Abundance is highest in western part of survey area and around 70.5 N.
- Trawl samples indicate that most of backscatter is from 3.2-6.2 cm Arctic cod.
- Abundances appear substantially higher (8-10x) than in 2012 and 2013



Trawl catch in this school was 99.5% age-0 Arctic cod



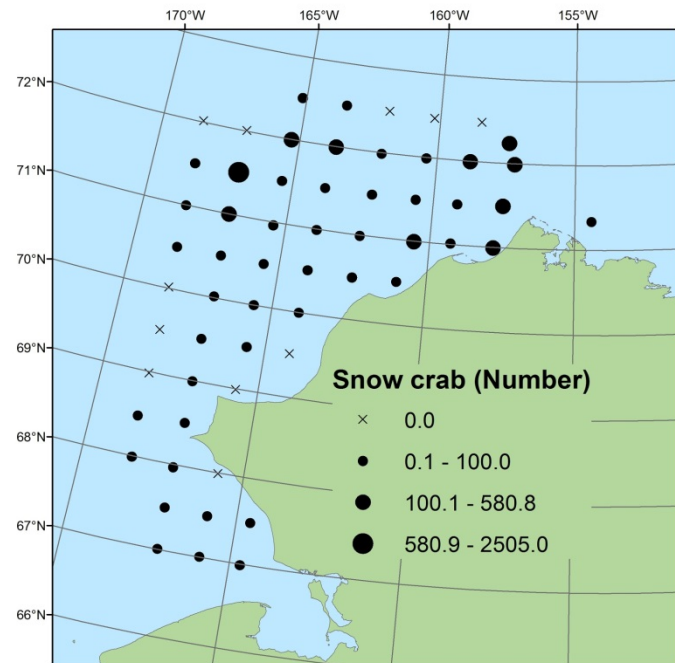
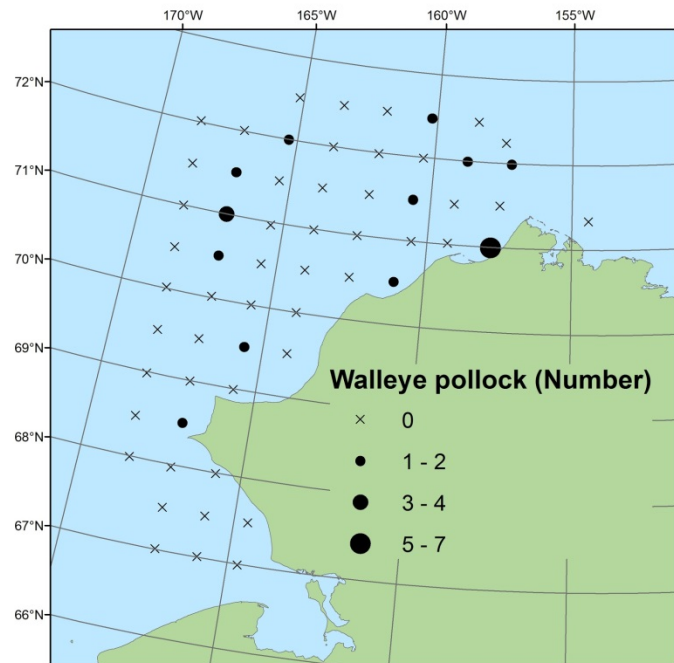
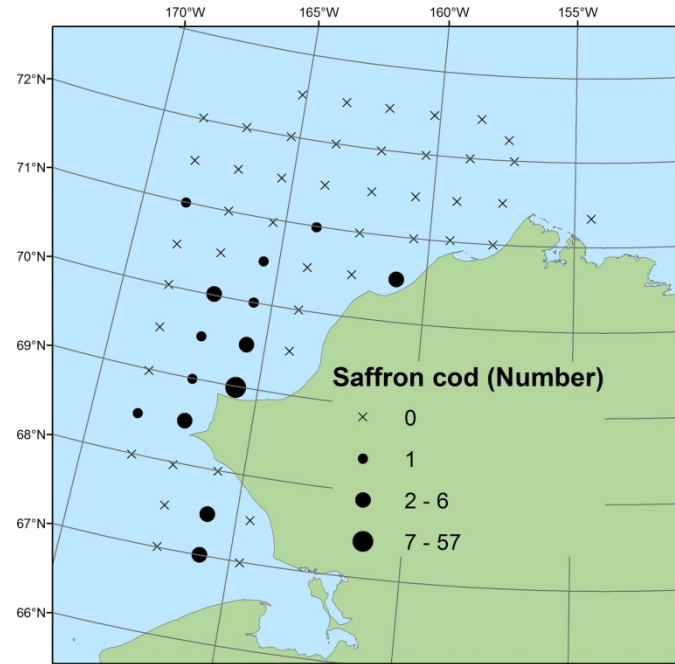
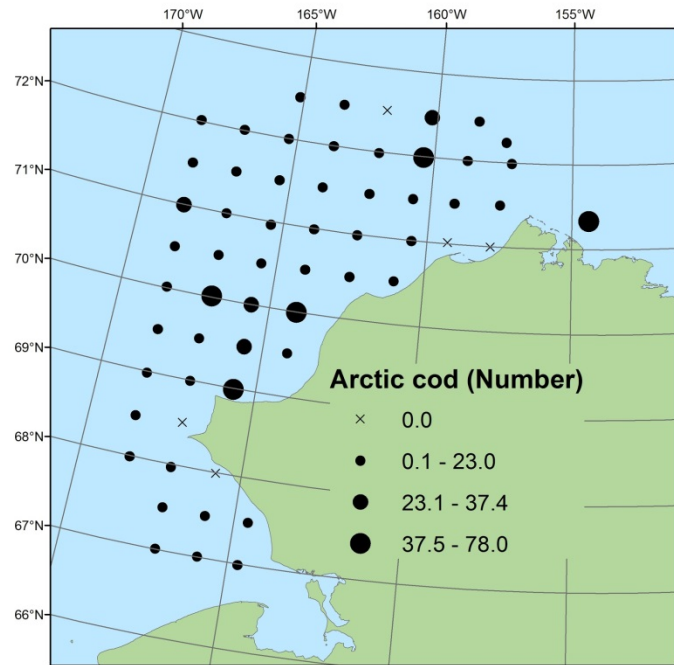
Moored systems to quantify fish abundance and movement under ice



- 38, 70, and 200 kHz split-beam transducers
- Year-round data collection until Fall 2019



Libby Logerwell





A. Kennedy

Seabirds

KATHY KULETZ

Seabird Surveys - Platforms in 2017

Principal Investigator : Kathy Kuletz (U.S. Fish & Wildlife Service)

- **Arctic IERP** (NPRB/BOEM /NOAA Ecosystem Study/ E. Farley)
- **ARCSS** (NSF/WHOI/ C. Ashjian)
- **ASGARD** (ArcticShelfGrowthAdvectionRespirationDeposition/S. Danielson)
- **AMBON** (Arctic Marine Biodiversity Observation Network/ K. Iken)
- **Canadian Icebreaker** (C30-DBO / J. Grebmeier & S. Vagle)
- **NCIS – DBO** (NSF/ WHOI/R. Pickart)
- **North Bering Sea Fish Surveys** (NOAA/ J. Murphy)

Planned 2018-2020: ASGARD, AIERP, C30, NBS, OshoroMaru, others...



2017

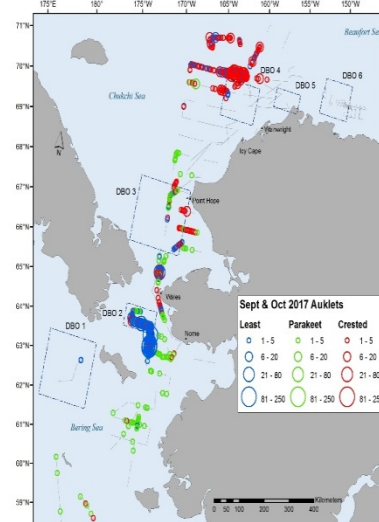
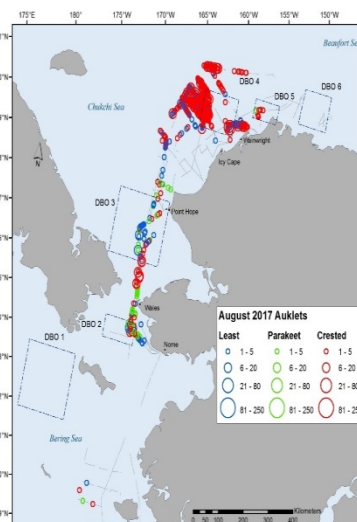
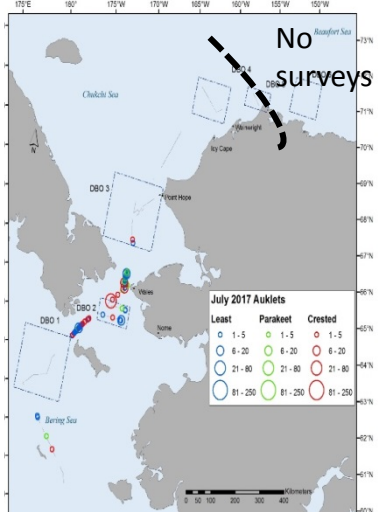
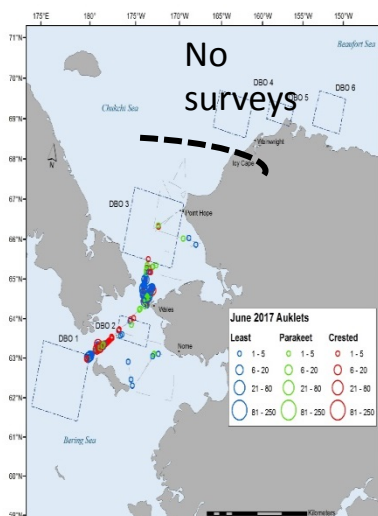
June

July

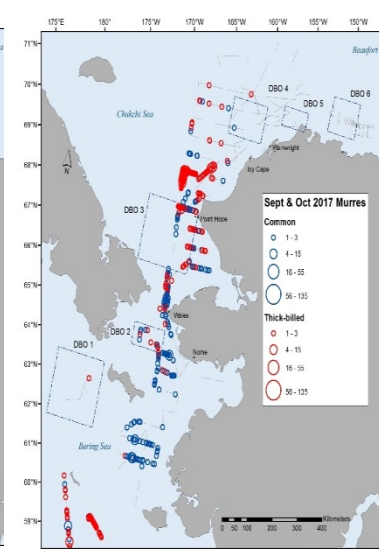
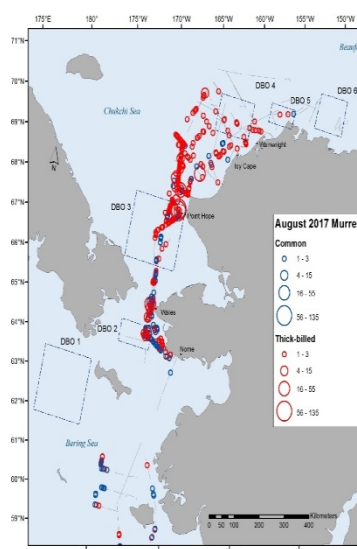
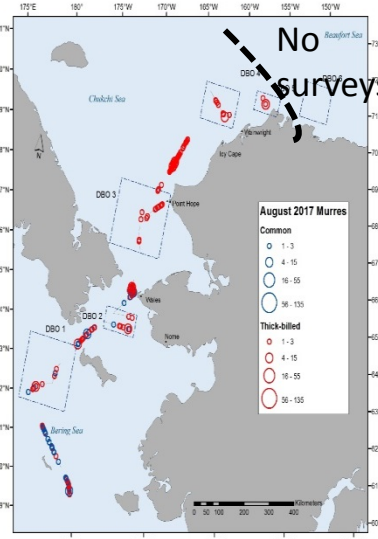
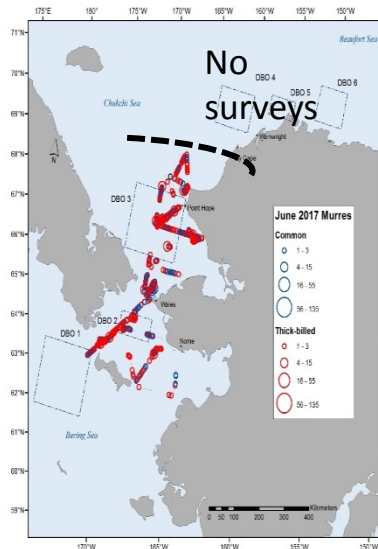
August

September

Auklets



Murres

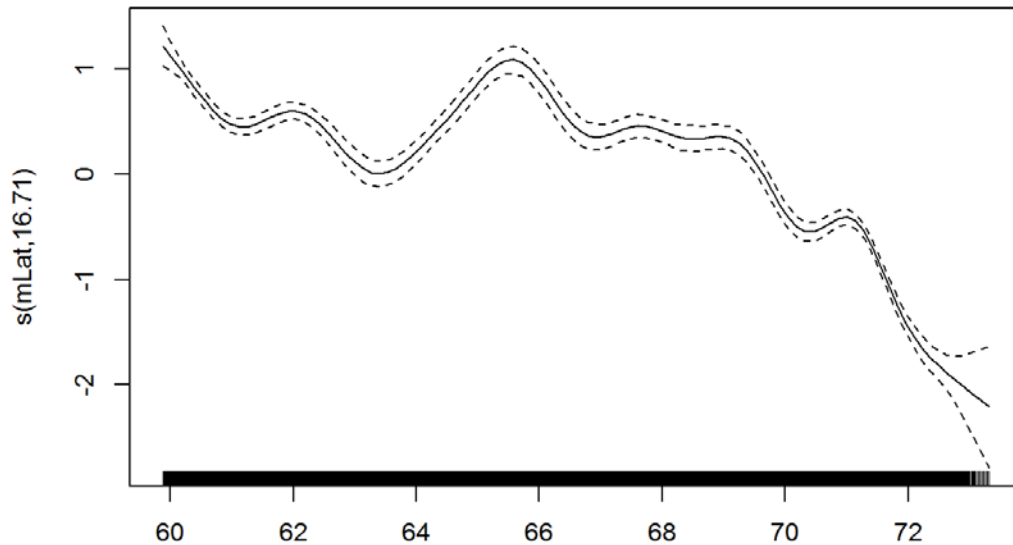


Total birds by latitude

Linear predictor – expected ave # of birds

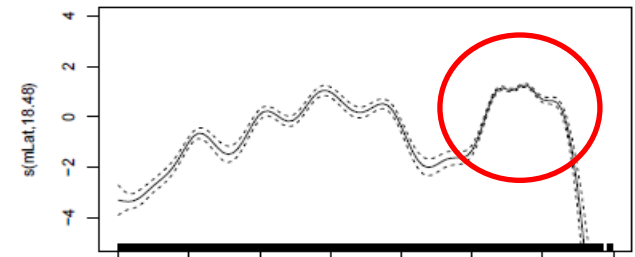
Generally lower abundance with latitude, but -
a peak near Bering Strait & sharp decline north of 70°.

Expected No. of birds (logit scale)



Latitude

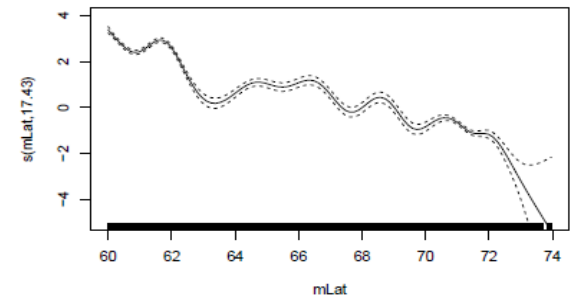
Crested Auklet



Phalaropes

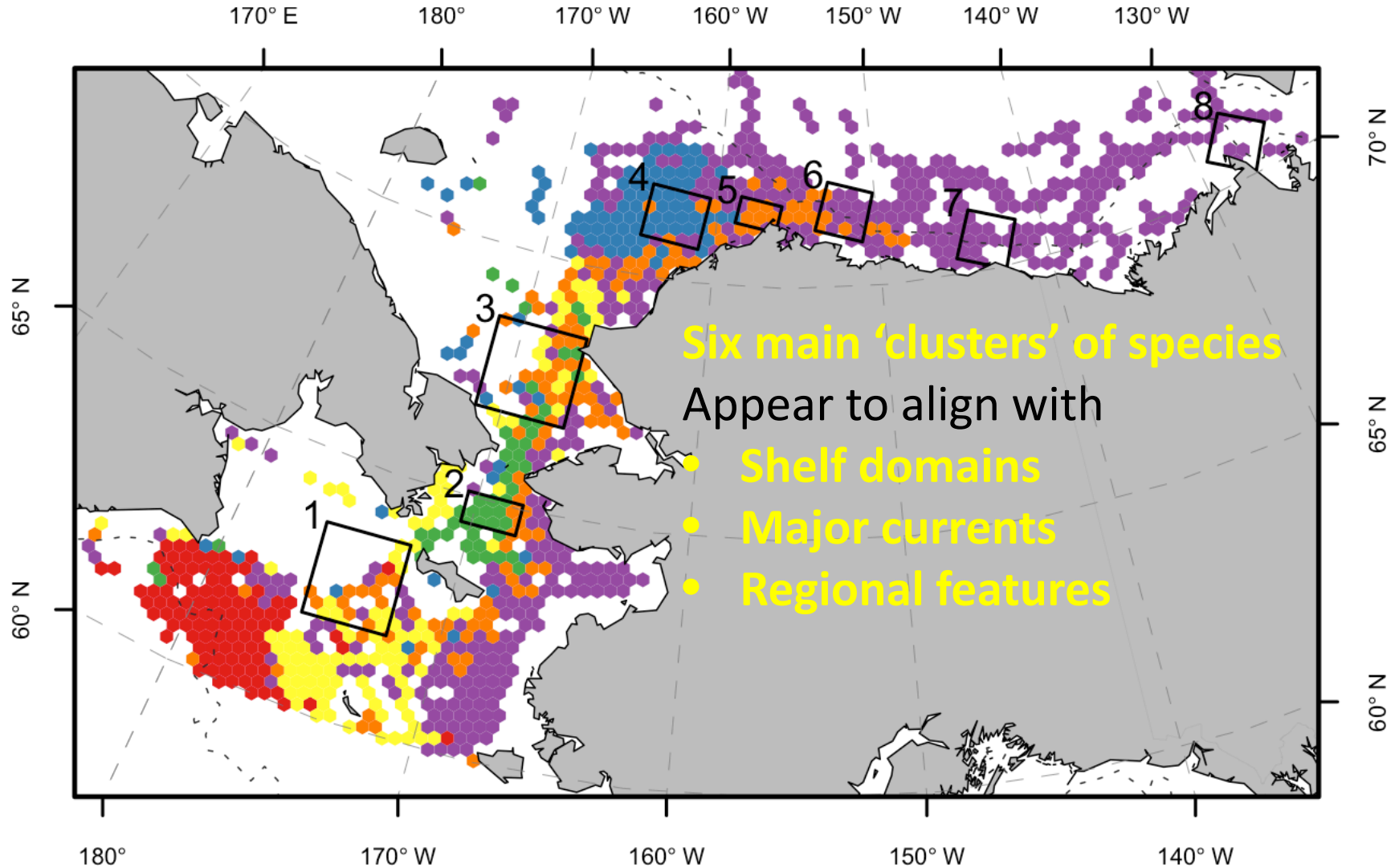


Northern Fulmars

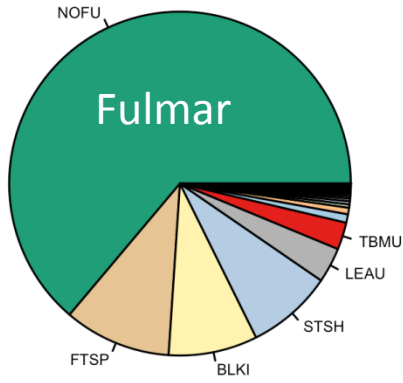


Seabird Communities in Pacific Arctic

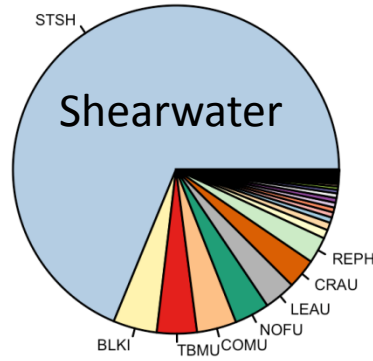
Cluster Analysis, using at-sea survey data, 2007-2015



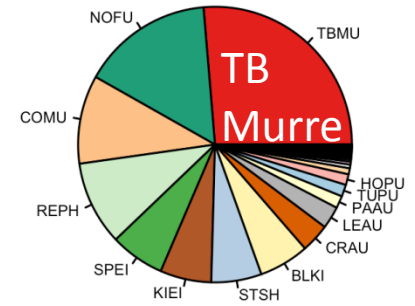
Cluster A



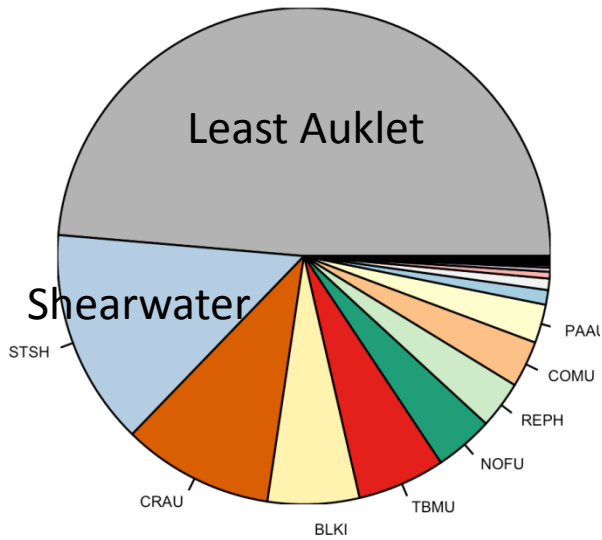
Cluster B



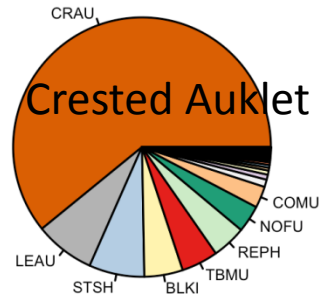
Cluster C



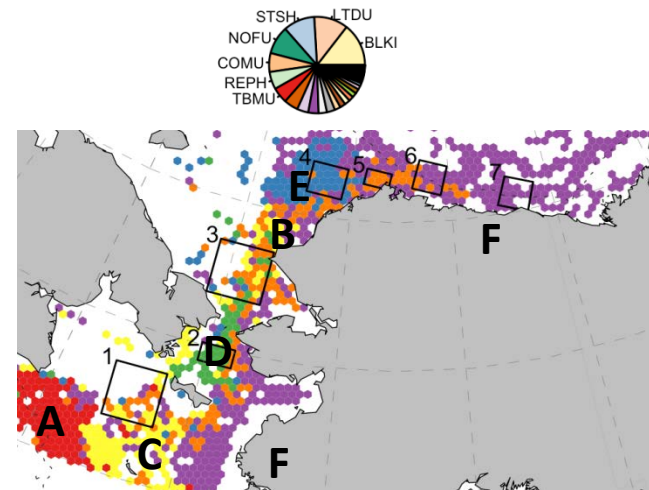
Cluster D



Cluster E



Cluster F

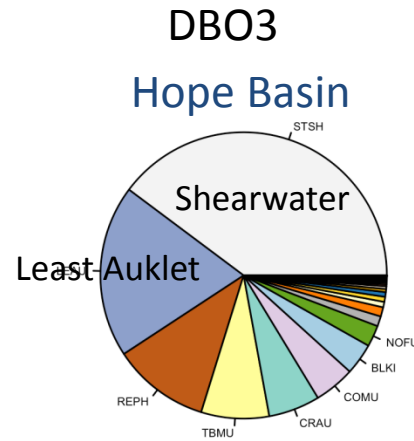
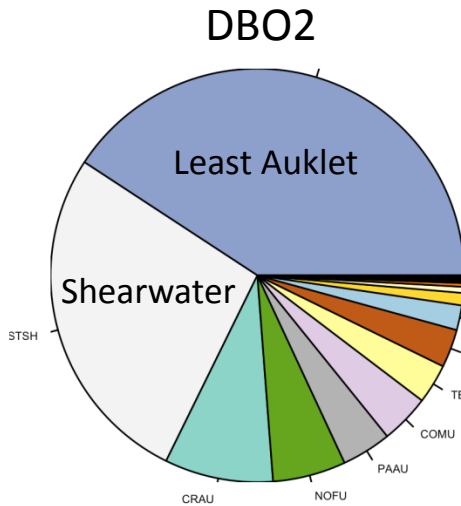
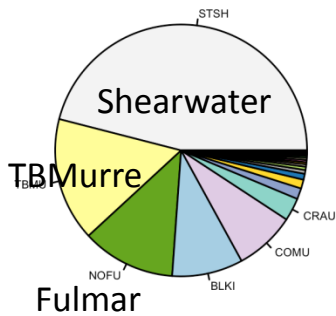


Proportion of total seabird density, by DBO

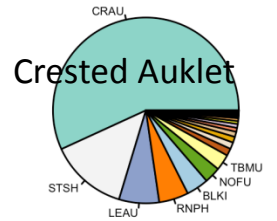
Based on at-sea surveys, 2007-2015

Chirikov Basin

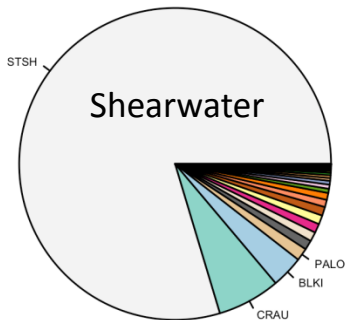
DBO1
S. St Lawrence Is



DBO4
Hana Shoal area

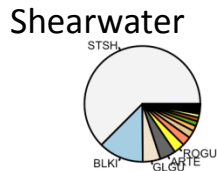


DBO5

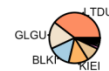


Upper Barrow Canyon

DBO6



DBO7



Longtail duck, kittiwake, gull

DBO8



GW Gull

-----Beaufort sites-----

Sizes of circles reflect relative total density

Species	aramete	In DBOs	Outside
		std.dev	std.dev
Total Birds	year	0.65	0.04
	DBO	1.45	0.54
Fulmars	year	0.33	0.03
	DBO	2.51	2.76
Shearwaters	year	3.07	0.80
	DBO	2.56	1.31
Phalaropes	year	0.43	0.56
	DBO	1.84	0.20
Blk-leg Kittiwakes	year	0.02	0.06
	DBO	0.61	0.76
Common Murre	year	0.63	0.03
	DBO	2.88	4.26
Thick-billed Murre	year	0.60	0.17
	DBO	2.26	2.68
Murres (total)	year	0.56	0.08
	DBO	2.25	2.66
Murrelets	year	0.42	0.85
	DBO	0.28	1.31
Crested Auklet	year	1.03	0.05
	DBO	4.90	4.80
Least Auklet	year	0.57	0.04
	DBO	6.00	4.79
Auklets	year	1.06	0.13
	DBO	5.73	4.67
Puffins	year	0.36	0.02
	DBO	2.63	2.52
Glaucous gull	year	0.35	0.00
	DBO	0.70	0.28
Higher Variance	Location		Year

Location vs Interannual variation

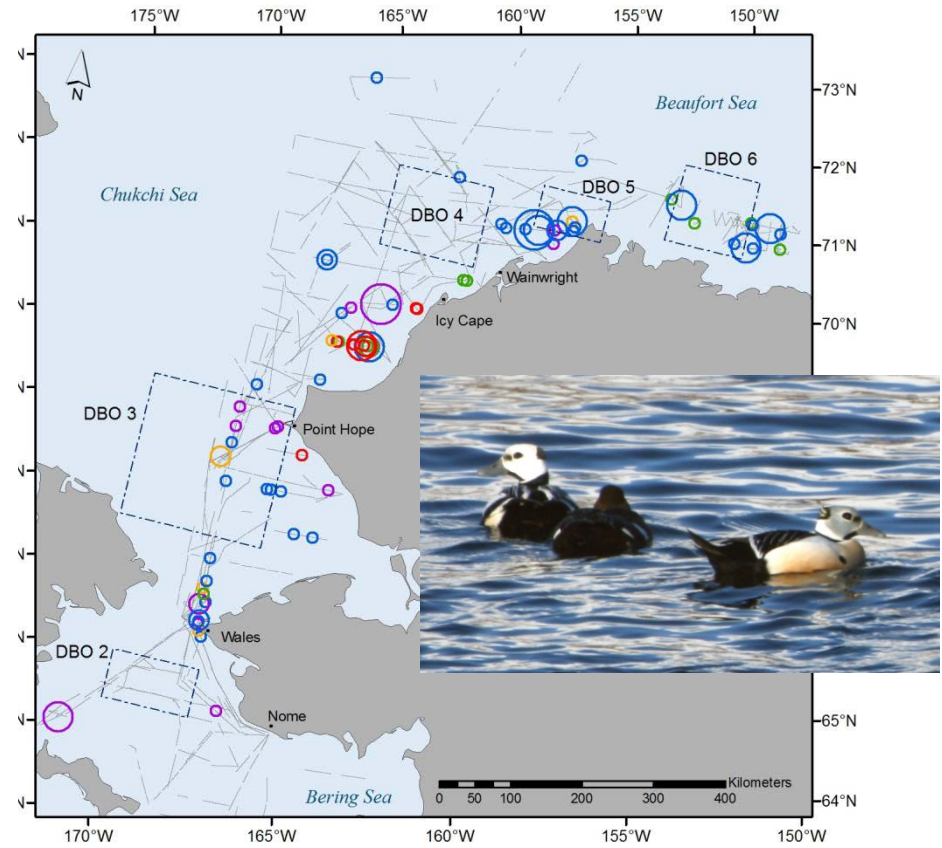
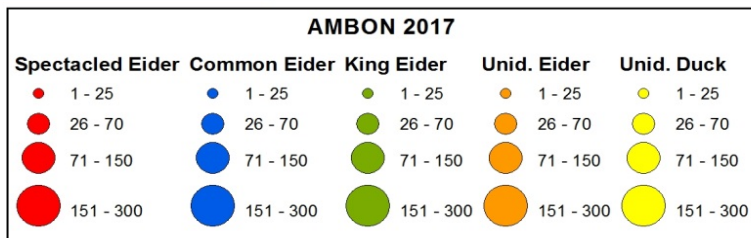
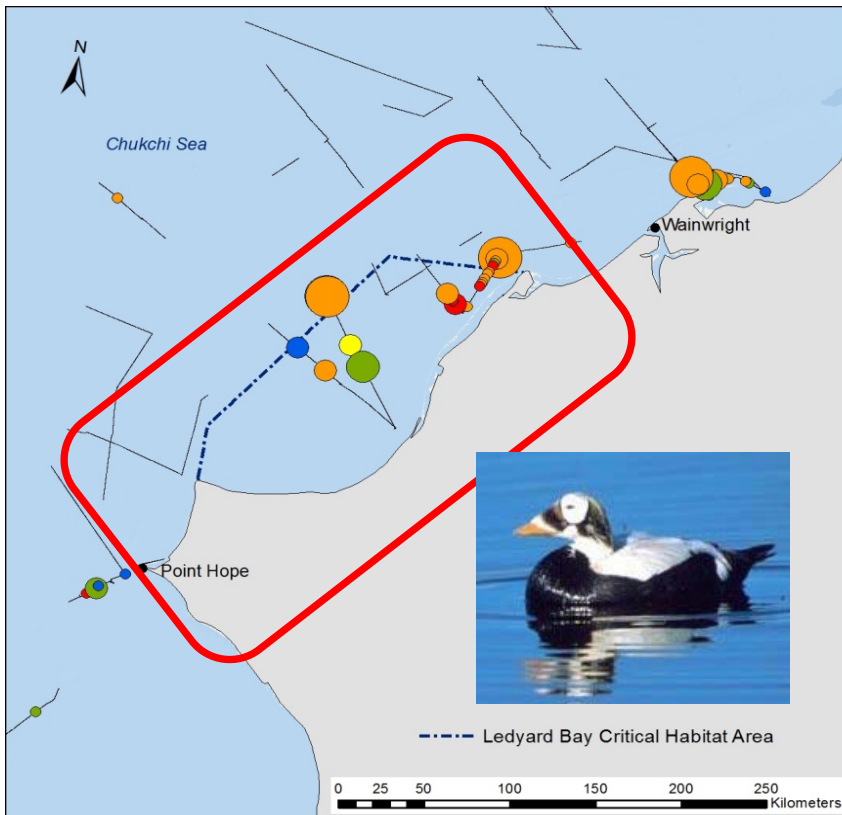
Do seabirds show more variance by Year or location?

Looked at variance in seabird densities among-years & location (DBOs, or outside of DBO boxes, within Region)

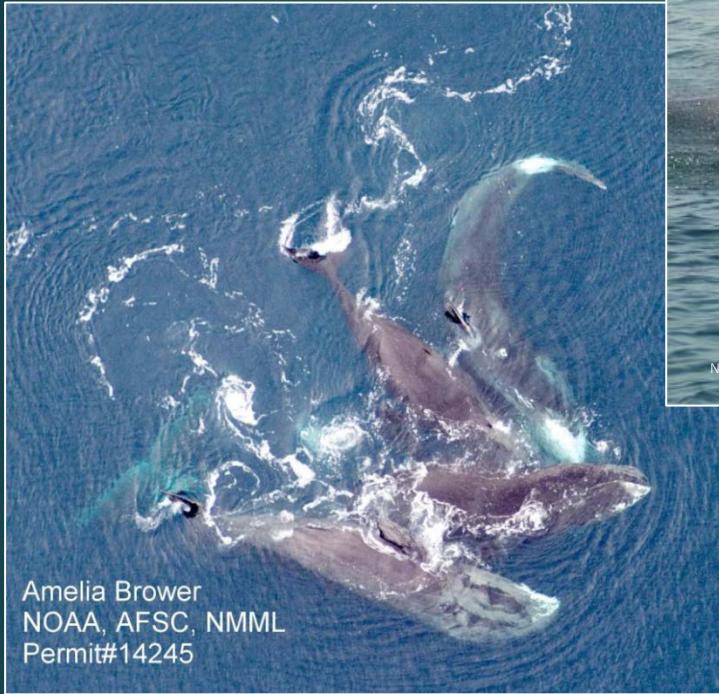
LOCATION LOCATION LOCATION

Exceptions: Highly migratory species

- Short-tailed shearwater
- Phalaropes (mostly Red Phalaropes)
- Murrelets (Ancient, Kittlitz's)



All Projects need to do consultation with USFWS (Ecological Services) for operations in **Ledyard Bay Critical Habitat Area (Spectacled Eider, Walrus)**



Mammals

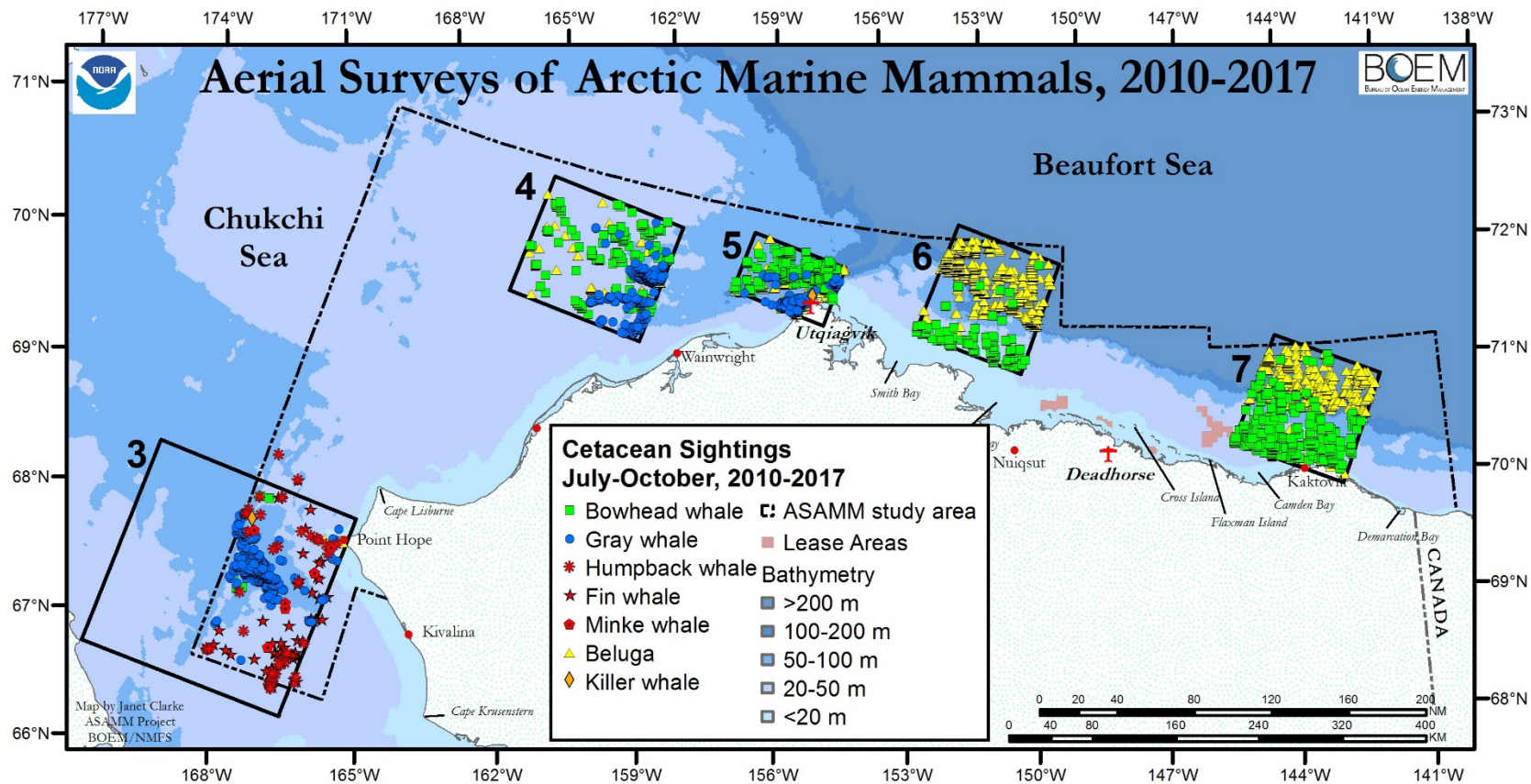
JANET CLARKE, SUE MOORE, AND
CATHERINE BERCHOK

Janet Clarke



ASAMM July-October 2010-2017 Cetacean Sightings

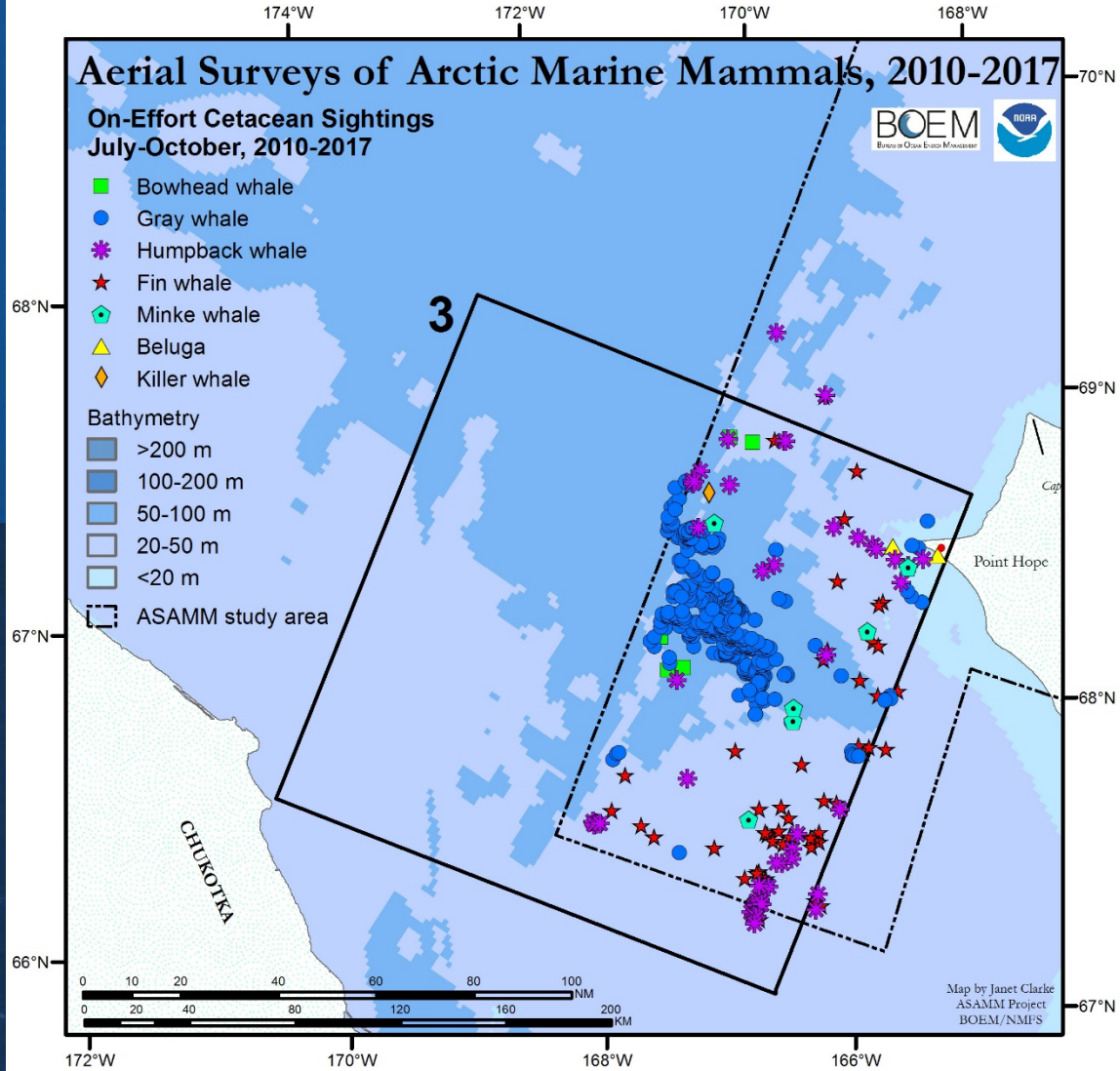
DBO 3, 4, 5, 6, and 7



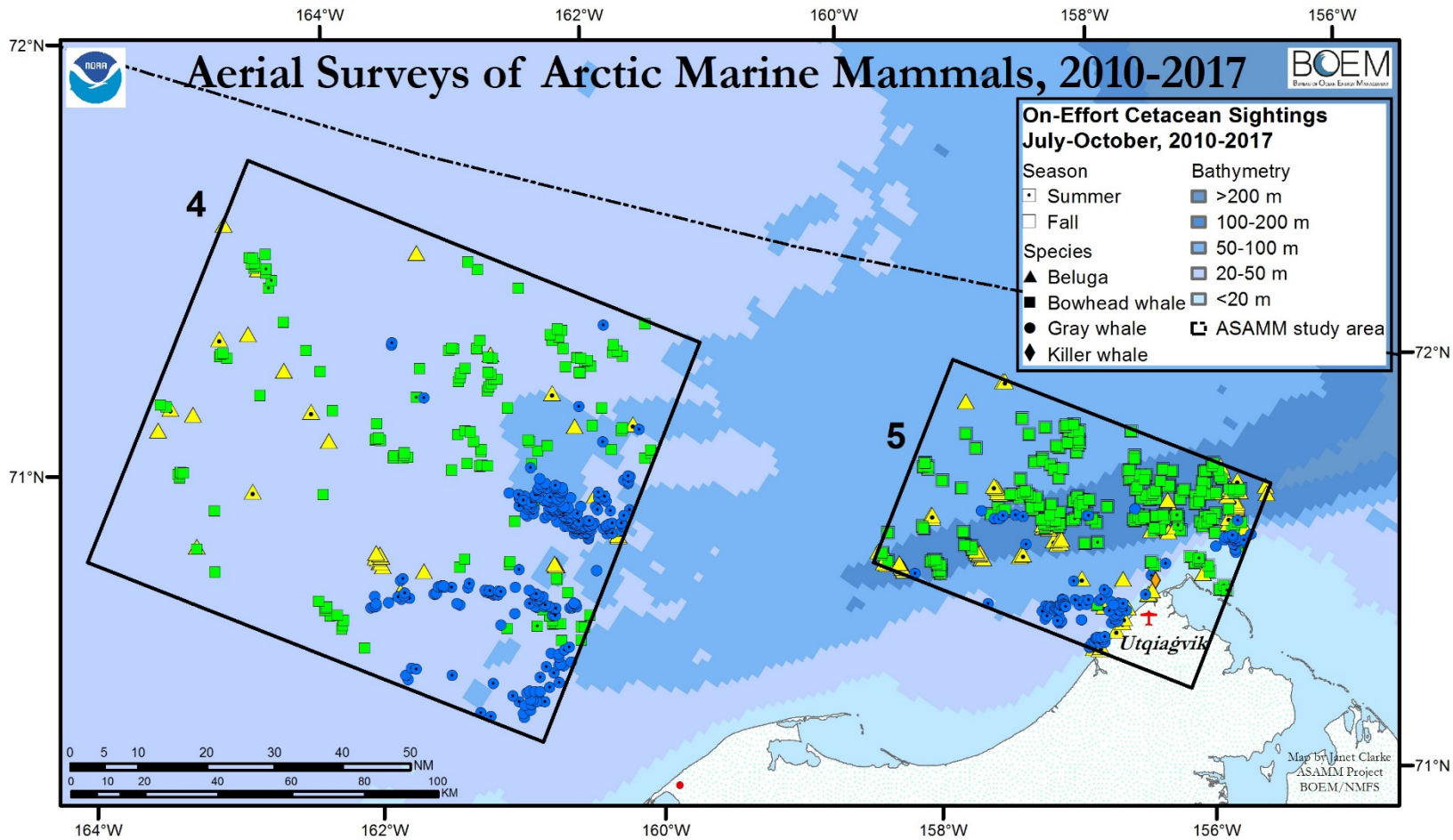
DBO-3 – gray whale hot spot, subarctic cetaceans
DBO-4 and DBO-5 – bowhead whales, gray whales, belugas
DBO-6 and DBO-7 – bowhead whales, belugas



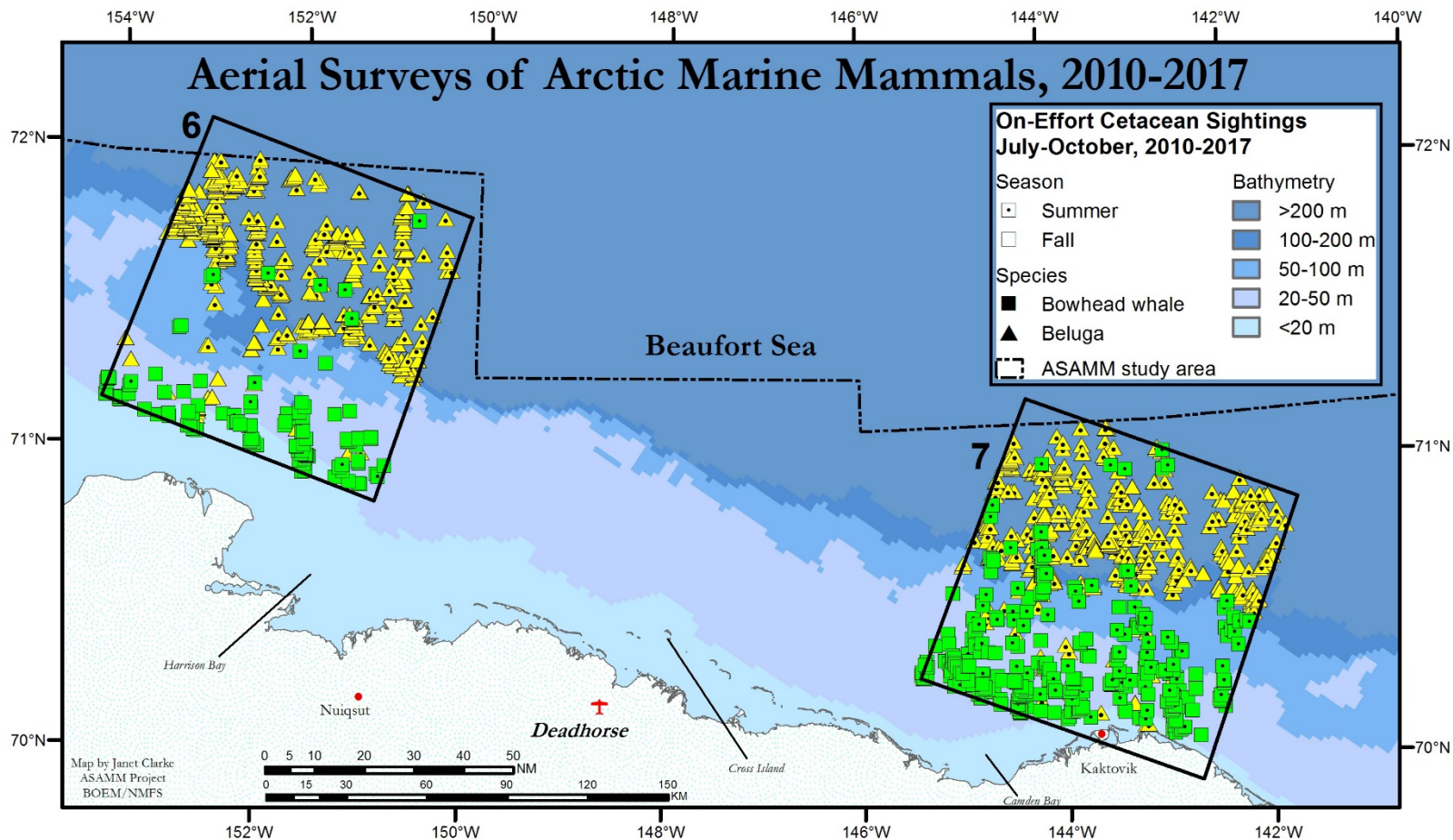
ASAMM 2010-2017 On-Effort Cetacean Sightings DBO-3



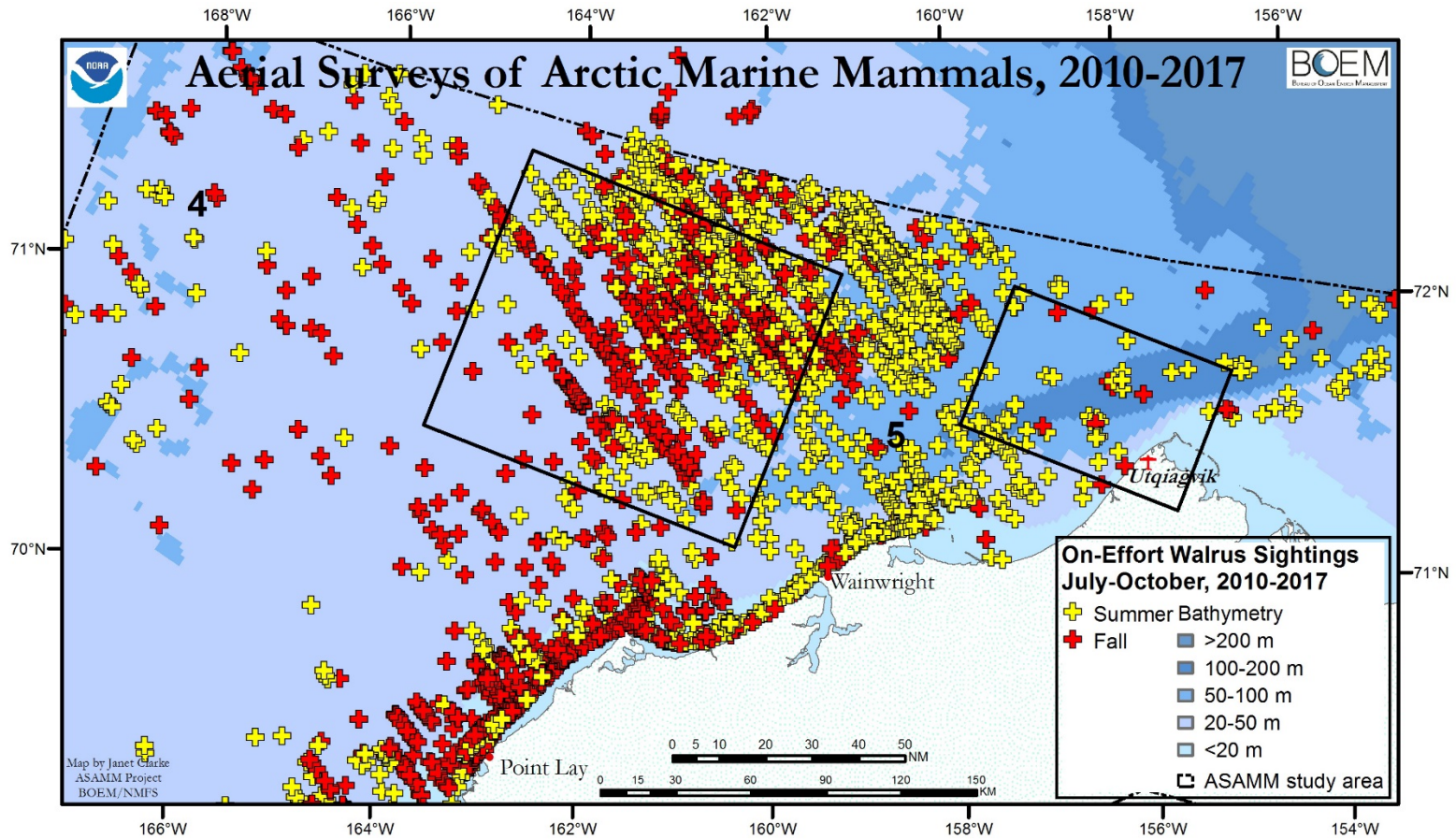
ASAMM 2010-2017 On-Effort Cetacean Sightings DBO 4 and 5



ASAMM 2010-2017 On-Effort Cetacean Sightings DBO 6 and 7



ASAMM 2010-2017 Walrus Northeastern Chukchi Sea



Sue Moore

DBO: Marine Mammals

Watches vs. Standard Surveys

Watch Effort: 1-2 people, handheld binoculars, excel form, or mini-Wincruz



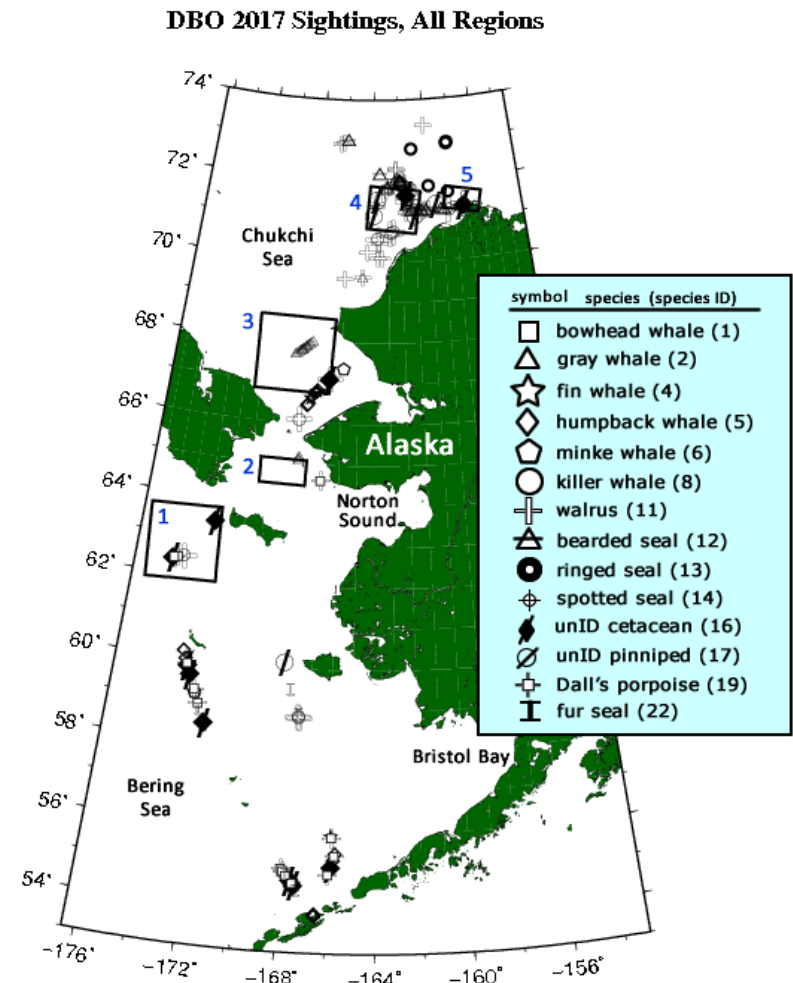
Standard Survey : 3-person team, Big Eye binoculars, Wincruz program



2017 DBO-NCIS Marine Mammal Watch

Highlights

- **DBO 3:** gray whale 'hotspot' stations 3.5-3.8; **80** humpback whales SE sector
- **DBO 4:** few walrus (due to zero ice), 'ship-curious'
- **DBO 5:** gray whale 'hotspot' stations 5.1-5.2 w/ 'juvenile cluster' SE sector
- **9 Sep:** bowhead & gray whales seals & thousands of shearwaters in 'hotspot' near UAF/CEO mooring



DBO Marine Mammal Watches and Surveys, 2010-2017

Watches = 1-2 observers, hand held binoculars

Surveys = 3 observers, Big Eye binoculars

What are we missing? Need input from PAG colleagues

Year	Marine Mammal Watch (n=18)	Marine Mammal Survey (n=7)
2017	ASGARD Bering Strait Mooring/AON AMBON DBO-NCIS Shelf-break Ecology	None
2016	Siri Wilfrid Laurier (SWL)/AON NOAA/Ocean Exploration	ARCWEST
2015	SWL/AON Bering Strait Mooring/AON AMBON	ARCWEST
2014	SWL/AON Bering Strait Mooring/AON	ARCWEST
2013	SWL/AON Bering Strait Mooring/AON	ARCWEST
2012	SWL/AON Bering Strait Mooring/AON	CHAOZ
2011	SWL/AON Bering Strait Mooring/AON	CHAOZ
2010	None	CHAOZ



Catherine Berchok &

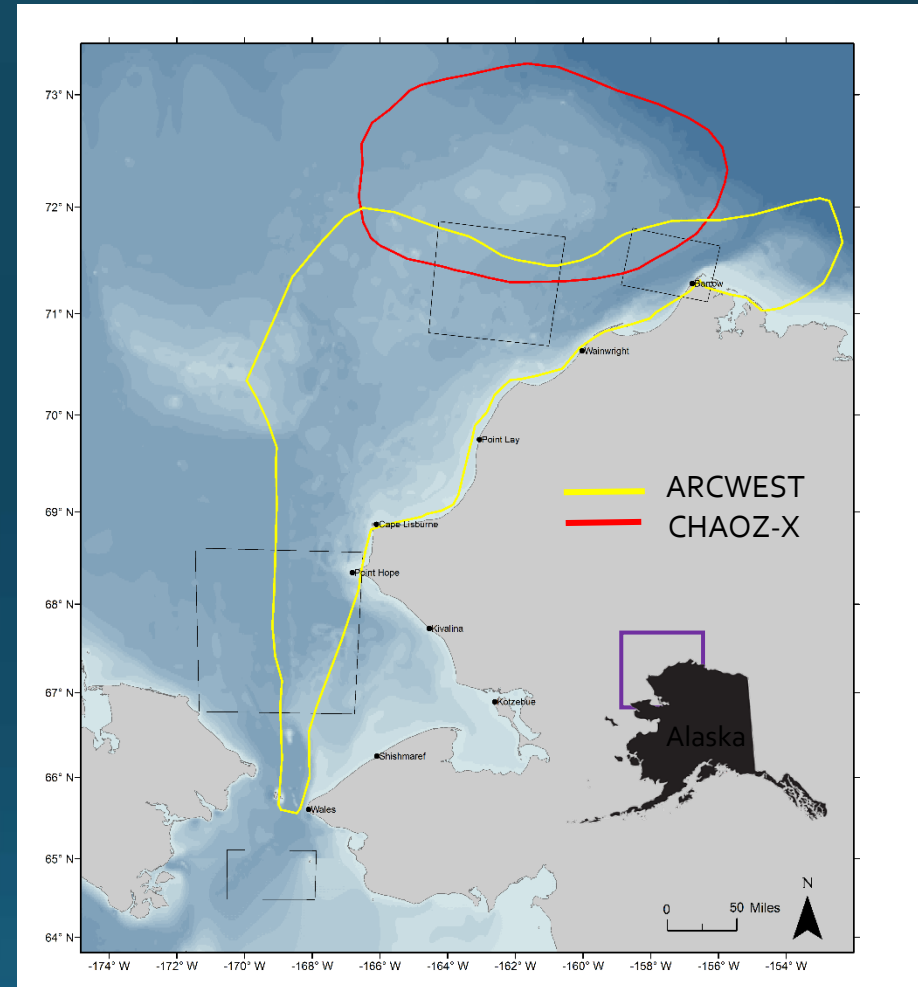
Jessica Crance, Stephanie Grassia, Dana Wright,
Eliza Ives, Alexandre Ulmke, Eric Braen, Brynn
Kimber, Jenna Harlacher, Megan Wood, Holly
Calahan, Ariel Brewer, Dan Woodwrich, Julie
Mocklin, Linda Vate Brattstrom, Jessica Thompson,
Ellen Garland

CHAOZ: Chukchi Acoustics, Oceanography,
2010-12 and Zooplankton Study

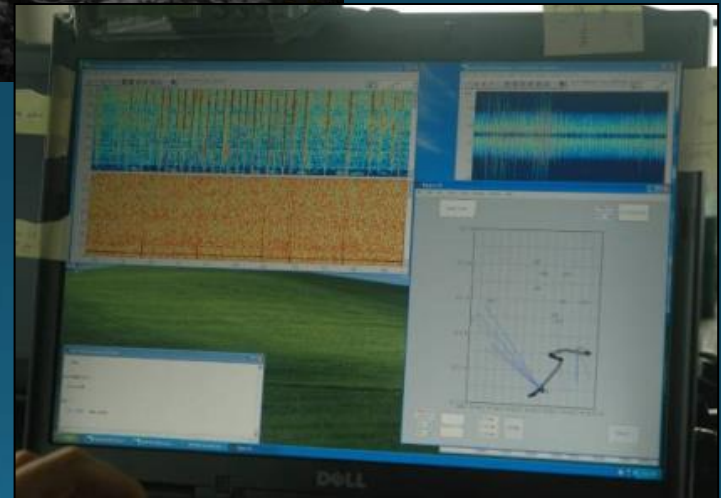
CHAOZ-X: CHAOZ Extension Study
2012-15 (Hanna Shoal)

ARCWEST: Arctic Whale Ecology Study
2012-16 2012-2017

ALTIMA: Arctic Long-Term Integrated
2017-? Mooring Array



Short-term results



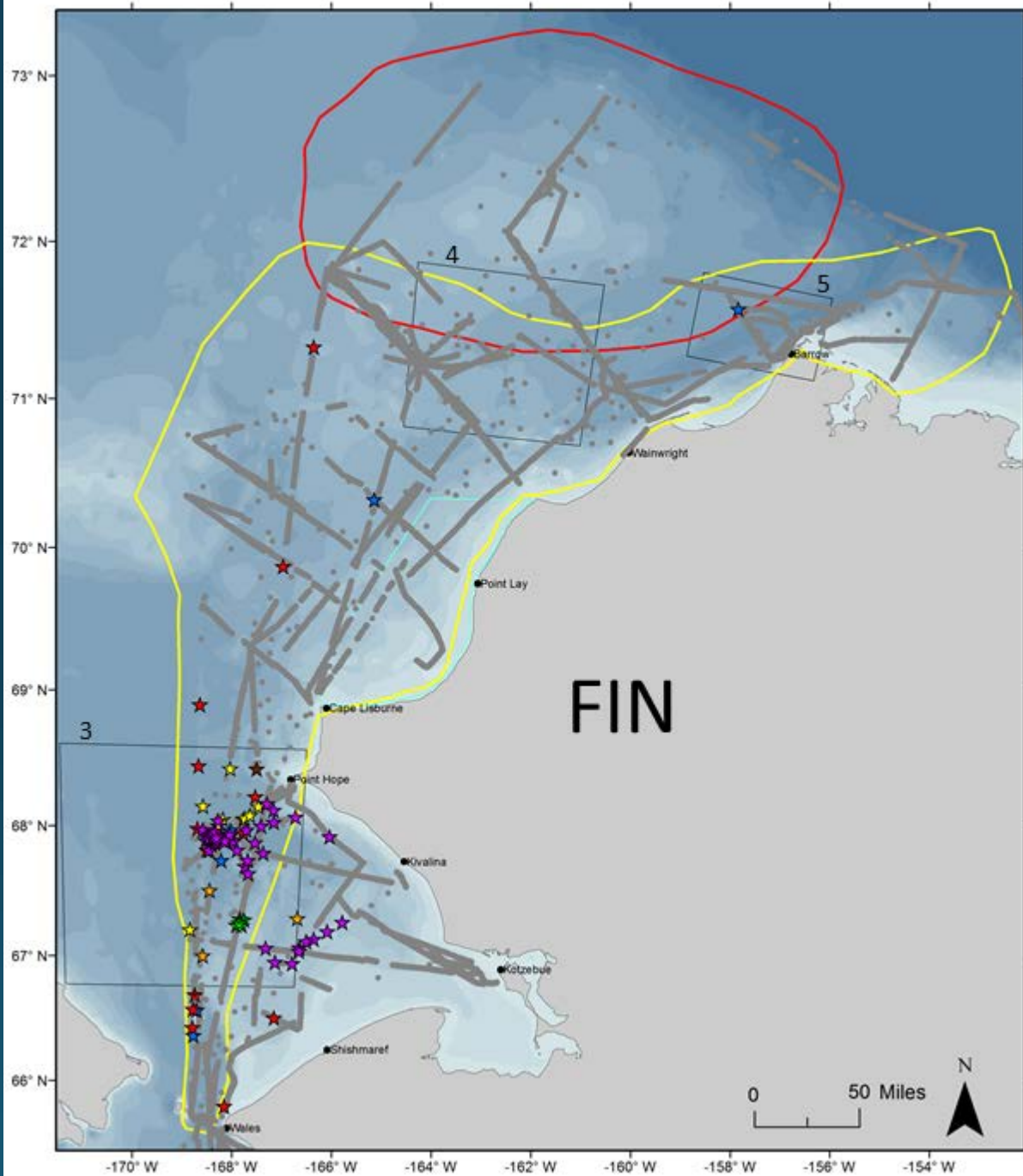
Visual survey and
passive acoustic monitoring



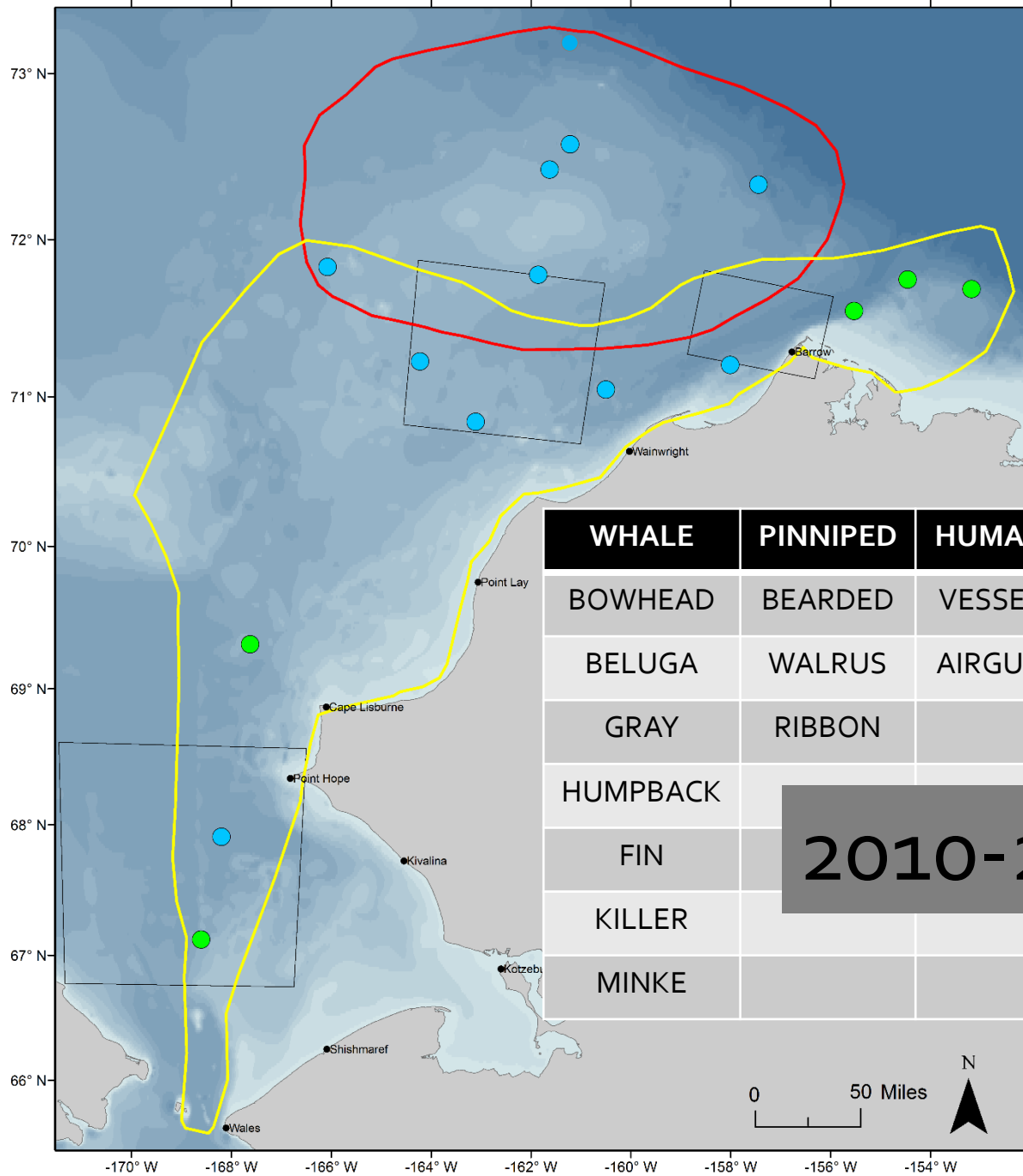
NOAA
FISHERIES

BOEM
BUREAU OF OCEAN ENERGY MANAGEMENT

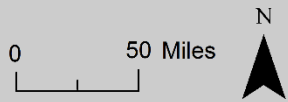
August-October
2010-2016

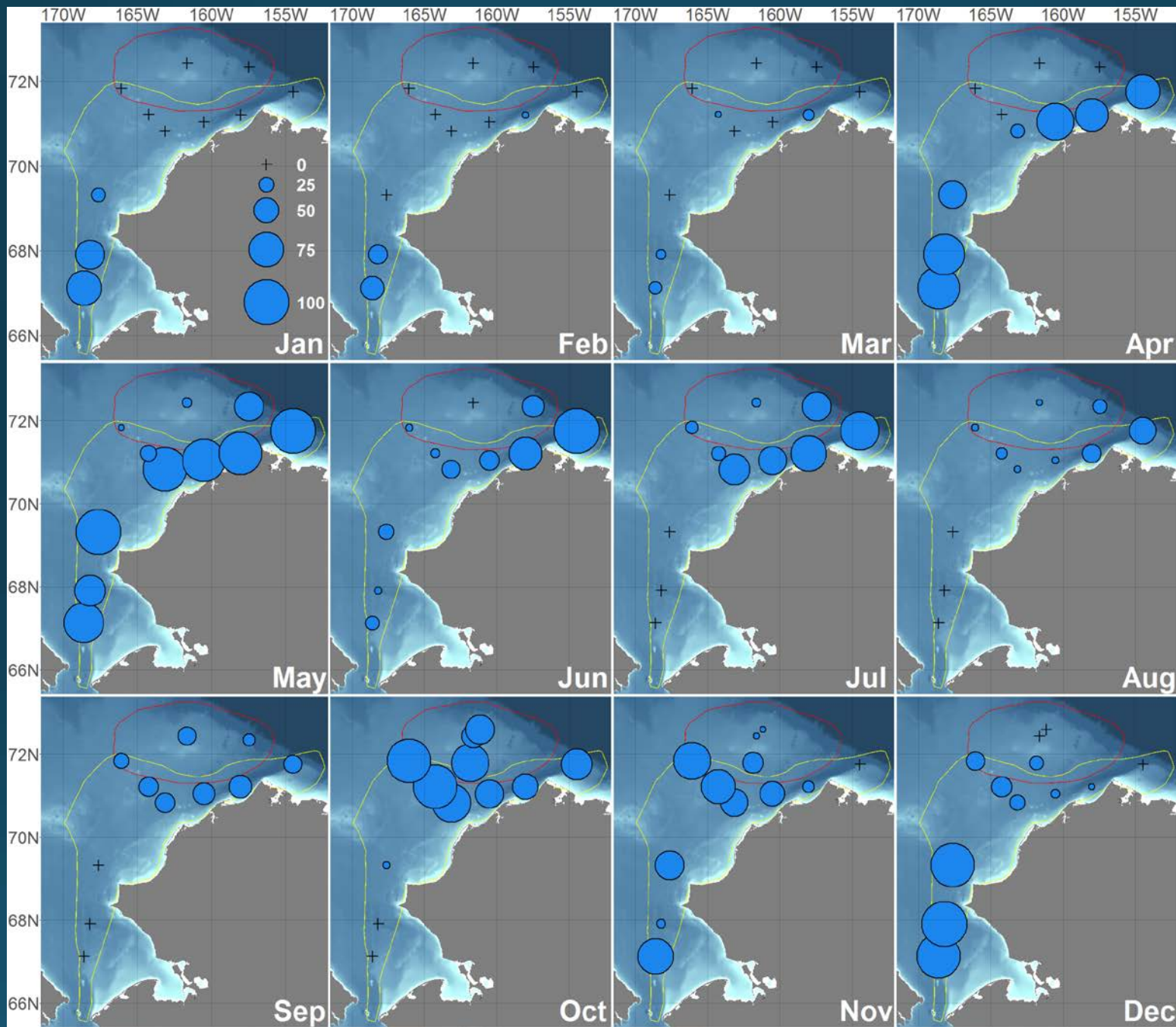


Visual Survey Team:
Brenda Rone
Amy Kennedy

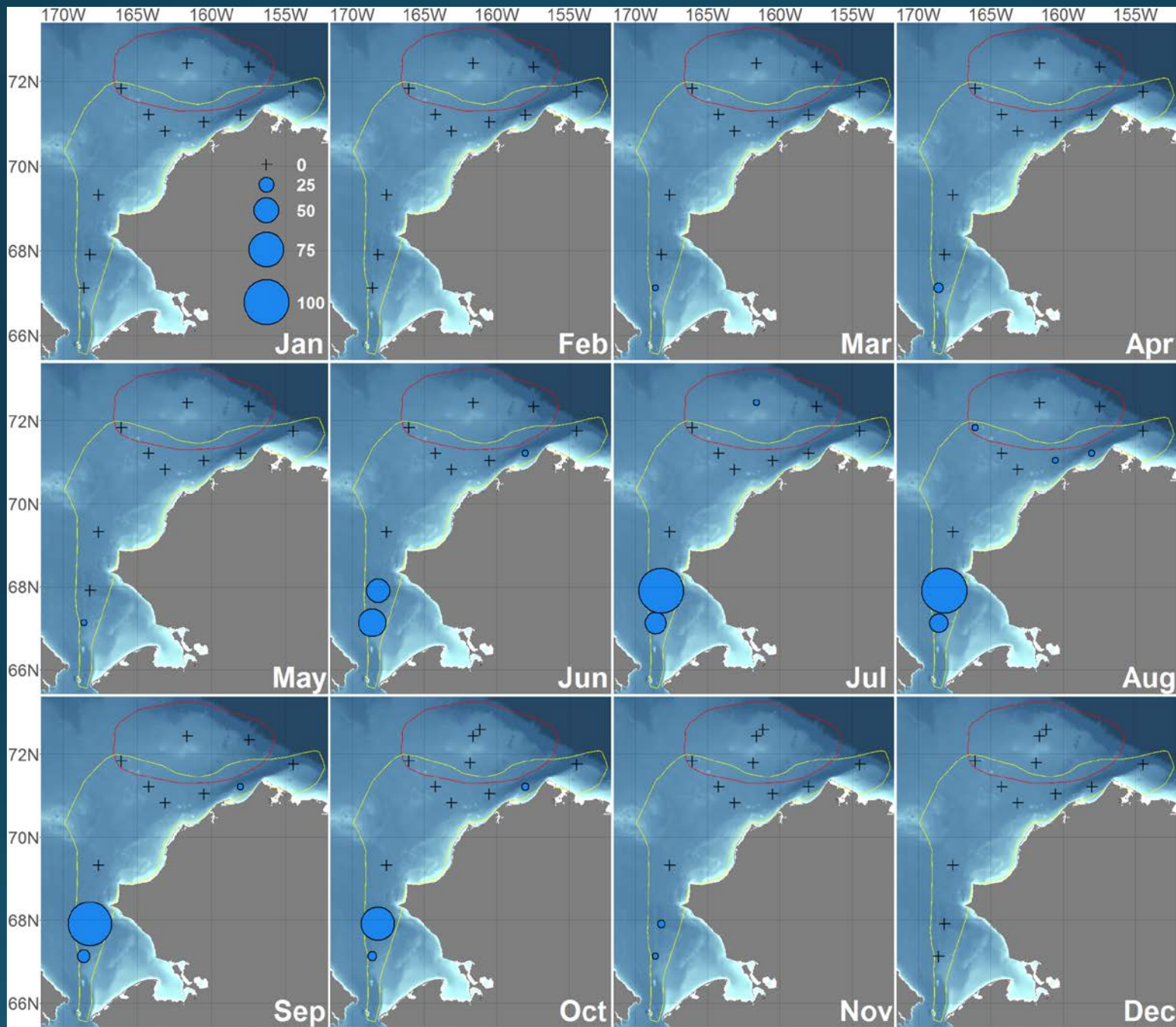


WHALE	PINNIPED	HUMAN	ENVIRO
BOWHEAD	BEARDED	VESSEL	ICE
BELUGA	WALRUS	AIRGUN	
GRAY	RIBBON		
HUMPBACK			
FIN	2010-2015		
KILLER			
MINKE			

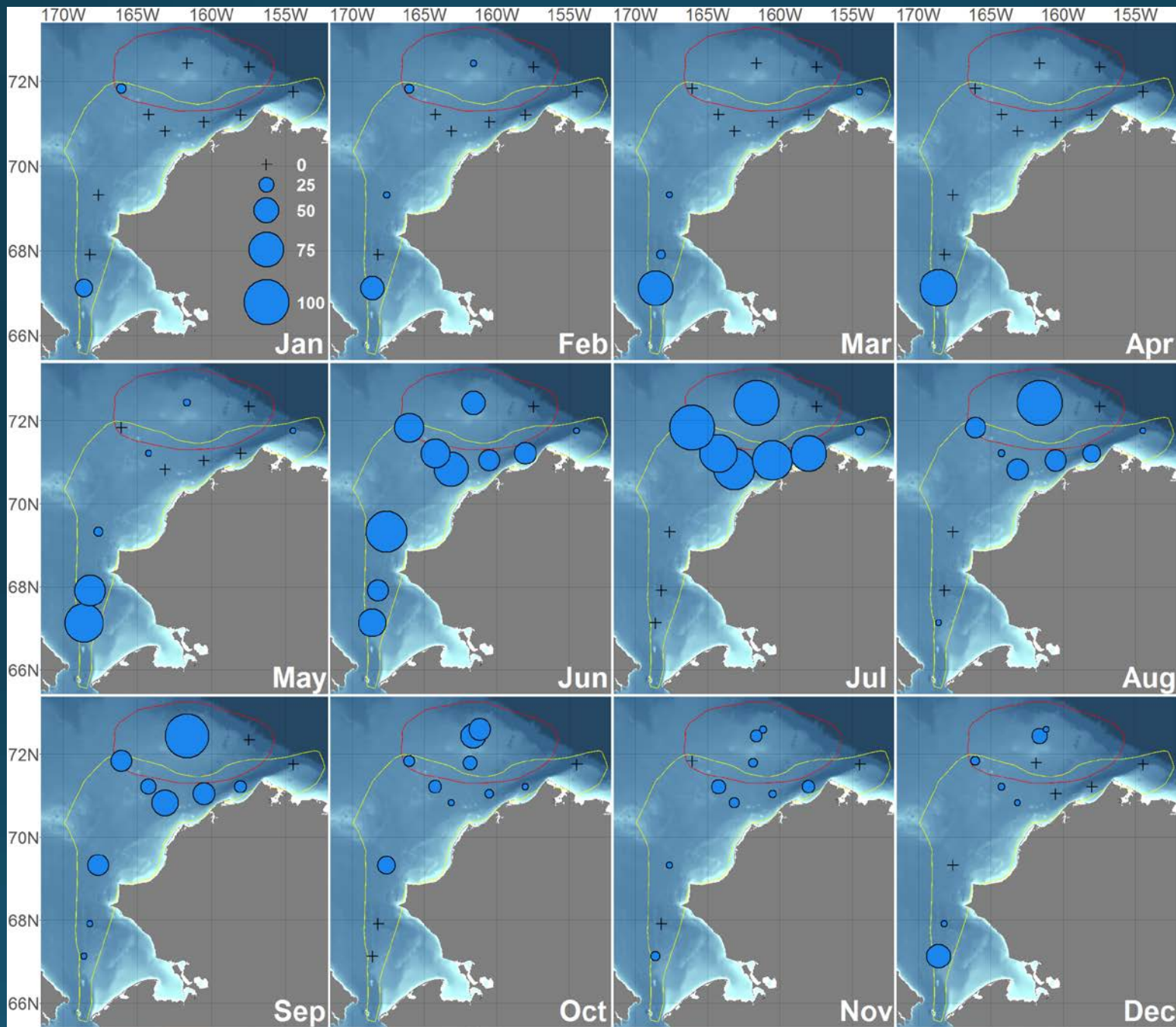




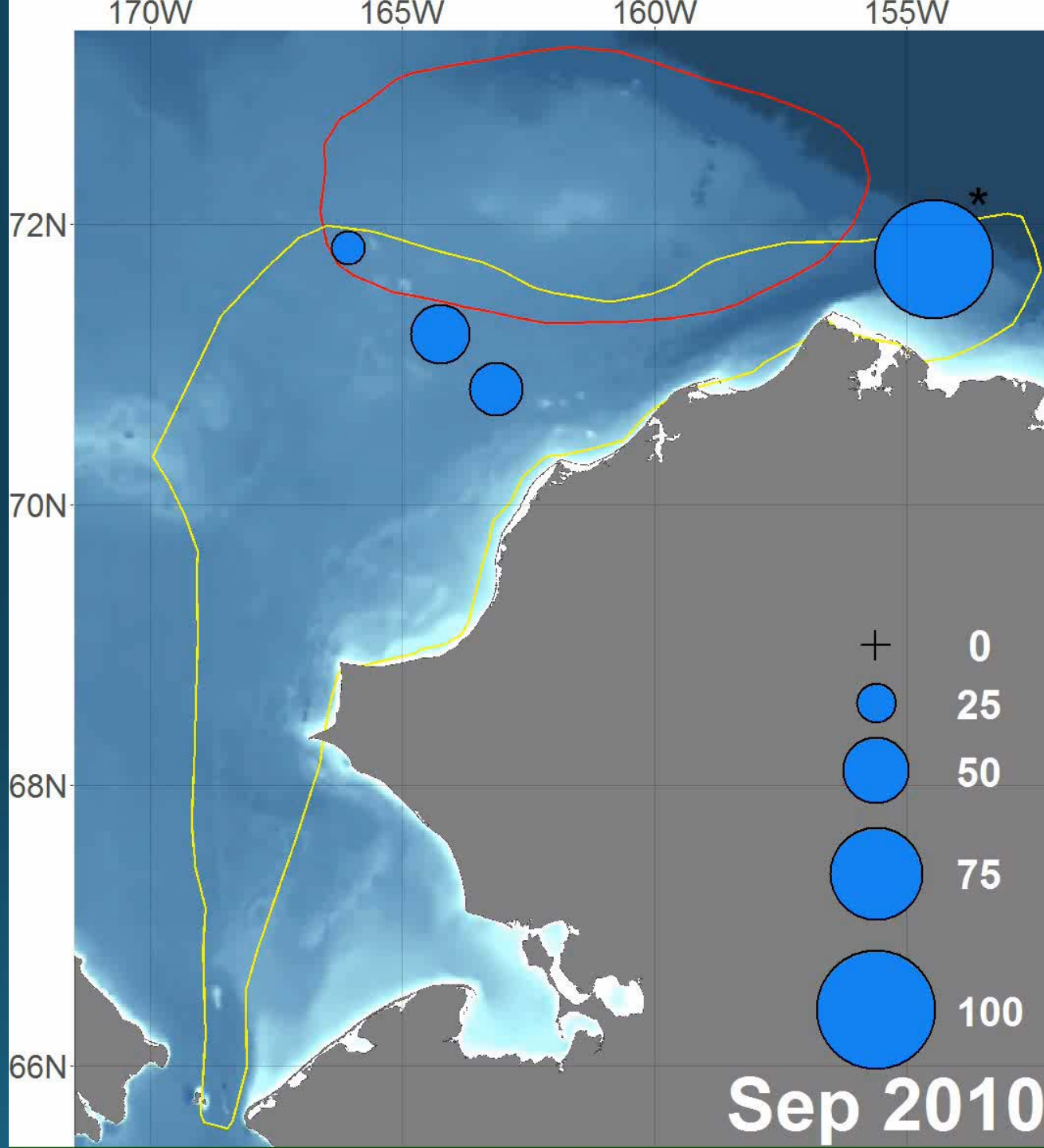
BOWHEAD
2014



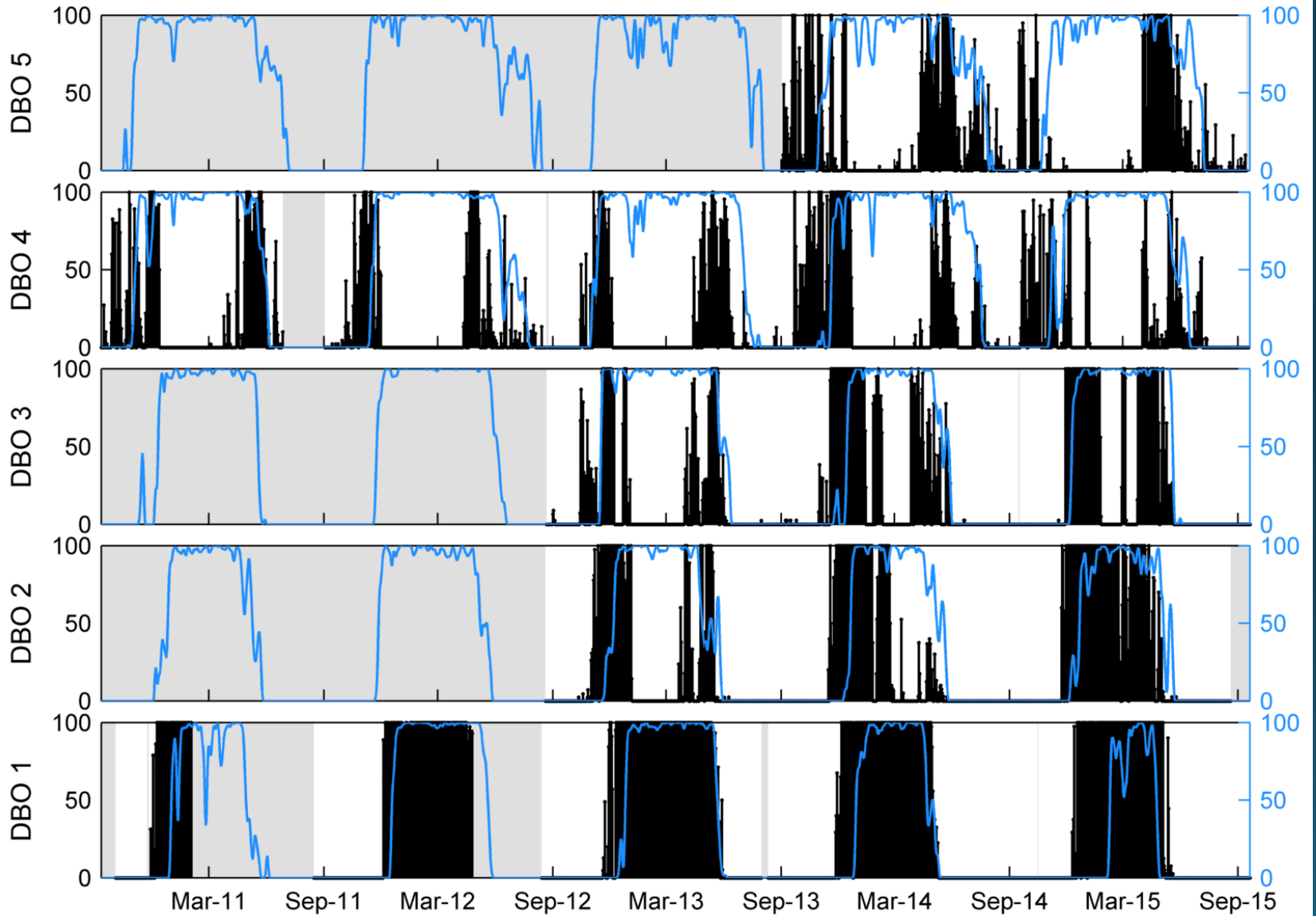
GRAY
2014



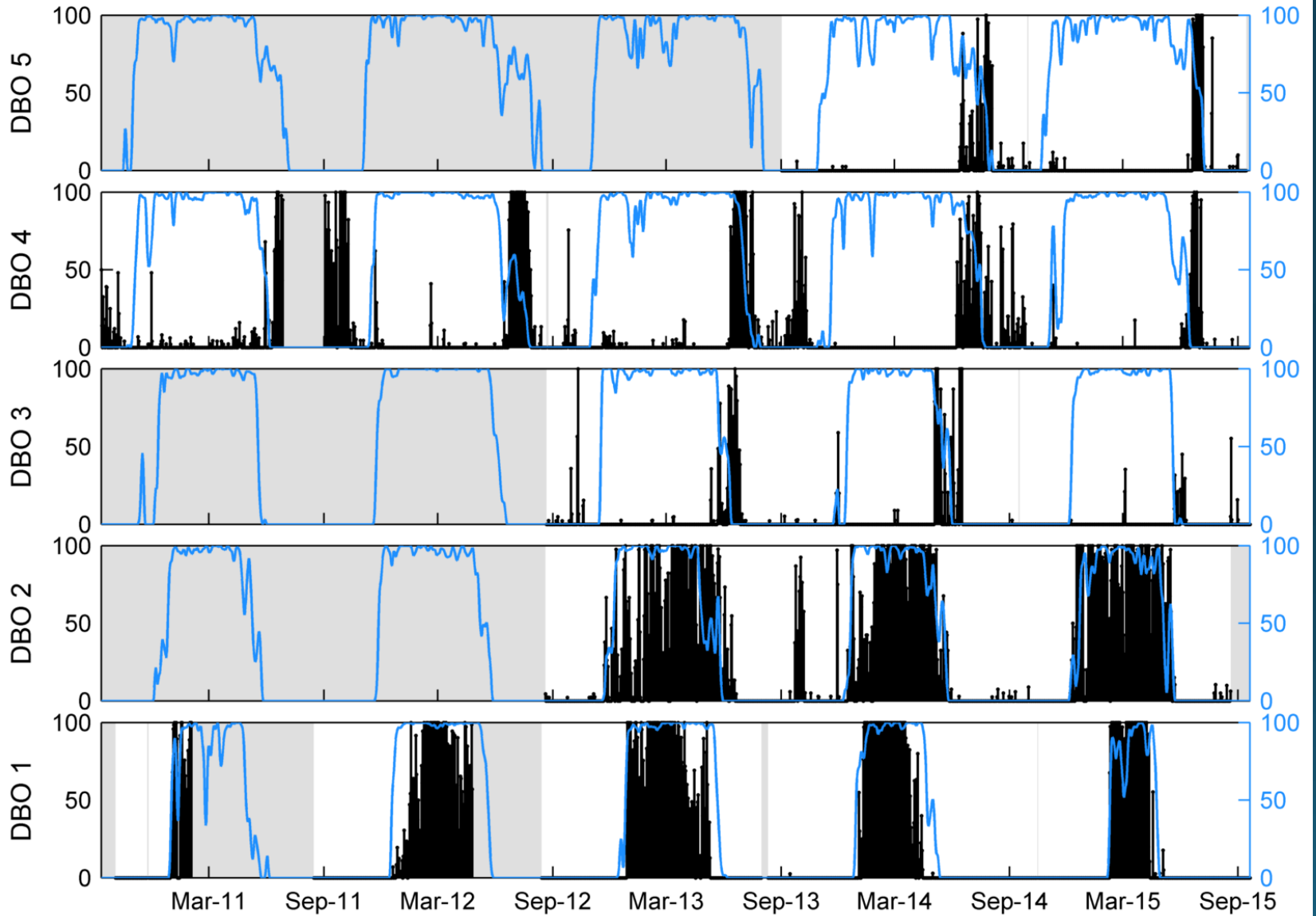
WALRUS
2014



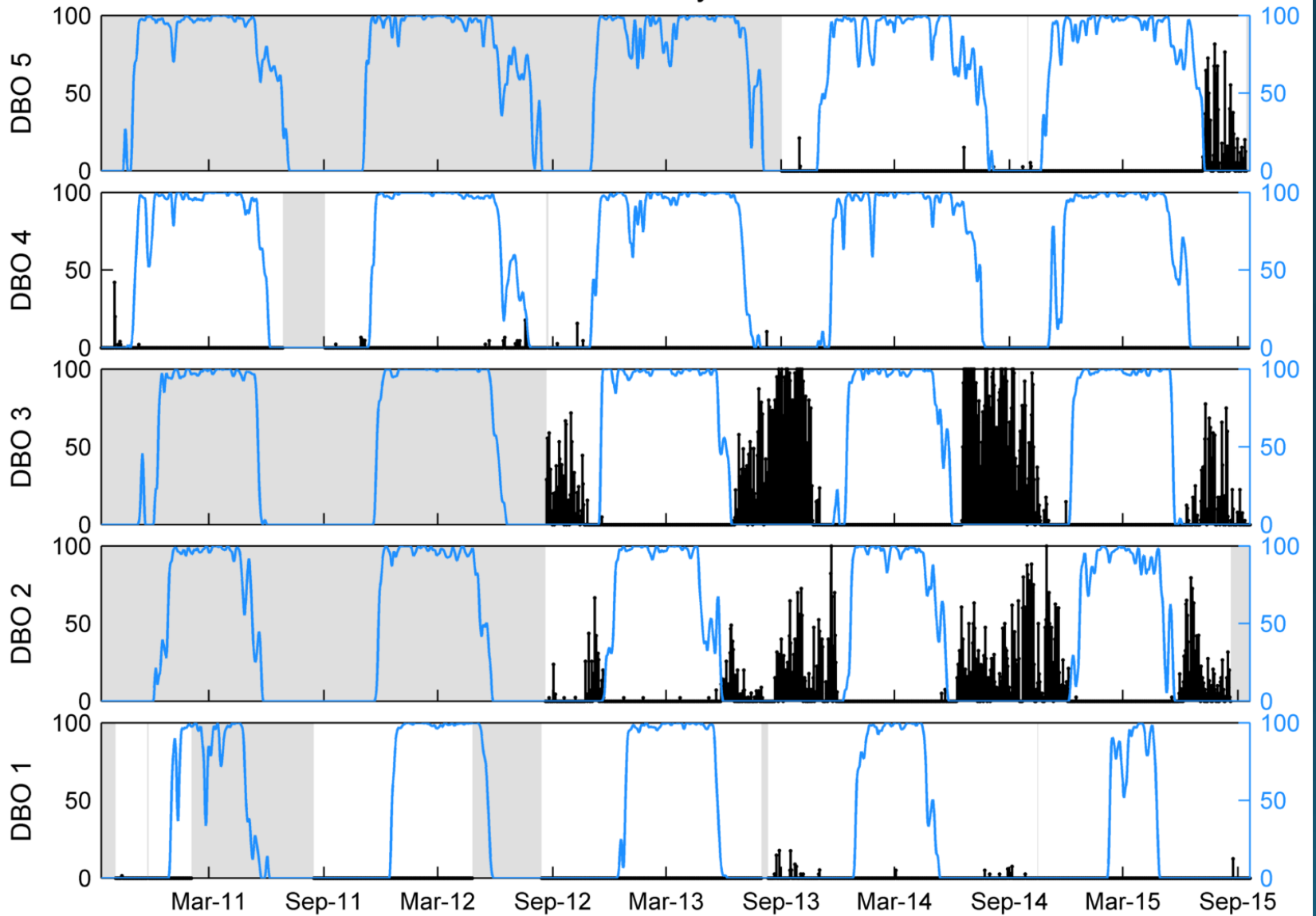
Bowhead



Walrus



Gray



Humpback

