



UpperTrophics

Marine Mammals, Birds, Fish, and Other Things Large

> CATHERINE BERCHOK JANET CLARKE CATHY COON AMY KENNEDY KATHY KULETZ LIBBY LOGERWELL SUE MOORE KATE STAFFORD





Marine Mammals

Janet Clarke: ASAMM aerial surveys

Catherine Berchok: CHAOZ/ARCWEST/CHAOZ-X ship surveys and long-term moorings Yoko Mitani: GRENE long-term moorings Kate Stafford: Rusalca long-term moorings Sue Moore: Laurier vessel surveys

Cathy Coon: Walrus tagging Amy Kennedy: CHAOZ/ARCWEST tagging results

Janet Clarke

ASAMM JULY-OCTOBER 2010-2015 CETACEAN SIGNTINGS

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 JULY-OCTOBER 2010-2015 CETACEAN SIGNTINGS



ASAMM JULY-OCTOBER 2010-2015 WALPUS SIGNTINGS

DBO 4 and 5 only



ASAMM 2010-2015 CELACEAN SIGNLINGS DEO 3



ASAMM data 1979-2013 are available at: http://www.afsc.noaa.gov/NMML/cetacean/bwasp/

The metadata has also been submitted to the EOL DBO Data Archive, which references the above URL.

The data are publicly available, and we encourage all to use the ASAMM dataset. We also strongly suggest that you contact Megan Ferguson (megan.ferguson@noaa.gov) or Janet Clarke (janet.clarke@leidos.com) if you have any questions about the data.

ARCWEST/CHAOZ-X/CHAOZ

Catherine Berchok

Short-term results



Visual survey and passive acoustic monitoring















The ALTIMA Project

Arctic Long-Term Integrated Mooring Array

Continuation of moorings from BOEM-funded interdisciplinary projects: BOWFEST, CHAOZ, ARCWEST, CHAOZ-X, NPRW





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FISHERIES

PME















Analysis by Dana Wright



Integration with oceanography/prey... stay tuned.





GRENE Yoko Mitani

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ICES International Council for the Exploration of the Sea CIEM Consell International pour recyporation de la Mer

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The migration of fin whales into the southern Chukchi Sea as monitored with passive acoustics

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RUSALCA Kate Stafford

Woodgate, R.A., K.M. Stafford, and F.G. Prahl. 2015. A synthesis of year-round interdisciplinary mooring measurements in Bering Strait (1990–2014) and the RUSALCA years (2004–2011). *Oceanography* 28(3):xx–xx, <u>http://dx.doi.org/10.5670/</u> oceanog.2015.xx.



Laurier survey

Sue Moore

Laurier - Marine Mammal Watch – July 2014





Sighting maps & data available on AOOS/AXIOM DBO Workspace

Walrus Tagging

Cathy Coon



ADFG Walrus Tagging Lori Quakenbush, Justin Crawford

Walrus Density Estimates

August 2013 - 2015

Alaska

Hanna Shoal Walrus Use Area

100

BOEM

Walrus location densities

% Probability (n = 40)

Legend

10

20

30

50

DBO areas

USGS- Walrus Tagging Walrus seasonal distribution and habitat use in the eastern Chukchi Sea

Jay, C.V., A.S. Fischbach, and A.A. Kochnev. 2012. Marine Ecology Progress Series.







ARCWEST/CHAOZ Amy Kennedy Fine-scale movement and dive behavior of gray whales satellite-tracked in the Northern Bering and Chukchi Seas





Joint Institute for the Study of the Atmosphere and Ocean





DBO 1, 3, and 4

Tag_Year	Period	Duration (d)	Total Dist (km)	Avg. Daily Dist (km)
112713_2012	Aug25- Oct12	49	1732.4	35.4
84482_2013	Sept8- Oct19	42	1362.5	32.4
84484_2013	Sept8- Oct27	50	2441.4	48.8
84485_2013	Aug24- Sept4	12	674.7	56.2
87636_2013	Sept7- Nov12	67	2616.5	39.1
Overall Avg.		44	1765.5	42.4

Average tag duration: 44 days Range: 12-67 days


DBO 4

2012 Results

• 57 day tag duration: Aug. 25 to Oct. 11



Max. distance from tagging location: **140km**



DBO 4



DBO 1 & 3

2013 Results

Deployed	PTT #	Туре	Duration (d)
8/24/2013	84485	Spot ₅	12
9/7/2013	87636	mk10a	67
9/7/2013	84484	Spot5	50
9/8/2013	84482	Spot5	42





DBO 3

- 2013 results overlap with ightarrowASAMM aerial gray whale sightings
- Visual surveys limited by igodolinternational borders



DBO 3



1984-2006 interpolated amphipod biomass

Heide-Jørgensen, M. P., et al. "Identifying gray whale (Eschrichtius robustus) foraging grounds along the Chukotka Peninsula, Russia, using satellite telemetry." *Polar biology* 35.7 (2012): 1035-1045.



2013 Kernel home range

Switching State-Space Model Results

Two behavioral modes : Travel and Area Restricted Search (ARS)

🔺 ARS 🛆 Travel

<u>At least 3 main regions of ARS:</u>

DBO 1, 3, and 4



Results and Discussion





Mk-10a Dive Depth Tag Results: Sept. 7 to Nov. 12, 2013

Daily transmission in September, then every 2 days for remaining tag duration

Birds

Kathy Kuletz: At-sea surveys

At-sea surveys Kathy Kuletz

Seabird Surveys

PI: Kathy Kuletz (USFWS) Funding: BOEM, NPRB, USFWS Collaborators:

NOAA, U.Alaska, U.Mass, USCG, Environment Canada, ABR Inc., others







Depend on ships of opportunity

- Join 3-8 cruises / year in Arctic
- Goals:
- Describe spatial/seasonal distribution & spp composition
- Identify physical & biological factors that drive seabird distribution &

abundance





In 2015

15,506 km surveyed in Alaska waters10,160 km surveyed in N. Bering & Arctic2,601 km surveyed within DBO boxes



2015 Distribution of three key groups

Short-tailed shearwaters – breeds in Southern Hemisphere; omnivore (mainly krill in north?); sporadic abundance (nearly absent in 2014)

Murres (Common & Thick-billed) – Breed in N. Bering & Chukchi; piscivores (TBMU also eat krill); abundant local breeders.

Auklets (Least, Crested)- Breed in N. Bering; planktivores; abundant 'local migrant'.







2010 – 2015 Seabird surveys

Seasonal:

Most surveys in July – Sept Greatest coverage – August

Spatial: Greatest coverage (Km) in DBO3, DBO4 DBO5 = highest density of transects

Best focus for analysis: Aug-Sept, DBOs 2,3,4,5

Seabird species composition by DBO (2, 3, 4) for 2013 - 2015 (2013 was similar to previous 3 years)



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Fish & misc.

Libby Logerwell: SHELFZ ship surveys Cathy Coon: Arctic EIS surveys

SHELFZ Libby Logerwell

SHELFZ Chukchi Sea Survey 2013

- SHELFZ Shelf Habitat and EcoLogy of Fish and Zooplankton
 - Leandra Sousa (North Slope Borough); Alexei Pinchuk (University of Alaska); Sandra Parker-Stetter & John Horne (University of Washington); Elizabeth Logerwell, Kimberly Rand, J. J. Vollenweider & Ron Heinz (Alaska Fisheries Science Center)

Survey dates and area



Concurrent surveys

Nearshore (< 20 m)

Offshore (> 20 m)



- 1) CTD
- 2) Tucker Trawl and CalVET
- 3) Plumb staff beam trawl (5 m footrope)
- 4) Midwater trawl (Alluette 6x4 m)
- 5) Fisheries Acoustics
- 6) Beach Seine

1) CTD

- 2) Tucker Trawl and CalVET
- 3) 83–112 Eastern otter trawl (34 m footrope)
- 4) Midwater trawl (Marinovich 6x4 m)
- 5) Fisheries Acoustics



Bottom trawl fish catch



Bottom trawl invertebrate catch



Snow crab 0.2% of catch Carapace width 25-72 mm



Arctic cod distribution



Arctic cod & PCA scores



Results

CCA (taxa and environmental)



Chukchi

• bottom hardness



Arctic EIS Cathy Coon

Arctic Ecosystem Integrated Survey

How: Three surveys sampling a 30x30 mile grid:

- 2012 and 2013 The F/V Bristol Explorer, conducts surface trawl (top 65'), mid-water trawl, and acoustic surveys to collect data on ocean circulation and physics, water chemistry, plankton, and fishes
- 2012 The F/V Alaskan Knight, conducted bottom trawl surveys in the Chukchi Sea only to collect demersal fishes and invertebrates
- All surveys collect tissue samples and whole fish to study the biology of salmon, Arctic cod, saffron cod, snow crab, capelin, and other fish & invertebrates

Climate impacts on the marine ecosystem, what do we expect in the future (in terms of fish distribution and fishery potential).

Principal Investigators: NOAA- Ed Farley, Bob Lauth UAF- Fran Mueter- Project Manager Jared Weems USFWS- Kathy Kuletz - Seabirds



Photo by Elizabeth Calvert Siddon (NOAA/UAF)

Summer Bottom Distribution and Abundance of Older Arctic and Saffron Cod in Relationship to DBO's

Arctic cod



Saffron cod





Data are from the Arctic Ecosystem Integrated Survey - see <u>https://web.sfos.uaf.edu/wordpress/arcticeis/</u> for more information

Summer Distribution and Abundance of Young Arctic and Saffron Cod



Data are from the Arctic Ecosystem Integrated Survey - see <u>https://web.sfos.uaf.edu/wordpress/arcticeis/</u> for more information



Predators must consume 2.7x the Saffron Cod to get the same lipid as 1 Arctic Cod



Heintz & Vollenweider Unpublished data

Growth Response in Relation to Temperature



Ben Laurel, In Review

Conclusion

Reduced sea ice extent and duration in Alaska's Arctic and Subarctic ecosystems will limit the available **HIGH FAT** prey that Fish and Mammals require for good health and survival.

This has the potential of affecting some of the most important commercial fisheries in Alaska and could impact marine mammal populations in the Arctic that Alaskan's depend on for food.



Other data available for a paper Beaufort Sea 2008 survey

Survey dates and area



Methods

- Charter vessel F/V Ocean Explorer
- Bottom trawl
 - 83-112 (1.5"mesh liner)
 - Net height, spread, bottom contact
- CTDs
- Bongo nets for zooplankton (333 and 150 micron)
- Acoustic-trawl
 - Calibrated ES-60 at 38kHz
 - Marinovich mid-water net

Study area


Beaufort Sea bottom traw

fish catch



Beaufort Sea bottom trawl invertebrate catch





Snow crab

- •60-120 mm wide
- •Legal size 78 mm
- •Commercial size 100 mm

Photo by: Erika Acuna

Arctic cod distribution



Results

CCA (taxa and environmental)



Beaufort lined net

- bottom depth
- Bottom temperature







Acknowledgements

Chukchi Sea SHELFZ survey:

CIAP-USFWS, R/V Ukpik Captain Mike Fleming and *F/V Alaska Knight* Captain Vidar Ljung and crew, Brian Person, Todd Sformo, Hugh Olemaun, Andy Whitehouse, Troy Buckley, Darcie Neff, Roger Clark, Bill Koplin, Arnold Arey, NSB-DWM, AFSC RACE Groundfish Assessment Program

Beaufort Sea survey: Bureau of Ocean Energy Management, AFSC RACE Groundfish Assessment Program, Heloise Chenelot, Erika Acuna, James Orr, Duane Stevenson, *F/V Ocean Explorer* Captain Darin Vanderpol and crew