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10.04	Joshua I. Brown*	INTER-SPECIFIC POPULATION DYNAMICS OF THE COMMON GOLDENEYE AND BARROW'S GOLDENEYE, <i>Joshua I. Brown, Sarah Sonsthagen, Robert Wilson, Sean Boyd, Sandra Talbot, Philip Lavretsky</i>
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10.10	Luke J. Fara ²	USING THERMAL IMAGERY AND "JUDAS" BIRDS TO INCREASE CAPTURE OF LONG-TAILED DUCKS ON LAKE MICHIGAN, <i>Luke J. Fara, Kevin P. Kenow, Michael W. Eichholz, Brian R. Lubinski, Larry R. Robinson, and Steven C. Houdek</i>
10.11	P-O. Fontaine	CO-CULTURE OF BLUE MUSSEL (<i>Mytilus edulis</i>) AND SUGAR KELP (<i>Saccharina latissima</i>): EXPLORING THE POTENTIAL EFFECT OF SEAWEEDS IN DETERRING THE EFFECT OF DUCK PREDATION ON MUSSELS, CASCAPEDIA BAY (QC, CANADA), <i>P-O. Fontaine, É. Tamigneaux</i>

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- 10.13 Luke C. Hawk **EVALUATING MOVEMENT PATTERNS AND HABITAT NUANCES OF WINTERING DIVING DUCKS, *Luke C. Hawk, Mason A. Hill, Susan E.W. De La Cruz, Michael Casazza, Joshua Ackerman, Joseph Fleskes, Cory Overton, Cliff Feldheim, and Caroline Brady***
- 10.14 Richard Hearn **CAUSES OF, AND RESPONSES TO, DECLINES IN EUROPEAN POPULATIONS OF LONG-TAILED DUCK AND VELVET SCOTER, *Richard Hearn and Mindaugas Dagys***
- 10.15 Holly L. Hennin **ENERGETIC PHYSIOLOGY MEDIATES INDIVIDUAL OPTIMIZATION OF BREEDING PHENOLOGY IN A MIGRATORY ARCTIC SEABIRD, *Holly L. Hennin, Joël Bêty, Pierre Legagneux, H. Grant Gilchrist, Tony D. Williams, and Oliver P. Love***
- 10.16 Mason A. Hill **ENHANCING PREY AVAILABILITY FOR SEA AND BAY DUCKS INJURED BY THE COSCO BUSAN OIL SPILL IN SAN FRANCISCO BAY, *Mason A. Hill, Kyle A Spragens, John Y. Takekawa, Susan E.W. De La Cruz***
- 10.17 Kevin P. Kenow **DISTRIBUTION OF WINTERING LONG-TAILED DUCKS ON LAKE MICHIGAN, *Kevin P. Kenow, Steven C. Houdek, Brian R. Lubinski, Timothy J. Fox, Luke J. Fara***
- 10.18 Mark D. Koneff **EVALUATING HARVEST POTENTIAL AND INFORMATION NEEDS FOR SEA DUCKS, *Mark D. Koneff, Chris P. Dwyer, Guthrie S. Zimmerman, Kathleen K. Fleming, Paul I. Padding, Patrick K. Devers, Fred A. Johnson, Michael C. Runge and Anthony J Roberts***
- 10.19 Charlotte Kilchenstein **A POTENTIAL TECHNIQUE FOR ATTACHMENT OF SOLAR GPS/GSM TRANSMITTERS ON SURF SCOTERS: SILICONE HARNESS, *Charlotte B. L. Kilchenstein, Alicia M. Wells-Berlin, Jonathan L. Fiely, K. Mark McBride***
- 10.20 Stéphane Lair **EFFECT OF INTRANASAL MIDAZOLAM HYDROCHLORIDE ADMINISTRATION ON SURVIVAL OF SURF SCOTERS (*MELANITTA PERSPICILLATA*) FOLLOWING INTRACOELOMIC IMPLANTATION OF SATELLITE TRANSMITTERS, *Rozenn Le Net, Stéphane Lair, Scott G. Gilliland, Timothy D. Bowman, Christine Lepage, Ariane Santamaria-Bouvier, Daniel M. Mulcahy and Matthew G. Sexson***

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10.22	Christine Lepage	RECOVERY DISTRIBUTION OF SURF AND WHITE-WINGED SCOTERS IN NORTHEASTERN NORTH AMERICA, <i>Christine Lepage, Scott G. Gilliland, Eric T. Reed, Megan V. Ross, Jean-Pierre L. Savard</i>
10.23	Holly Hennin	PRE-BREEDING FATTENING MEDIATES INVESTMENT IN CLUTCH SIZE IN A CAPITAL-INCOME BREEDING SEADUCK, <i>Holly L. Hennin, Cody J. Dey, Joël Bêty, Pierre Legagneux, H. Grant Gilchrist, and Oliver P. Love</i>
10.24	Leho Luigujõe	WINTER DISTRIBUTION AND TRENDS OF SEADUCKS IN ESTONIAN COASTAL WATERS IN THE PERIOD 1993 – 2016, <i>Leho Luigujõe</i>
10.25	Brian R. Lubinski	AN AIRBORNE REMOTE SENSING ALTERNATIVE FOR CONDUCTING PELAGIC SURVEYS OF LONG-TAILED DUCKS, <i>Brian R. Lubinski, Larry R. Robinson, Luke J. Fara, and Kevin P. Kenow</i>
10.26	Kate H. Martin	SPECTACLED AND STELLER'S EIDER RECOVERY PROGRAM: CONSERVATION STRATEGY, <i>Kate H. Martin, Neesha C. Stellrecht, Ted R. Swem</i>
10.27	Kathleen McGrew ^{1*}	REDUCING GILLNET BYCATCH: SEADUCK UNDERWATER HEARING THRESHOLDS AND AUDITORY DETERRENT DEVICES, <i>Kathleen A. McGrew, Christopher K. Williams, Alicia M. Wells-Berlin, Sara E. Crowell</i>
10.28	Kathleen McGrew ²	CAPTIVE RAISED GROWTH MODELS FOR SEADUCKS, <i>Kathleen A. McGrew, Sarah Fitzgerald, and Alicia M. Wells-Berlin</i>
10.29	Nic McLellan	IDENTIFYING AREAS OF IMPORTANCE FOR SEA DUCKS THROUGHOUT THEIR ANNUAL CYCLE, <i>Nic McLellan, Tim Bowman, Sean Boyd, Shannon Badzinski, Christine Lepage Scott Gilliland, and James Churchill</i>
10.30	Jacob McPherson (presented by Chris Williams)	ESTIMATING BEHAVIORAL MULTIPLIERS TO RESTING METABOLIC RATE IN AMERICAN BLACK DUCK AND LESSER SCAUP, <i>Jacob W. McPherson, Christopher K. Williams, Alicia M. Berlin, John M. Coluccy</i>
10.31	Micah W.C. Miller*	ASSESSMENT OF BIOINDICATOR APPROACHES FOR TRACE ELEMENTS AND SUBLETHAL HEALTH EFFECTS IN SEA DUCKS BREEDING IN ARCTIC ALASKA, <i>Micah W.C. Miller, James R. Lovvorn, Angela C. Matz, Robert J. Taylor, Christopher J. Latty, David E. Safine, Tuula E. Hollmén</i>

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10.32	William P. Mueller	LONG-TAILED DUCKS IN WESTERN LAKE MICHIGAN, <i>William P. Mueller, Bryan B. Lenz</i>
10.33	Glenn H. Olsen ¹	USING I-STAT BLOOD RESULTS TO PREDICT POST PTT IMPLANT SURVIVAL IN LONG-TAILED DUCKS AND SCOTERS, <i>Glenn H. Olsen, Anand Krishnaswamy, Michael C. Runge, Alicia M. Wells-Berlin, Dustin E. Meattley</i>
10.34	Glenn H. Olsen ²	LONG-TAILED DUCK AND SCOTER HEMATOLOGY AND SERUM CHEMISTRY, <i>Glenn H. Olsen, Alicia M. Wells-Berlin, Sara E. Crowell, Kathleen A. McGrew</i>
10.35	John Pearce	VISUALIZING POPULATION DELINEATION AMONG NORTH AMERICAN SEA DUCKS: MAPS FOR FUTURE RESEARCH AND MANAGEMENT PLANNING, <i>John Pearce, Mary Whalen, and Josh Stiller</i>
10.36	Hannah M. Plumpton*	ANNUAL FACTORS AFFECTING THE WINTERING DISTRIBUTION OF BLACK SCOTERS, <i>Hannah M. Plumpton, Emily D. Silverman, Beth E. Ross</i>
10.37	Carrick M. Rice*	FORAGING DIVE TIMES OF DIVING DUCKS IN A FRESHWATER LAKE, <i>Carrick M. Rice, Philipp N. Maleko, Tracey Rice, and Luke J. Matthews</i>
10.38	Lucas Savoy ²	TIMING, DURATION, AND PATHWAYS OF HARLEQUIN DUCK MIGRATION TO PACIFIC MOLTING AND WINTERING AREAS, <i>Sean Boyd, Beth MacCallum, Malcolm McAdie, Lisa Bate, Chris Hammond, Matt Wilson, Joseph Evenson, Susan Patla, Lucas Savoy</i>
10.39	Lucas Savoy ³	CONTAMINANT CONCENTRATIONS IN THE ENDANGERED SCALY-SIDED MERGANSER FROM RUSSIA, <i>Diana V. Solovyeva, Lucas Savoy, Oksana Lane, Sergey L. Vartanayan, Christopher Perkins, and Kevin Regan</i>
10.40	Vera Y. Kokhanova (presented by Diana Solovyeva)	SURVIVAL RATE OF SPECTACLED EIDERS ON AYOPECHAN ISLAND, CHUKOTKA, RUSSIA, <i>Vera Y. Kokhanova and Diana V. Solovyeva</i>
10.41	Diana V. Solovyeva	WINTER DIVING ACTIVITY OF SPECTACLED EIDER SOMATERIA FISCHERI AS REVEALED BY PRESSURE TAG, <i>Diana V. Solovyeva</i>
10.42	Sarah A. Sonsthagen	COAST TO COAST: ASSESSING MIGRATORY CONNECTIVITY OF NORTH AMERICAN SCOTERS, <i>Sarah A. Sonsthagen, Robert E. Wilson, Philip Lavretsky, and John M. Pearce</i>
10.43	Kyle A. Spragens	A REVIEW OF SEA DUCK HARVEST IN WASHINGTON STATE: MONITORING HUNTER PARTICIPATION AND HARVEST TRENDS, <i>Kyle A. Spragens, Joseph R. Evenson, and Matthew T. Wilson</i>

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- 10.44 Tanner J. Stechmann* **NEST ATTENDANCE PATTERNS OF COMMON EIDERS AT WAPUSK NATIONAL PARK IN NORTHERN MANITOBA,** *Tanner J. Stechmann, David T. Iles, Andrew F. Barnas, Samuel D. Hervey, Robert F. Rockwell, and Susan N. Ellis-Felege*
- 10.45 Rolanda J. Steenweg* **THE ENERGETIC COSTS AND REPRODUCTIVE BENEFITS OF MATE GUARDING IN A DIVING SEADUCK,** *Rolanda J. Steenweg, Holly L. Hennin, Pierre Legagneux, H. Grant Gilchrist, Glenn T. Crossin, and Oliver P. Love*
- 10.46 Rune S. Tjørnløv **ASSESSING HUNTING SUSTAINABILITY IN A DECLINING FLYWAY POPULATION OF COMMON EIDERS, SOMATERIA MOLLISSIMA,** *Rune S. Tjørnløv, Morten Frederiksen, Roger Pradel and Rémi Choquet*
- 10.47 Sadie E.G. Ulman **A SURVEY OF SEA DUCK PREY ITEMS ACROSS FOUR SITES ON THE YUKON-KUSKOKWIM DELTA, ALASKA,** *Sadie E.G. Ulman, Elizabeth A. Ruffman, and Tuula E. Hollmén*
- 10.48 David H. Ward **BREEDING AND MIGRATION DELINEATION OF SURF SCOTERS WINTERING IN SOUTHEAST ALASKA,** *David H. Ward, Corey S. VanStratt, Daniel Esler, Katherine M. Brodhead, and Brian D. Uher-Koch*
- 10.49 Wilhelm L. Wiese **WHAT'S EATING COMMON EIDER EGGS? NEST CAMERAS TELL THE REAL STORY,** *Wilhelm L. Wiese, Tuula E. Hollmen, Mark S. Lindberg, Christopher J. Latty*
- 10.50 Heather M. Wilson **AERIAL SURVEY DETECTION FOR SPECTACLED EIDERS AND OTHER WATERBIRDS ON THE ARCTIC COASTAL PLAIN OF ALASKA,** *Heather M. Wilson, Robert A. Stehn, William W. Larned, Tamara K. Zeller, and Robert T. Platte*
- 10.51 Denny Zwiefelhofer **KODIAK ISLAND COOPERATIVE BARROW'S GOLDENEYE NEST BOX PROJECT,** *Denny Zwiefelhofer, John Crye, and Robin Corcoran*

10.01: POSTER PRESENTATION**FACTORS AFFECTING THE DISTRIBUTION AND NUMBERS OF WINTERING SEA DUCKS IN THE EASTERN PART OF THE BALTIC SEA**

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The Baltic Sea is one of the largest brackish water bodies in the world, which is known to be supporting nearly three million sea ducks during the non-breeding season. This study focuses on the less known eastern part of the Baltic – marine waters of Latvia and Estonia. Previous surveys indicated that large numbers of Long-tailed Ducks *Clangula hyemalis* as well as Velvet Scoters *Melanitta fusca* and Black Scoters *M. nigra* use these areas for wintering, however, none of these earlier surveys covered the whole area. The survey took place in February 2016. Field transects were chosen so that they would cover the whole study area – every 3km in the shallow parts and every 6 or 8 km in the deepest parts. Line transect plane surveys with distance sampling were used for data collection. The total length of transects was more than 11,500 km. Eco-geographical variables such as depth, water temperature, salinity, water velocity, availability of different bottom substrates, shipping intensity and others were collected both for the transect segments and cells of the 1-km prediction grid. Different combinations of the variables were tried in the GAM models to explain the recorded distribution of the seaduck species. The obtained GAM models allowed describing habitat preferences and were used for prediction to create density distribution maps and estimate population size for analyzed species and species groups. The abundance of seaducks in winter 2016 was lower than before in most of the sites, however, new concentration hotspots were discovered in previously surveyed areas. The obtained distribution maps were used to identify potential gaps in the current network of Marine protected Areas.

10.02: POSTER PRESENTATION**COMMUNITY-BASED MONITORING OF KING AND COMMON EIDER NEAR ULUKHAKTOK, NT, DURING SPRING MIGRATION**

Jeffrey R. Ball and Kirsty E. B. Gurney

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Climate change is having widespread impacts on natural and human systems. These impacts are most acute in the Arctic, and marine and freshwater ecosystems are predicted to be the two systems most affected by climate warming in this region. Inuit are experiencing these changes first hand and they are concerned about the effects these changes will have on their subsistence culture. Eiders are more closely associated with the arctic and with sea ice than most other avian taxa. Numbers of King and Common Eider have declined substantially in recent decades. Loss of sea ice, altered foraging conditions, overharvesting, and accumulation of heavy metals are suggested potential mechanisms. We partnered with the community of Ulukhaktok, NT, in 2016 to survey eider passing the community during spring migration, and to quantify the level of mercury contamination in King Eider. Large numbers of eider, particularly King Eider, pass Ulukhaktok during spring migration and significant numbers are harvested annually. Community members are concerned about the availability of eider and what contaminants they may contain. Our goals are to 1) estimate numbers of King and Common Eider passing Ulukhaktok during spring migration, 2) compare current abundance and phenology to a previous survey conducted in the mid-1990's, 3) quantify mercury levels in King Eider, and 4) evaluate wintering location factors contributing to variation in mercury levels within the local southwestern Victoria Island population, and within a regional/continental population by comparing results from a concurrent study at Karrak Lake, NU, where the local King Eider population winters in both Pacific and Atlantic water. This study will provide information on the numbers of eider available to local harvesters, and insights into variation in contaminant exposure that should prove useful in evaluating potential risk factors to eider populations and subsistence hunters.

10.03: POSTER PRESENTATION**IMPACT OF A MID-SUMMER STORM SURGE ON COMMON EIDERS NESTING ON BEAUFORT SEA BARRIER ISLANDS**

*Elizabeth S. Bonczek**, Christopher J. Latty, Tuula E. Hollmén, and Peter Winsor

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In a recent climate change vulnerability assessment of birds breeding on Alaska's North Slope, Pacific common eider (*Somateria mollissima v-nigrum*) were reported to be the highest-risk waterbird, largely due to potential overwash of nests from forecasted sea-level rise and increases in storm surges. To address this risk, the Arctic National Wildlife Refuge and the University of Alaska Fairbanks began a study in 2014 to determine how flooding may impact the population breeding on the Beaufort Sea barrier islands along 120 miles of the Arctic Refuge coastline. We located nests by visiting the islands by boat, then monitored nests with time-lapse cameras and revisited nests to determine fate. We also used high resolution GPSs to determine the height of nests relative to mean sea-level. Summer 2016 was characterized by unusually low snow extent and record low Arctic sea ice in mid-June. On July 18, 2016, a storm lasting 36 hours with winds building to 39 mph led to a surge that brought water levels 1.12 m above mean sea-level and resulted in the inundation of most common eider nests on the islands. Although storm surges have been observed in the region during late summer and fall, we are unaware of an event of this magnitude occurring in mid-July, a period when most common eiders are still incubating. Model predictions suggest that wave heights and storm surges will continue to increase as the sea ice retreats in response to a warming Arctic, placing the barrier island nesting population of eiders at an increasing risk in the future.

10.04: POSTER PRESENTATION**INTER-SPECIFIC POPULATION DYNAMICS OF THE COMMON GOLDENEYE AND BARROW'S GOLDENEYE**

Joshua I. Brown, Sarah Sonsthagen, Robert Wilson, Sean Boyd, Sandra Talbot, Philip Lavretsky

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Some of the highest rates of hybridization occur in waterfowl (Order *Anatidae*). Within sea ducks, interspecific gene flow is thought to be most prevalent within the goldeneyes (*Bucephala spp.*) as hybrids have been described from all areas of contact. Barrow's (*B. islandica*) and Common (*B. clangula*) goldeneyes engage in reciprocal nest parasitism, resulting in nests containing eggs of both species. Social ontogeny has been shown to constrain species-recognition abilities, potentially leading to misdirected mating efforts (i.e. hybridization) and interspecific gene flow. Common Goldeneye has a Holarctic distribution and Barrow's Goldeneye is primarily restricted to western North America, but they occur sympatrically in the boreal forest of British Columbia. These species' reciprocal nest parasitism, coupled with the general observation of male biased sex ratios within waterfowl (i.e. unpaired males will be present), led us to hypothesize that gene flow, if any, should occur symmetrically in areas where the two species are codistributed. Using ddRAD-seq data, we examined inter-specific genetic variation between Barrow's (n = 30) and Common (n = 34) goldeneyes. Based on 4315 autosomal and 232 Z-linked loci, we uncovered strong differentiation between species (global autosomal $\Phi_{st} = 0.53$; global Z-linked loci $\Phi_{st} = 0.67$) and identified one putative male F1 hybrid captured in British Columbia with assignment probability of 55% as Barrow's and 45% Common goldeneye. Detection of a F1 hybrid in this locale verifies that cross-species gene flow does occur, although given the high level of differentiation observed between species it is likely relatively uncommon. Alternatively, F1 hybrids may suffer some reduction in fitness (e.g. via sexual selection).

10.05: POSTER PRESENTATION**DABBLING DUCK MOVEMENTS: FROM SUISUN MARSH AND BEYOND**

Michael Casazza, Joshua Ackerman, Joseph Fleskes, Susan De La Cruz, Cory Overton, Mark Herzog, Christopher Hartman, Cliff Feldheim, John Eadie, Caroline Brady, Jeffrey Kohl, Desmond Mackel, Mason Hill, Fiona McDuie

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Suisun Marsh is the largest estuarine marsh (48,000 ha) on the Pacific Coast of the coterminous United States and offers an unparalleled opportunity to observe the movements and resource use of sympatric dabbling and diving duck species. Beginning in 2015, we have tracked 5 species of waterfowl in Suisun Marsh using 17 gram Ecotone® GPS transmitters that communicate using the cellular (GSM) network. To date we have marked 268 individuals including five dabbling duck species; Mallard (*Anas platyrhynchos*), Northern Pintail (*Anas acutas*), Gadwal (*Anas strepera*), Northern Shoveler (*Anas clypeata*), and American Wigeon (*Anas Americana*). To date we have collected over a half million locations and followed individuals as they move within California during the winter, and in North America through both spring and fall migrations. Three individuals have been tracked for more than 500 days and the longest movement track is over 18,000 kilometers. Each species generally demonstrates specific movement processes. Locally breeding Mallards and Gadwall typically complete a post-breeding migration to molt in the Klamath Basin. Northern Pintail emigrate north, mostly to the Prairie Pothole region of the north-central US and south-central Canada. The varied habitats present Suisun Marsh during the winter create a hub of co-occurring species that serves as the terminus of autumnal migration.

10.06: POSTER PRESENTATION**CHARACTERIZATION OF IMMUNE FUNCTION IN STELLER'S EIDERS**

Katrina Counihan and Tuula Hollmén

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The Alaska breeding population of Steller's eiders (*Polysticta stelleri*) was listed as threatened under the Endangered Species Act due to declines in their numbers and nesting habitat. The Alaska SeaLife Center maintains a captive population of Steller's eiders and their offspring are being used by USFWS to reintroduce the species to the Yukon Kuskokwim Delta. It is important that the immunocompetence of captive bred eiders is similar to wild eiders; therefore, this study compared the immune function of captive and wild bred eiders that are housed at ASLC. Twenty males from four different age classes were included in the study. This project had three objectives: 1) measure various immune biomarkers to assess immune function, 2) compare immune function among the different age classes, and 3) determine if immune function varied between captive and wild eiders. We hypothesized that immunocompetence would vary among age classes, but not between wild and captive bred birds. Multiple biomarkers were used to characterize immune function including: total and differential white blood cell count, immunoglobulin G and total protein content of serum, T and B cell immunoreactivity and glutathione levels. Nine year old and second year male eiders had significantly higher immune activity than hatch year and males older than 13 years. Immune function appeared to be influenced primarily by age and not whether the eider was captive or wild bred. This study provided a baseline of the immunocompetence of captive male Steller's eiders at ASLC by evaluating various aspects of their immune function.

10.07: POSTER PRESENTATION**CLUTCH SIZES OF THE SPECTACLED EIDER ON THE YUKON DELTA NATIONAL WILDLIFE REFUGE, ALASKA*****Bryan L. Daniels***

BLD: Yukon Delta National Wildlife Refuge, Bethel, AK 99559, USA

The spectacled eider (*Somateria fischeri*) breeds along the coasts of the Bering and Chukchi seas in western and northern Alaska and northern and eastern Russia. Spectacled eiders nesting on the Yukon-Kuskokwim Delta have been in decline since the 1970s (Stehn et al. 1993, Arctic 46:264) and were listed by the U. S. Fish and Wildlife Service as a threatened species in 1993. Listing prompted basic biological research and systematic surveys in Alaska to monitor Yukon-Kuskokwim Delta spectacled eider subpopulations. Recent survey results indicate that the Yukon-Kuskokwim Delta subpopulation may be close to meeting the minimum population benchmark of $\geq 6,000$ breeding pairs to be de-listed. Dau (1976, Wildfowl 27:111) noted that nesting patterns of spectacled eiders on the Yukon-Kuskokwim Delta appeared to be dictated by the timing and duration of the spring break-up period. Dau reported a reduction in mean clutch size in females who initiated later within the same season. Stehn et al. (1993) provided information on clutch sizes from random plots throughout the Yukon-Kuskokwim Delta from 1965-1992 while the population was in decline. We plan to look at clutch sizes of spectacled eiders nesting on Kigigak Island on the Yukon-Kuskokwim Delta, Alaska from 1991- 2012 while the subpopulation was beginning to increase. Our objectives were: 1) to compare clutch sizes within and between years, and 2) to compare effects of laying date on clutch sizes.

10.08: POSTER PRESENTATION**DETERMINING THE SOURCE POPULATIONS OF COMMON EIDERS IMPACTED BY WELLFLEET BAY VIRUS USING MITOCHONDRIAL DNA**

Chris Dwyer, Sarah Sonsthagen, Randall M. Mickley, Samantha E. J. Gibbs, Jean-Francois Giroux, Brad Allen and G. Randy Milton

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Continued annual mortality events of American common eiders (*Somateria mollissima dresseri*) during the fall migration on Cape Cod, MA, USA associated with the Wellfleet Bay virus (WFBV) have led to questions regarding the geographic origin and potential impacts (if any) of this disease on various population segments of common eiders. The relatively few band recoveries of eiders found dead on Cape Cod has included birds that were previously banded in Maine, Nova Scotia and Quebec. However, there continues to be insufficient numbers of band recoveries for use in identifying the source population(s) of eiders affected, and likely many areas across the breeding range of common eiders where banding is not occurring. Gaining a better understanding of the source population(s) of common eiders involved in these mortality events has become increasingly important given the growing concern over population trends in various portions of their range.

Common eiders are unique among sea ducks as they exhibit fine scale spatial genetic structure at both mitochondrial and nuclear markers. Therefore, it is possible to assign birds collected during these fall mortality events to geographic breeding areas based on their genetic signature. This study is designed to develop a multi-locus data matrix containing reference samples from breeding colonies within the Gulf of St. Lawrence, Nova Scotia, Maine and Massachusetts. Under a scenario of genetic structure among breeding colonies, we are working toward probabilistically assigning common eiders involved in these annual mortality events back to their natal breeding areas. This has enabled us to examine the spatial distribution and proportion of migrant vs. local common eiders that have been involved in die-off events on Cape Cod, and could be used to support information needs of managers and decision-makers beyond these annual mortality events where the source population is of interest.

10.09: POSTER PRESENTATION**MIGRATION PATTERNS, HABITAT USE, FOOD HABITS, AND HARVEST CHARACTERISTICS OF LONG-TAILED DUCKS WINTERING ON LAKE MICHIGAN**

*Luke J. Fara**, Kevin P. Kenow, Michael W. Eichholz, and Steven C. Houdek

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Recent aerial surveys indicate that Lake Michigan supports a considerable number of wintering long-tailed ducks (*Clangula hyemalis*). For example, a December 2013 survey tallied over 18,000 long-tailed ducks (LTDUs) along 2,400 km of transects. Ranking high in priority with the Sea Duck Joint Venture, LTDUs have been a focal species in a large-scale wintering telemetry project in the Atlantic and Great Lakes regions to address information needs concerning population delineation, migration, and ecology. While a large effort has been placed on radio-marking LTDUs during 2007-2013 on the Atlantic coast and Lake Ontario, the effort has not yet included Lake Michigan. Additionally, hunter harvest of LTDUs has increased since 2002, and forage base has likely changed due to invasive species. We will implant adult female LTDUs wintering on Lake Michigan with satellite transmitters to determine temporal and spatial patterns of migration, breeding ground affiliations, and site fidelity. We will conduct a voluntary boat launch survey on Lake Michigan to assess LTDU harvest, determine harvest rates, species composition, and sex ratios. We will use a combination of hunter harvested LTDUs and Next Generation Sequencing of fecal DNA to determine and assess changes in LTDU diet. Results of the study will aid managers as they deal with outbreaks of type-E avian botulism, near and off-shore wind energy development, and assessment of hunter regulations. Preliminary results of one or more of these will be presented.

10.10: POSTER PRESENTATION**USING THERMAL IMAGERY AND “JUDAS” BIRDS TO INCREASE CAPTURE OF LONG-TAILED DUCKS ON LAKE MICHIGAN**

Luke J. Fara*, Kevin P. Kenow, Michael W. Eichholz, Brian R. Lubinski, Larry R. Robinson, and Steven C. Houdek

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Locating and capturing long-tailed ducks (*Clangula hyemalis*) and other pelagic waterbirds at night is difficult on large bodies of water, such as the Great Lakes, particularly when there is little knowledge on the locations of night-time distributions. To increase capture opportunities, two approaches were utilized to supplement our knowledge of LTDU distribution on Lake Michigan. Aerial thermal imagery was used to locate flocks at night and guide capture crews on the water. Additionally, a subset of transmitters (n = 5) programmed to transmit at noon and midnight, were deployed on males, termed “Judas” birds, to document diel movements. By utilizing these methods, capture was increased from 0.16 birds per hour (0.83 birds per night) to 0.42 birds per hour (2.10 birds per night).

10.11: POSTER PRESENTATION**CO-CULTURE OF BLUE MUSSEL (*Mytilus edulis*) AND SUGAR KELP (*Saccharina latissima*): EXPLORING THE POTENTIAL EFFECT OF SEAWEEDS IN DETERRING THE EFFECT OF DUCK PREDATION ON MUSSELS, CASCAPEDIA BAY (QC, CANADA)**

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In Europe and Canada the economic losses in blue mussels (*Mytilus edulis*) farms due to duck predation represent a major problem. In this project, an alternative approach will be presented to reduce duck predation passively in mussel farms as traditional techniques are generally neither effective, cost efficient nor without any impact on ducks. These methods are generally focusing on protecting mussels by isolating them (net, protective socks, cages...), using passive repellent (mannequins, mirrors, corpses...) or active repelling techniques (sound, light, chase, lethal force...). These techniques were found to be generally expensive, prone to habituation, potentially stressful to duck populations and often do not take in consideration ice cover. To solve this problem, the presented project intends to introduce sugar kelp (*Saccharina latissima*) in co-culture over a mussel floating line, to visually shield the mussels. We hypothesize that by hiding the mussels from the ducks vision field, it will protect the mussels without imposing further stress on the ducks. Additionally, it is expected that the sugar kelp and blue mussels could benefit from the spatial proximity in terms of production, consumption and excretion. On the farm production, such design, allowing a circular economy where the repellent is also a product, could ease the losses recovery while developing a polyculture model for the farmers. During spring, visual observation of the migrating flock will be made to insure the validity of the test based on the occurrence, the length of stay, the species present as well as duck general behavior around the experimental design. Between April and May 2017, the resulting growth (biomass \ meter), survival rate (density \ meter) and overall quality (Body condition Index) of the mussel will be assessed and compared to a neighbouring empty line without kelp and to another line carrying artificial kelp made of polypropylene sheets.

10.12: POSTER PRESENTATION**EVALUATION OF PRE- AND POST-SURGICAL LACTATE LEVELS IN LONG-TAILED DUCKS (*CLANGULA HYEMALIS*) AS AN INDICATOR OF HYPOXEMIA**

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Blood lactate is a biochemical parameter that is known to increase when an organism undergoes anaerobic metabolism, which can be seen in cases of exertional myopathy, mechanical obstruction as well as in other stressful events. During a recent field capture event of long-tailed ducks (*Clangula hyemalis*) in Nantucket Sound, MA, blood lactate levels were assessed using a point-of care analyzer both prior to surgery and prior to release. Results from this study can be utilized to develop novel balanced anesthesia protocols to mitigate the adverse effects associated with field surgery and improve survival outcomes post release and can also direct future research into the value of lactate as a marker of organism stress.

10.13: POSTER PRESENTATION**EVALUATING MOVEMENT PATTERNS AND HABITAT NUANCES OF WINTERING DIVING DUCKS**

Luke C. Hawk, Mason A. Hill, Susan E.W. De La Cruz, Michael Casazza, Joshua Ackerman, Joseph Fleskes, Cory Overton, Cliff Feldheim, and Caroline Brady

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Methods to evaluate habitat use and localized movements by diving ducks is complicated by concerns over adverse effects of externally-mounted tracking devices, thus limiting the spatial resolution of inference for these species. However, regional and sub-bay connectivity within the San Francisco Bay-Delta system is presently undocumented, but represents a region of species-specific ecological needs occurring within a mosaic of habitats. The goal of this project was to test emerging technologies for evaluating wintering diving duck movements and habitat associations in the San Francisco Bay-Delta region. During the winter 2015-2016, we deployed 14 solar-powered GPS-GSM backpack transmitters using custom molded silicone harnesses developed to facilitate transmitter attachment to diving ducks. Three species were marked in this pilot year: Canvasback ($n = 12$), Greater Scaup ($n = 2$), and Lesser Scaup ($n = 1$). A total of 4,148 GPS-quality (<20 m) locations were obtained from marked individuals between December 2015 and May 2016. Individuals used a full spectrum of habitats from shallow shoals, tidal marsh, managed marsh, and static deep-water ponds within the Bay sites and transitioned inland towards freshwater habitats during spring months. We describe general movement patterns and habitat nuances highlighted by this methodology, as well as study design considerations for broader application of this marking scheme. Given climate change and cyclical drought conditions the importance of describing key habitat features, spatio-temporal patterns of distribution, and landscape connectivity for these unique-niche species in this ecosystem is critical.

10.14: POSTER PRESENTATION**CAUSES OF, AND RESPONSES TO, DECLINES IN EUROPEAN POPULATIONS OF LONG-TAILED DUCK AND VELVET SCOTER**

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Large declines in some populations of European seaduck were first detected in 2011. Of particular concern are Long-tailed Duck (*Clangula hyemalis*) and Velvet Scoter (*Melanitta fusca*), both of which are thought to have declined by around two thirds since the early 1990s and are now listed as Vulnerable on the IUCN Red List.

Action planning workshops carried out for the African-Eurasian Migratory Waterbird Agreement (AEWA) in 2014 (Long-tailed Duck) and 2016 (Velvet Scoter) identified a number of potential threats. Of primary concern are: (i) small scale oil discharges in non-breeding areas and (ii) accidental bycatch in static fishing nets in wintering and staging areas. Other possible contributing factors include: (i) hunting, (ii) development of offshore infrastructure, (iii) large scale accidental oil spills, (iv) competition with non-native Round Goby *Neogobius melanostomus*, (v) disturbance from shipping, (vi) dredging and dumping of aggregates, (vii) human disturbance, and (viii) habitat degradation in breeding areas.

Crucially, data to causally link seaduck declines to most of these factors are lacking, limiting immediate conservation responses. Furthermore, demographic data with which to understand population responses are also lacking. However, some evidence from wing surveys of hunters bags, birds caught as bycatch and ratios of juvenile:adult males in winter flocks suggests that the productivity of Long-tailed Duck has decreased significantly in the last 30 years. This suggests that in addition to the above threats, most of which are thought to be impacting over-winter survival rates, factors affecting breeding success in the Arctic could also be important, at least for Long-tailed Duck.

For an effective conservation response, huge improvements are needed in baseline monitoring and research of European seaducks, including in the remote breeding grounds. In particular, this requires the development of well-resourced research programmes, linked to other established marine and Arctic biological research, aimed at understanding seaduck declines.

10.15: POSTER PRESENTATION**ENERGETIC PHYSIOLOGY MEDIATES INDIVIDUAL OPTIMIZATION OF BREEDING PHENOLOGY IN A MIGRATORY ARCTIC SEABIRD**

Holly L. Hennin, Joël Bêty, Pierre Legagneux, H. Grant Gilchrist, Tony D. Williams, and Oliver P. Love

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The reproductive phenology of migratory species breeding in seasonal environments is predicted to be impacted by a combination of arrival condition, arrival date and the ability to gain in condition once on the breeding grounds. While empirical studies have confirmed that greater arrival body mass and earlier arrival dates result in earlier investment in reproduction, no study has yet been able to assess whether individual variation in energetic management of condition gain impacts this key, fitness-related breeding decision. Using an 8-year dataset from over 350 pre-breeding female Arctic common eiders (*Somateria mollissima*), we tested whether individual variation in two physiological traits influencing energetic management (plasma triglycerides: physiological fattening rate, and baseline corticosterone: energetic demand) predicted individual variation in breeding phenology after controlling for arrival date and body mass. Individuals with higher physiological fattening rates combined with lower energetic demand had the earliest breeding phenology (shortest delays between arrival at the breeding grounds and laying, and earliest laying dates). Our results are the first to determine empirically that individual flexibility in pre-breeding energetic management influences key fitness-related reproductive decisions, suggesting that individuals have the capacity to optimally manage reproductive investment.

10.16: POSTER PRESENTATION**ENHANCING PREY AVAILABILITY FOR SEA AND BAY DUCKS: RESULTS OF A POST OIL SPILL RESTORATION PILOT PROJECT**

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The November 2007 M/V Cosco Busan oil spill resulted in significant injury to wintering waterfowl, especially surf scoters (*Melanitta perspicillata*) and greater scaup (*Aythya marila*) in San Francisco Bay (SFB). To assess the restoration potential of habitat augmentations, we deployed two types of prey enhancement treatments in SFB: 1) spawning substrates for Pacific Herring (*Clupea harengus pallasii*) Eggs on Kelp (HEOK), a significant waterfowl prey item, and 2) substrates for natural mussel recruitment to increase availability and quality of prey. Three HEOK rafts were deployed in Richardson Bay Audubon Sanctuary from October 2014 to April 2015. Of the 12 separate kelp deployments, spawn was recorded on 4 deployments, but recorded 3 times on one particular raft. The total number of herring eggs deposited upon deployed kelp over study duration was estimated at just over 3,210,000 eggs, equating to a potential caloric energy of 15,185 – 26,003 kJ. A number of bivalve species readily colonized deployed substrates. Present in this “fouling community” were: California Lyonsia (*Lyonsia californica*) at 52 individuals per m², invasive Asian Mussel (*Musculista senhousia*), which averaged 14 individuals per m², the Blue or Bay Mussel comprising multiple species of the *Mytilus* sp. complex, which averaged 135 individuals per m² and the Carinate dove shell (*Alia carinata*) which had an average of 5 individuals per m². Bufflehead (*Bucephala albeola*) and scaup showed a dramatic increase of individuals during the spawn period compared to the pre-spawn period and a substantial decline in the post spawn time period. While restoration of eelgrass as a spawning substrate is planned to benefit herring damaged by the Cosco Busan spill, the HEOK rafts and bivalve recruitment methodologies may provide unique benefits to scoters, scaup and other wintering migratory waterbirds that utilize this food source.

10.17: POSTER PRESENTATION**DISTRIBUTION OF WINTERING LONG-TAILED DUCKS ON LAKE MICHIGAN**

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While the Great Lakes are recognized as an important resource to migrating and wintering waterbirds, information on the distribution and abundance of long-tailed ducks (LTDUs; *Clangula hyemalis*) is limited, especially in the western Great Lakes. Information on Great Lakes sea duck concentrations is of interest to resource managers as they deal with several important conservation issues. For example, impact assessment of near-shore and off-shore wind turbine placement and elucidating factors that influence the outbreak of type-E avian botulism require better understanding of the distribution, abundance, and temporal use patterns of waterbirds. We conducted low-level aerial surveys of northern, southern, and eastern Lake Michigan during migration and winter periods of autumn 2010 through spring 2014 along fixed-width transects. Transects were spaced at 3.2 to 4.8-km intervals, and extended up to 32 km offshore.

Long-tailed ducks were among the most abundant species observed during our surveys. The distribution of LTDUs on Lake Michigan was widespread throughout survey areas in northern Lake Michigan during autumn. During winter months, up to 74% of the number of waterbirds tallied along survey transects were LTDUs, when largest concentrations were observed along the Michigan coast from Ludington Bay to Benton Harbor, MI, where water depths ranged between 10-40 m. A peak count of 17,803 LTDUs was tallied on 18-19 December 2013 during a survey of 1,129 km of transects. An extensive portion of waters up to 30 km offshore and 50 m deep in the south end of Lake Michigan was also frequently used by wintering LTDUs. Lake Michigan ice cover extent varied among years, and at times impacted LTDU distribution. The survey data are useful in delineating areas of conservation concern for LTDUs. We plan to model the association of LTDU abundance to a suite of environmental covariates using a hierarchical Bayesian spatial count model.

10.18: POSTER PRESENTATION**EVALUATING HARVEST POTENTIAL AND INFORMATION NEEDS FOR SEA DUCKS**

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In 2012, the Sea Duck Joint Venture (SDJV) created a Harvest Management Subcommittee (hereafter we) and initiated an effort to determine the priority information needs to support harvest management decisions for 5 focal species: American common eider, surf scoter, white-winged scoter, black scoter and long-tailed duck. To prioritize information needs, we assessed the influence of uncertainty in individual reproductive and survival parameters on the capacity to determine whether contemporary harvest levels exceeded an assumed management objective of maximum sustained yield (MSY). We compiled estimates from published and unpublished literature and used them to develop probability distributions for each parameter that reflected uncertainty about true mean values for each population. Available field data for these species frequently were collected at small spatial scales (i.e., local sub-population), and may not be representative of mean values for the populations of interest. Therefore, we conducted an expert elicitation to supplement available empirical data. We used Monte Carlo simulation to propagate uncertainty in demographic parameters into probability distributions describing uncertainty in the intrinsic rate of increase (r_{max}), population size, and harvest (harvest rate for common eider) for each population. We used the Prescribed Take Level framework to contrast contemporary harvest levels with allowable harvest levels (i.e., MSY). We assessed the sensitivity of comparisons of contemporary and allowable harvest levels to uncertainty in each of the demographic parameters. Finally, we summarized priority information needs for the SDJV by identifying parameters which were both highly uncertain and had the most influence on the comparison of contemporary and allowable harvest levels. We present the results of the harvest potential assessment and a summary of priority information needs for each of the five species.

10.19: POSTER PRESENTATION**A POTENTIAL TECHNIQUE FOR ATTACHMENT OF SOLAR GPS/GSM TRANSMITTERS ON SURF SCOTERS: SILICONE HARNESS**

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The effects of climate change and additive stressors from anthropogenic disturbance have negatively impacted sea-duck populations across North America. To evaluate these impacts, coelomically implanted PTT transmitters have been used to track sea-ducks, but implanting tags in the field is logistically challenging, costly, and invasive. No proven technique currently exists to attach devices externally for long-term tracking of sea-ducks. Compared to surgical techniques, the ability to externally attach tracking devices reduces handling time and stress to tagged birds. Additionally, solar-rechargeable GPS/GSM transmitters provide longer tag-life, a better relocation rate, and data of higher precision than PTT devices. At Patuxent Wildlife Research Center, we developed a silicone-based back-pack style harness for use on surf scoters (*Melanitta perspicillata*). Diving and behavioral studies conducted with captive surf scoters provide evidence that these birds can tolerate external devices attached with flexible, durable silicone, but that we have not yet optimized the design of the equipment including tag design. A more flexible type of silicone, light-weight attachment materials, reduced thickness and weight of harness straps, and improvements in fit and positioning of the device on the dorsal surface of the birds, saw improved results in the second of two pilot field studies conducted on the Atlantic coast in 2015 and 2016. We recommend conducting further dive studies to optimize device position to reduce hydrodynamic drag, and improving transmitter case design so that externally attached equipment can more closely mimic the streamlined body shape seaducks have evolved to support underwater foraging.

10.20: POSTER PRESENTATION**EFFECT OF INTRANASAL MIDAZOLAM HYDROCHLORIDE ADMINISTRATION ON SURVIVAL OF SURF SCOTERS (*MELANITTA PERSPICILLATA*) FOLLOWING INTRACOELOMIC IMPLANTATION OF SATELLITE TRANSMITTERS**

Rozenn Le Net, **Stéphane Lair**, Scott G. Gilliland, Timothy D. Bowman, Christine Lepage, Ariane Santamaria-Bouvier, Daniel M. Mulcahy and Matthew G. Sexson

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Intracoelomic implantations of satellite transmitters have been associated with suboptimal survival rates in surf scoters (*Melanitta perspicillata*), especially when compared to other species of sea ducks. It has been proposed that physical exertion and stress associated with capture, handling, and confinement of these birds results in physiological alterations that could impact post-surgical survival. The objective of this study was to evaluate if the intranasal administration of a sedative (midazolam) could improve the survival rate of surf scoters implanted with intracoelomic transmitters. Midazolam hydrochloride (5 mg) was administered intranasally to 26 randomly selected female adult surf scoters shortly after their capture in Forestville (October 2013, Quebec, Canada). The same volume of saline was given to 26 surf scoters of the same sex and age for comparison. All birds were surgically implanted with an intracoelomic transmitter equipped with a percutaneous antenna by the same surgeon. To assess the effect of the treatment, transmitters were programmed to transmit 2h each day for 30 days post-implantation and survival rate was estimated for each group using the telemetry data. The association between the administration of midazolam and survival was assessed while controlling for other factors such as body mass, hematocrit, plasma total solids, duration of surgery, anesthesia and confinement. Death odds at 30 days for the midazolam group (23%) was significantly lower than those for the saline group (61%) ($p = 0.004$). No other variable was significantly associated with survival. This result indicates that sedation with midazolam following the capture might increase post-surgical survival in surf scoters.

10.21: POSTER PRESENTATION**DISEASE AS A POTENTIAL LIMITING FACTOR FOR COMMON EIDER BREEDING ON BEAUFORT SEA BARRIER ISLANDS**

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The Pacific common eider (*Somateria mollissima v-nigrum*; COEI) population declined by 50–90% between 1957 to 1992, and the species is listed as a U.S. Fish and Wildlife Service Bird of Management Concern and an Audubon WatchList species. Although Pacific common eiders have declined throughout their range, those breeding on barrier islands in the Beaufort Sea are considered particularly vulnerable due to small population size, genetic and physical segregation, and rapid environmental change. These factors may place the population vulnerable to disease, and disease may be limiting population recovery. Infectious and parasitic diseases have been documented to cause both mortality and reduced productivity in COEI across the circumpolar region. In previous studies, evidence of disease exposure has been detected in COEI in the Beaufort Sea and a novel adenovirus was reported as a cause of mortality in other sea ducks in the same area. However, the ecology and role of disease as a limiting factor in COEI in arctic Alaska has not been systematically studied. To address this, we collected blood and cloacal swabs from nesting and post-breeding COEI hens across 120 miles of barrier islands in the Eastern Beaufort Sea in 2015 and 2016 and screened samples for evidence of exposure to avian pathogens. Our results are compared to previous data collected 15 years ago in the same region.

10.22: POSTER PRESENTATION**RECOVERY DISTRIBUTION OF SURF AND WHITE-WINGED SCOTERS IN NORTHEASTERN NORTH AMERICA**

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Conservation of North American sea ducks is challenging due to considerable knowledge gaps surrounding key demographic parameters. Scoter demography and harvest are poorly understood despite undergoing apparent long-term population declines. The objective of our study was to determine the distribution and level of harvest of Surf and White-winged scoters (*Melanitta perspicillata* and *M. fusca*) banded during the molting period in eastern Canada from 2004–2013. Estimates of harvest rate were 0.5%–2.4% for Surf Scoters and 0.9%–3.6% for White-winged Scoters banded in Labrador and Quebec. Harvest rates thus appear to be relatively low for these species compared to other waterfowl. The harvest locations for Quebec-banded Surf Scoters occurred mostly in Maryland (27%) and North Carolina (27%) followed by Quebec (19%), while Labrador-banded birds were recovered in Maryland (40%), Quebec (11%), North Carolina (10%) and Virginia (10%). For White-winged Scoters, half of the recoveries of Quebec-banded birds were made in Massachusetts (50%), followed by Quebec (21%) and Nova Scotia (14%), while recoveries of Labrador-banded birds were split equally among Massachusetts (20%), Maine (20%), Quebec (20%), Nova Scotia (20%) and New Brunswick (20%). Surf scoters were recovered in Quebec and Nova Scotia in September and October, and gradually recovered in U.S. from November through January, when most of the harvest occurred in Maryland, North Carolina and Virginia. White-winged Scoter harvest occurred in Quebec in October, progressing towards Massachusetts by January, where most birds were recovered. The harvest distribution results were consistent with both species' wintering distribution as recently identified from satellite telemetry. These results represent the first direct measures of harvest rate and harvest distribution for Surf and White-winged scoters. This information will be useful to support harvest management decisions, clarify migratory pathways, and help decision making for resource development (e.g., offshore wind energy).

10.23: POSTER PRESENTATION**PRE-BREEDING FATTENING MEDIATES INVESTMENT IN CLUTCH SIZE IN A CAPITAL-INCOME BREEDING SEADUCK**

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Many species experience a seasonal decline in clutch size, but few mechanisms have been tested to account for this relationship. Theoretical models predict two possible, non-exclusive pathways: poor condition at arrival on the breeding grounds may delay laying and thereby reduce investment in the clutch, or later arriving females may have reduced resource availability to support the formation of a large clutch. As such, if lower condition or later-arriving females can gain in condition at a faster rate they may be able to lay larger than expected, earlier clutches. Energetic metabolites are useful metrics used by physiologists to estimate an individual's current energetic state, and elevated plasma triglycerides (TRIG) in particular are useful for estimating fattening rate during hyperphagic life history stages. Lipid accumulation and management is critical prior to laying in common eiders (*Somateria mollissima*), which must accumulate significant fat stores prior to laying to both fuel follicle growth and deposit the fat stores needed to successfully complete their 24-day incubation fast. Here we use an 11-year data set collected from East Bay Island, NU, Canada, in pre-recruiting, Arctic-nesting female eiders to examine the potential indirect effect that fattening rate may have on clutch size. Path analytical methods revealed that fattening rate had an indirect effect on clutch size *via* a direct influence on the timing of laying: females with higher fattening rates (TRIG) laid earlier and produced larger clutch sizes. Our results are the first to provide mechanisms underlying the well-documented seasonal decline in clutch size across species, namely that fattening prior to breeding indirectly influences reproductive investment *via* changes to breeding phenology. Further, this work illustrates that flexibility within physiological traits can overcome poor arrival condition or late arrival to positively influence reproductive investment.

10.24: POSTER PRESENTATION**WINTER DISTRIBUTION AND TRENDS OF SEADUCKS IN ESTONIAN COASTAL WATERS IN THE PERIOD 1993 – 2016.*****Leho Luigujõe***

LL: Estonian University of Life Sciences, Kreutzwaldi1, Tartu 51014 Estonia

The present report gives an overview of the land-based counts of waterfowl in Estonia. The counts were made in mid-January and the counts were organized by the Estonian Ornithological Society since 1966. The Estonia waters were divided into 7 major-sections, 20 sub-sections and 338 count areas. The land-based survey was based mainly on fixed routes or observation points at the coast. The wide network of the Estonian Ornithological Society (150-200) observers covered 80% of Estonian coastline. The key areas of important coastal wintering sites were visited by professional ornithologist. From the coast, birds were recorded to a distance up to 2 km, depends the weather condition.

Main results:

- Stellers Eider was increasing up to 1994. After that these species have a decreasing trend.
- Smew, Goosander and Goldeneye have shown increase.
- Numbers of Mallard, Red-breasted Merganser and Cormorant are stable.

10.25: POSTER PRESENTATION**AN AIRBORNE REMOTE SENSING ALTERNATIVE FOR CONDUCTING PELAGIC SURVEYS OF LONG-TAILED DUCKS**

Brian R. Lubinski, Larry R. Robinson, Luke J. Fara, and Kevin P. Kenow

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Traditional low-level aerial surveys have been used recently to determine waterbird distribution and relative density on Lake Michigan. Surveys were flown in a fixed-wing aircraft at an average speed of 200 km/h at about 61 m above the water. Observers tallied waterbirds within 200 m-wide transects on each side of the plane, although only the outside 165 m were observable. Each observation was recorded using an integrated GPS voice recording system.

Airborne remote sensing surveys reduce risk to aircrew and eliminate human factors, such as observer fatigue, affecting target detection. In 2016, the FWS acquired an 80 megapixel metric grade aerial camera with a 70 mm lens and added a medium wavelength cooled thermal camera integrated into a direct georeferencing system. This system produces imagery that can be georeferenced without the need for discernable features within the imagery, providing a tool to survey pelagic waterbirds during the day and at night. In October 2016, the system was used to locate long-tailed ducks (LTDUs) at night from 610 m above the water at 230 km/h ground speeds and the location information relayed to capture crews on the water. In addition, daytime missions were flown to evaluate the efficacy of replacing traditional low-level surveys with an airborne remote sensing alternative. These daytime flights were flown at 305 m above the water, and produced 234 m-wide images that were georeferenced, mosaicked and used to manually count LTDUs with encouraging results. Thermal imagery collected at night from 610 m above the water produced a 218 m-wide image (0.17 m ground sample distance) that suggested night time surveys of waterbirds was possible for certain applications under certain environmental conditions. Efforts are now underway to develop an automated tool to identify LTDUs within the visible imagery, necessary to make this remote sensing technique operational.

10.26: POSTER PRESENTATION**SPECTACLED AND STELLER'S EIDER RECOVERY PROGRAM: CONSERVATION STRATEGY**

Kate H Martin, Neesha C Stellrecht, Ted R Swem

KHM, NCS and TRS: Endangered Species Recovery Program, US Fish and Wildlife Service, Fairbanks, AK, USA; Kate_Martin@fws.gov

The range-wide population of spectacled eiders and the Alaska-breeding population of Steller's eiders are listed as Threatened under the Endangered Species Act (ESA). Region 7 (Alaska) Fairbanks Fish and Wildlife Field Office, which leads recovery programs for both species, coordinates management actions that are guided by a broad conservation strategy and conducted by a suite of partners. For spectacled eiders, three breeding populations are recognized: Yukon-Kuskokwim Delta (YKD), Arctic Coastal Plain (ACP), and Arctic Russia (AR). Monitoring data indicates that the status of the YKD population has improved since listing, the ACP population has remained stable, and the AR population meets recovery criteria based on its abundance. The most important element of the spectacled eider conservation strategy is monitoring population abundance and trend needed to evaluate status in relation to recovery criteria. For Steller's eiders, viable populations on both the ACP and YKD are required to meet recovery criteria established in the species' recovery plan. Aerial surveys indicate that roughly a few hundred individuals occur on the ACP although abundance and reproductive effort appear to vary across the region and among years. The YKD population is considered essentially extirpated, with only one nest found in the last decade. The Steller's eider conservation strategy includes increasing adult female survival and breeding success of the extant ACP population, and possibly re-establishment of a viable population on the YKD through reintroduction. Management actions being implemented on the ACP include: research and monitoring, outreach and law enforcement to reduce shooting mortality and use of lead shot, arctic fox and raven control near Barrow to increase nest and brood success, and reducing habitat loss and disturbance through the ESA Section 7 consultation process. The feasibility of reintroduction of Steller's eiders to the YKD is being evaluated through an experimental pilot project begun in 2015.

10.27: POSTER PRESENTATION**REDUCING GILLNET BYCATCH: SEADUCK UNDERWATER HEARING THRESHOLDS AND AUDITORY DETERRENT DEVICES**

Kathleen A. McGrew¹, Christopher K. Williams, Alicia M. Wells-Berlin, Sara E. Crowell

KAM and CKW: University of Delaware, Department of Entomology and Wildlife Ecology, Newark DE

AMW and SEC: United States Geological Survey, Patuxent Wildlife Research Center, Laurel MD

As diving foragers, seaducks are vulnerable to underwater human activities, including naval sonar activity, seismic surveys, construction, and gillnet fisheries. Bycatch in gillnets is an important source of mortality for seaducks and other marine birds, killing hundreds of thousands of seabirds annually. While several studies have looked at the potential of acoustic deterrents to lower bycatch risk for marine mammals, sea turtles, and some species of seabirds, there has been very little work done to determine the potential for these types of devices to reduce seaduck bycatch. Understanding of underwater acoustic sensitivity in diving birds is important for the design of acoustic deterrent devices and evaluation of their effects on reducing bycatch. In addition, hearing sensitivity measurements provide information on possible behavioral and physiological impacts of man-made noise sources in aquatic environments. We are investigating underwater hearing in captive seaduck species in order to determine the efficacy of commercially available auditory deterrents, such as pingers, to specifically reduce seaduck bycatch. We hand-raised long-tailed ducks (*Clangula hyemalis*), surf scoters (*Melanitta perspicillata*), lesser scaup (*Aythya affinis*), and harlequin ducks (*Histrionicus histrionicus*) at Patuxent Wildlife Research Center's (PWRC) captive sea duck facility. We used psychoacoustic techniques to train the ducks to respond to sound stimuli underwater in PWRC's dive-tanks. Trials are underway in order to obtain underwater auditory thresholds for these bycatch-sensitive species. Preliminary threshold data suggest that long-tailed ducks may have less sensitive underwater hearing than marine mammals, which are the target for most commercial pingers today. In the coming months we will gather more threshold data from our captive seaducks in order to be able to recommend appropriate specifications for seaduck targeted acoustic deterrents.

10.28: POSTER PRESENTATION**CAPTIVE RAISED GROWTH MODELS FOR SEADUCKS**

Kathleen A. McGrew², Sarah Fitzgerald, and Alicia M. Wells-Berlin

KAM, SF, AMW: USGS, Patuxent Wildlife Research Center, Laurel, MD, USA

The establishment of Patuxent Wildlife Research Center's breeding captive colony has enabled us to collect duckling growth data on multiple species of seaducks and dabbling ducks, including surf scoters (*Melanitta perspicillata*), white-winged scoters (*Melanitta fusca*), long-tailed ducks (*Clangula hyemalis*), lesser scaup (*Aythya affinis*), and harlequin ducks (*Histrionicus histrionicus*), and American black ducks (*Anas rubripes*). Daily weights and biweekly tarsus and culmen measurements were obtained on ducklings from day of hatch up to 100 days of maturity for two years, with the objective of developing models that predicted each respective species' growth trend. We preliminarily present key parameters of the Gompertz growth model, including growth rate constants, total growth, and the growth asymptote, for multiple species. Overall, seaducks had higher growth rates than dabbling ducks and larger ducks had older ages of peak growth than smaller individuals. These baseline data could be used as model growth curves of ontogenetic development and peak growth for individuals encountered in the field, allowing field biologists to use these measurements to potentially estimate age.

10.29: POSTER PRESENTATION**IDENTIFYING AREAS OF IMPORTANCE FOR SEA DUCKS THROUGHOUT THEIR ANNUAL CYCLE**

*Nic McLellan, Tim Bowman, Sean Boyd, Shannon Badzinski, Christine Lepage
Scott Gilliland, James Churchill*

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Studies supported by the North American Sea Duck Joint Venture (SDJV) partnership have helped improve our understanding of important sea duck habitats across the continent and beyond. This work has involved a variety of techniques including satellite telemetry, and new or improved waterfowl surveys. The SDJV's goal is to make information on habitat use available to decision makers and ultimately improve the conservation and management of these species. Currently, we are developing an atlas that identifies key sites for sea ducks throughout North America and documents their seasonal importance, current protection or designations, and potential threats. Our next step is to make accessible spatially explicit sea duck data through one or more existing geospatial database hosts that can be queried by interested folks, along with other environmental parameter data. We envision these products will be used to: 1) provide justification for protecting areas of importance to sea ducks, 2) improve decision making for resource development in key areas, 3) direct research investigating biotic and abiotic features that characterize sea duck habitats, and 4) predict how habitat conditions may change and potentially impact populations. In this poster we highlight some of the most important habitats/areas for sea ducks in North America.

10.30: POSTER PRESENTATION**ESTIMATING BEHAVIORAL MULTIPLIERS TO RESTING METABOLIC RATE IN AMERICAN BLACK DUCK AND LESSER SCAUP**

Jacob W. McPherson, **Christopher K. Williams**, Alicia M. Berlin, John M. Coluccy

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American black duck (*Anas rubripes*) and lesser scaup (*Aythya affinis*) populations have experienced continual declines over recent decades. Research suggests that these declines may be the result of a complex of factors including resource availability on non-breeding landscapes. In an attempt to quantify the ability of a landscape to support migrating and wintering waterfowl populations, many studies have begun using bioenergetics modeling to calculate energetic carrying capacity by estimating energy demand and energy supply. Estimates for many of the physiologic parameters required in calculating energetic demand (i.e. resting metabolic rates, time-activity budgets, etc.) have been explored, yet estimates of other critical parameters are still lacking. The objective of this project is to produce estimates of behavior specific multipliers to resting metabolic rate (RMR) in American black ducks and lesser scaup. These species were chosen as focal species due to their current population status and their representation of both the diving and dabbling duck guilds, which allows for reasonable extrapolation to additional species. We used open-flow respirometry techniques to estimate RMR and to isolate behavior specific factorial increases to RMR in captive American black ducks and lesser scaup. Respirometry trials were performed between September, 2015 and March, 2016 at Patuxent Wildlife Research Center, Laurel, MD. Results presented will provide more accurate estimates of daily energetic expenditure for these species and will ultimately contribute to refined landscape carrying capacity estimates for waterfowl during the non-breeding period.

10.31: POSTER PRESENTATION**ASSESSMENT OF BIOINDICATOR APPROACHES FOR TRACE ELEMENTS AND SUBLETHAL HEALTH EFFECTS IN SEA DUCKS BREEDING IN ARCTIC ALASKA**

Micah W.C. Miller, James R. Lovvorn, Angela C. Matz, Robert J. Taylor, Christopher J. Latty, David E. Safine, Tuula E. Hollmén

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RJT: Trace Elements Research Laboratory, Texas A&M University, College Station, TX, USA

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As industrial development, thawing permafrost, and aerial deposition of pollutants increase in the Arctic, bioindicators to monitor contaminants exposure in a range of community components are increasingly important. However, indicators are seldom compared to similar species to verify their relevance. For example, female common eiders (*Somateria mollissima*) are widely used indicators of species that use marine habitats for much or all of the year. However, they are but one of a number of related species found in the Arctic, with varying migration, diet, and body size which may influence contaminant exposure. Contaminants may induce a suite of physiological responses, but typically contaminants are regressed against single markers independently. We examined blood levels of multiple trace elements, and effects on blood-based biomarkers, in long-tailed ducks (*Clangula hyemalis*), Steller's eiders (*Polysticta stelleri*), spectacled eiders (*Somateria fischeri*), king eiders (*Somateria spectabilis*), and common eiders nesting in Arctic Alaska. We also assessed element levels in feathers of king and spectacled eiders. Blood concentrations of elements varied widely among species, and among ages and sexes within species. Comparisons among species indicate that element concentrations in blood of common eiders may yield very different toxicity and biomarker responses than in other species. For all species, concentrations in feathers ranged from ~6 to over 900 times those in blood, and did not demonstrate the same relative patterns. Future biomonitoring efforts must consider the potential variation in metals concentrations among species. Moreover, use of bioindicator species to infer concentrations and their effects in other species may not always be suitable, even in closely-related taxa.

10.32: POSTER PRESENTATION**LONG-TAILED DUCKS IN WESTERN LAKE MICHIGAN**

William P. Mueller, Bryan B. Lenz

WPM, BBL: Western Great Lakes Bird and Bat Observatory, 4970 Country Club Rd, Port Washington, WI 53074, USA

As part of a group of research entities studying pelagic waterfowl in the Great Lakes, WGLBBO observers surveyed the waters of western Lake Michigan during Phase 1 and 2 of the Great Lakes Commission's pelagic waterfowl/waterbird monitoring in 2012-2014. Our mapped data portray examples of temporal and geographic distribution of Long-tailed Ducks (LTDU) in the offshore waters of western Lake Michigan, in a zone covering survey blocks 1.6-16.0 km from shore, from Door Co. WI to the WI/IL border, plus additional observations in the 0-1.6 km zone. LTDU consistently occupy an offshore zone in deeper water and consistently further from shore than most other diving duck species, with many data records as far as 16.0 km from shore not uncommon. In both migration seasons, LTDU arrive later than most other divers, in spring have often migrated out of this zone by early April, and are replaced there by other, later-migrating species.

10.33: POSTER PRESENTATION**USING I-STAT BLOOD RESULTS TO PREDICT POST PTT IMPLANT SURVIVAL IN LONG-TAILED DUCKS AND SCOTERS**

Glenn H. Olsen¹, Anand Krishnaswamy, Michael C. Runge, Alicia M. Wells-Berlin, Dustin E. Meattley

GHO, MCR, AMW : USGS Patuxent Wildlife Research Center, golsen@usgs.gov

AK: Veterinary Medicine Student, Sri Lanka

DEM: University of Rhode Island and Biodiversity Research Institute

We obtained blood samples from Long-tailed Ducks (*Clangula hyemalis*), Surf Scoters (*Melanitta perspicillata*), and White-winged Scoters (*Melanitta fusca*), after capture and before surgically implanting the ducks with satellite transmitters (PTTs). The blood samples were immediately analyzed using an I-Stat blood analysis unit. We followed the ducks post-release until they died, the battery on the PTT died, or the signal was otherwise lost. Using a Weibull analysis of the survival data, we are seeking to determine whether any factors available on the I-Stat cartridge help predict long-term (1-2 years) post-implant survival in these three species. The I-Stat blood analysis unit is portable, battery operated, and easily taken into most field conditions where surgery would be performed to implant PTTs. Using predictive pre-surgical blood screening techniques would enable wildlife biologists and wildlife veterinarians to better choose the sea ducks to implant with satellite transmitters. Initial results with a small sample of ducks suggest that the heterophil to eosinophil ratio is a weak predictor of long-term survival, but none of the I-Stat metrics showed a significant effect.

Mention of commercial products does not imply US Government endorsement.

10.34: POSTER PRESENTATION

LONG-TAILED DUCK AND SCOTER HEMATOLOGY AND SERUM CHEMISTRY

Glenn H. Olsen², *Alicia M. Wells-Berlin, Sara E. Crowell, Kathleen A. McGrew*

GHO, AMW, SEC, KAM: USGS Patuxent Wildlife Research Center, Laurel, Maryland,
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Starting in 2006 as part of Sea Duck Joint Venture and Bureau of Ocean and Energy Management Projects, we collected blood from healthy surf scoters (*Melanitta perspicillata*), black scoters (*Melanitta americana*), white-winged scoters (*Melanitta fusca*), and long-tailed ducks (*Clangula hyemalis*) being banded and receiving satellite transmitter implants. We report the clinical blood results including white blood cell counts, red blood cell counts, hematocrits, and serum chemistry results, creating baseline results for each species.

10.35: POSTER PRESENTATION**VISUALIZING POPULATION DELINEATION AMONG NORTH AMERICAN SEA DUCKS: MAPS FOR FUTURE RESEARCH AND MANAGEMENT PLANNING**

John Pearce, Mary Whalen, and Josh Stiller

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JS: New York State Department of Environmental Conservation, 625 Broadway, Albany, New York, 12233, USA

Most sea duck species remained poorly-studied up until the mid-twentieth century and population declines were noted in many species beginning in the 1990s. In 1998, the North American Sea Duck Joint Venture (SDJV) was established to promote “the conservation of all North American sea ducks through partnerships by providing greater knowledge and understanding for effective management.” A priority of the SDJV has been to complete assessments of migratory connectivity to inform population delineation of sea duck species across North America. The U.S. Geological Survey (USGS) has participated on the Continental Technical Team and Management Board of the SDJV since its inception, and provides scientific information relevant to the mission and priorities of the SDJV. Continuing with that goal, here we provide an update on the status of current knowledge regarding geographic distribution, migratory connectivity, and population delineation of sea duck species in North America. We provide maps of all known band recovery, genetic, and telemetry data across the North American range of sea duck species and visually assess evidence for population delineation at the continental scale. Results from this exercise demonstrate consistency across different marker data sets in continental levels of population delineation for several species, a lack of basic information on population delineation for others, and evidence for where future research dollars would most efficiently be directed to enable hypothesis-driven research that addresses knowledge gaps.

10.36: POSTER PRESENTATION**ANNUAL FACTORS AFFECTING THE WINTERING DISTRIBUTION OF BLACK SCOTERS**

Hannah M. Plumpton*, Emily D. Silverman, Beth E. Ross

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EDS: U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Laurel, MD, USA

Along the Atlantic coast of the United States there has been an increase in human activity. These activities include energy production, sand mining, aquaculture, shipping, and coastal development that all have the potential to greatly impact sea ducks throughout their migratory cycle. Of the sea ducks wintering along the Atlantic coast the black scoter (*Melanitta americana*) has the largest and most variable range, encountering the effects of global change throughout migration. To better quantify the abundance and wintering distribution of black scoters and other sea ducks, the U.S. Fish and Wildlife Service conducted aerial surveys from 2009-2012 along the Atlantic coast. The initial results show that the core wintering areas used by black scoters varied each year and that black scoters could be found as far north as the U.S.-Canada border and as far south as the Georgia coast. We build on this work to further describe the species distribution during winter and assess the factors affecting their annual distribution using the data from the U.S. Fish and Wildlife Service winter surveys. We discuss and identify several key habitat variables including the ocean depth, substrate type, and the interpolated surface of slope. This study will increase knowledge on the wintering ecology of black scoters and aid in the development of future aerial surveys to better quantify abundance, as well as identifying areas of potential overlap with energy development.

10.37: POSTER PRESENTATION**FORAGING DIVE TIMES OF DIVING DUCKS IN A FRESHWATER LAKE**

Carrick M. Rice**, Philipp N. Maleko, Tracey Rice, and Luke J. Matthews

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PNM, TR, and LJM: Department of Wildlife, Fish, and Conservation Biology, University of California, Davis, CA, USA

Behavioral observations of wildlife can offer valuable information about species' life histories and ecological interactions. Due to the fact that waterfowl from both the Aythyini and Mergini forage by diving, investigating factors relating to dive duration could offer valuable insight into how this shared behavior differs among groups of ducks. Members of both of these tribes winter and forage at Lake Solano in the Central Valley of California. Observation of their foraging behavior was undertaken during the winter of 2016 to assess inter- and intra-specific differences, as well as to determine the influence of local environmental factors. Dive durations were recorded for individuals of each species present at the study site. Also noted for each dive was the gender of the individual, the location along the lake (water depth), the time of day, and whether or not the dive was synchronous with other individuals. Data was collected for seven species: five Mergini (*Bucephala albeola*, *B. clangula*, *B. islandica*, *Mergus merganser* and *Lophodytes cucullatus*) and two Aythyini (*Aythya collaris* and *A. affinis*). Results showed a correlation between species and dive times, as well as water depth and time of day. While these data are not conclusive owing to the small sample size and limited spacial scale, they suggest that future studies could focus on determining which factors are most influential on dive duration in a larger system.

10.38: POSTER PRESENTATION**TIMING, DURATION, AND PATHWAYS OF HARLEQUIN DUCK MIGRATION TO PACIFIC MOLTING AND WINTERING AREAS**

Sean Boyd, Beth MacCallum, Malcolm McAdie, Lisa Bate, Chris Hammond, Matt Wilson, Joseph Evenson, Susan Patla, **Lucas Savoy**

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The core breeding range for Harlequin Ducks (*Histrionicus histrionicus*) in western North America extends from Alaska, south through the Yukon, Northwest Territories, and British Columbia. Smaller, breeding populations exist in southwestern Alberta and the northwestern US and include areas of Washington, Idaho, Wyoming, and Montana. Each state and province has identified the Harlequin Duck as a species of conservation priority, given their small and isolated populations and specific nesting requirements for pristine mountain-streams. Conservation objectives for these areas have all identified the importance of mapping migration routes that connect breeding sites to Pacific coast molting and wintering locations, as well as determining migration timing, duration, habitat use, and stopover sites. In spring 2016, we captured Harlequin Duck pairs on breeding streams and surgically implanted satellite transmitters in the males and attached geolocators to the leg bands of females. We marked a total of 18 male harlequins (Alberta = 10, Montana = 5, Wyoming = 2, Washington = 1) and 17 females (Alberta = 8, Montana = 5, Wyoming = 2, Washington = 2). One Montana male was presumably predated shortly after capture; so 17 males successfully migrated from their breeding streams to their Pacific coast molting locations. Migration initiation dates for the 17 marked males varied by breeding areas and occurred between June 03 –July 10. Individual male migration lasted between 1-17 days and stopover sites were approximately half-way to the coast and included rivers, mountain streams and lakes. The males arrived at their molting areas between June 05-July 24 and these areas ranged from southeast Alaska to northwestern Washington. Satellite transmitters are programmed to provide location data until July 2017 so this will allow us to map their winter sites once they have completed molting. Efforts will be made to retrieve the geolocators from females in spring 2017.

10..39: POSTER PRESENTATION**CONTAMINANT CONCENTRATIONS IN THE ENDANGERED SCALY-SIDED MERGANSER FROM RUSSIA**

Diana V. Solovyeva, Lucas Savoy, Oksana Lane, Sergey L. Vartanayan, Christopher Perkins, and Kevin Regan

The Scaly-sided Merganser (*Mergus squamatus*) is a highly endangered sea duck, and breeding exclusively in isolated areas in Far-East Russia, China, and Korea. The Scaly-sided Merganser's breeding habitat consists of freshwater rivers within wooded mountainous regions. Nesting occurs in natural tree cavities or artificial nest boxes erected near the river's edge. Post-breeding, the Scaly-sided Merganser migrates to wintering locations, consisting of river, pond, and ocean areas of central China and primarily in the Yangtze River Basin. In recent decades, this region has become highly polluted from rapidly increasing industrial development and agricultural runoff. From 2012-2015, we collected un-hatched or abandoned eggs, whole blood and feathers from breeding female Scaly-sided Mergansers in Russia. We also collected feathers from molting male mergansers in Primorye, Far East Russia. Samples were delivered to the United States for trace element and heavy metal analyses to determine contaminant exposure to the Scaly-sided Merganser. We analyzed a total of 53 samples for nine different contaminants and included: silver (Ag), Arsenic (As), cadmium (Cd), chromium (Cr), mercury (Hg), nickel (Ni), lead (Pb), selenium (Se), zinc (Zn). We compared results to published sea duck contaminant studies worldwide. The majority of the contaminants contained concentrations similar to those reported for other sea duck species, and considered non-harmful background levels. However, Hg and Cr frequently exceeded concentrations noted in other sea duck studies and may contain concentrations of concern for the Scaly-sided Merganser. We present the first Scaly-sided Merganser contaminant data and compare our findings to concentrations reported for several sea duck species worldwide.

10.40: POSTER PRESENTATION**SURVIVAL RATE OF SPECTACLED EIDERS ON AYOPECHAN ISLAND, CHUKOTKA, RUSSIA**

Vera Y. Kokhanova and Diana V. Solovyeva

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Demography of Spectacled Eiders (*Somateria fischeri*) was investigated during 2002 – 2015, with breaks in 2006 and in 2014, on Ayopechan Island, Chaun Delta, Chukotka, Russia. 52 square nest search plots (1 km² each) set up in 2003 but these were reduced to 40 in 2007 as unsuitable plots were removed. At least 40 plots were in use annually after 2007. All active and depredated nests were recorded. All active nests were revisited in 10-day interval. We used water test for determined stages of incubation and captured females at their nests 0 to 5 days prior to predict hatch date using mechanical or automatic bow-trap, or a small net. In addition to nesting females we captured non of failure breeding females with mist-nets on their feeding lakes. Females were marked with Moscow standard bands and engraved plastic bands with alfa-numeric code. A total 135 adult females were marked between 2002 and 2015 and 22 ducklings were banded between 2003 and 2004. Females were resighted during nesting in the years following banding year by capturing or by use of camera-traps. Forty two females were recaptured in subsequent years. Comrack-Jolly-Seber maximum likelihood approach was used to estimate annual survival (ϕ) and resighting probabilities (p) from mark-resight data. Based on data, which were collected during field study on Ayopechan Island, we estimated recapture probabilities, median age of first reproduction, natal and breeding site fidelity of Spectacled Eider females.

10.41: POSTER PRESENTATION**WINTER DIVING ACTIVITY OF SPECTACLED EIDER *SOMATERIA FISCHERI* AS REVEALED BY PRESSURE TAG*****Diana V. Solovyeva***

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Four females Spectacled Eiders were equipped with pressure tags with three tags by Cefas Co, United Kingdom, and one tag by Lotek Co, Canada. Females were trapped at their nests in Chaun-Delta, Chukotka, Russia, in June 2010 and June 2012. Only females which showed site-fidelity to the same nest site were selected for tag deployment. Two females were recaptured after two years of tag wearing. One more female was recaptured after 3 years but tag wasn't retrieved. Among two tags retrieved one was recording diving depth and temperatures for 5 days between 1 and 5 of November 2010. Second tag was injected salt water and didn't provide a record. Diving tag recorded pressure and temperature data in one minute interval. Maximal diving depth averaged 43.05 m. Diving sessions timing and duration, dive and pause duration are discussed.

10.42: POSTER PRESENTATION**COAST TO COAST: ASSESSING MIGRATORY CONNECTIVITY OF NORTH AMERICAN SCOTERS**

Sarah A. Sonsthagen, Robert E. Wilson, Philip Lavretsky, and John M. Pearce

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Understanding how populations of migratory species are geographically linked throughout the annual cycle (i.e. migratory connectivity) is fundamental to understanding the genetic and demographic structure of populations, as well as where and when conservation measures should be implemented. Among North American seaducks, assessing connectivity is challenging as species have large distributions, varied migratory strategies and dispersal propensities. Many seaduck species exhibit some level of breeding and wintering site fidelity; though unless seasonal fidelity is accompanied by philopatry, it does not result in breeding population structure as young birds disperse among regions linking demographic parameters. Although scoters have similar life history characteristics, patterns in their breeding and wintering distributions are species-specific (based on banding and telemetry data), potentially influencing the degree of migratory connectivity. Black Scoters are highly segregated (east and west coast); coincident with their discontinuous breeding distribution. Surf Scoters have a continuous breeding distribution with limited overlap between eastern and western segments in winter. Despite a disjunct breeding distribution, White-winged Scoters are likely highly admixed in winter due to movement of central region birds to both coasts. Species, such as the scoters, with limited detailed data on migratory and dispersal patterns, genetic data can provide much needed insight into population connectivity and delineation. We used genome-wide scans (i.e., RadSeq) to assess population genetic structure of the three North American scoter species across four regions (Alaska, Pacific, Central, and Atlantic). This method allowed us to scan larger portions of the genome (> 3000 loci) than past efforts, enhancing our ability to uncover shallow genetic divergence (a general characteristic of high-latitude species) and detect loci promoting divergence among geographic regions. These data will provide additional information on where (or if) demographic breaks as evidenced by restricted dispersal among regions are occurring and aid managers in delineating populations.

10.43: POSTER PRESENTATION**A REVIEW OF SEA DUCK HARVEST IN WASHINGTON STATE: MONITORING HUNTER PARTICIPATION AND HARVEST TRENDS**

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Substantial waterfowl populations in the Pacific Flyway over the last 15 years have allowed for liberal seasons and bag limits. Current regulations are among the most liberal ever offered in Washington and beginning with the 2014-15 season hunters could retain three times the daily bag in their possession for most waterfowl. The 2015-16 waterfowl harvest was regulated under Washington State regulations following federal framework recommendations and allowed the maximum (107 days) number of days under the Migratory Bird Treaty Act; by which, Washington's season length was 105 days statewide with two additional days for the statewide Youth Hunt. The daily bag-limit was 7 ducks, but Washington State elected to further restrict sea duck harvest to include not more than 1 harlequin (season limit), 2 scoter, 2 long-tailed duck, and 2 goldeneye in western Washington due to concerns over low recruitment in sea ducks and the potential for small harvest to be focused on a disproportionately high concentration of certain species relative to the rest of the Pacific Flyway winter distribution. Because statewide surveys are not accurate enough to measure harvest of several priority waterfowl species, special surveys have been developed that utilize written hunting authorizations and mandatory reporting. The sea duck (harlequin, scoter and long-tailed duck), brant, and snow goose harvest is estimated annually using a mandatory harvest report card for each species. Written authorization and harvest reports have been required of sea duck hunters in all of western Washington since 2004. The harvest survey indicated a total harvest of 737 scoters, 103 long-tailed ducks, 88 harlequin ducks and 451 goldeneyes. The reported goldeneye harvest included 60% common goldeneye. From 2,113 authorizations, an estimated 632 hunters were successful and hunted a total of 1,810 days. Primary harvest areas included Island, Mason, Skagit, Clallam, Pierce, and Whatcom counties. Patterns in harvest are consistent with distributional patterns detected during extensive annual aerial survey efforts of the Puget Sound region. Since adoption of the 2004 mandatory harvest card reporting requirement, harvest of the primary species, surf scoter, has been reduced by more than 50%, but some level of harvest has been maintained on the seven species of sea duck commonly sought after by the state's waterfowling community.

10.44: POSTER PRESENTATION**NEST ATTENDANCE PATTERNS OF COMMON EIDERS AT WAPUSK NATIONAL PARK IN NORTHERN MANITOBA**

Tanner J. Stechmann, David T. Iles, Andrew F. Barnas, Samuel D. Hervey, Robert F. Rockwell, and Susan N. Ellis-Felege

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Common eiders (*Somateria mollissima*) have been well studied because of their value to the down industry. However, little data is available regarding detailed nesting behaviors in areas where down is not commercially harvested. Nesting behaviors of incubating hens can be reflective of changing environmental conditions important to reproductive success. The objective of this study was to explore factors influencing nest attendance patterns of female common eiders breeding along the western Hudson Bay in Wapusk National Park, Manitoba, Canada. During 2014-2016 nests were located using systematic searches, and eggs were candled to determine incubation stage. Time-lapse photography was used to monitor a subset of common eider nests within the colony. Cameras were left at the nest until hatch or failure, and photographs were reviewed to record female attendance patterns. We examined the influence of covariates including nest location within the colony and incubation stage on the number and duration of daily recess events and overall incubation constancy. Preliminary results from 2014-2015 show female eiders took 2 recesses per day, each lasting an average of 29 minutes. Females spent approximately 97% of their time incubating which decreased slightly as incubation age progressed. We found little variation in incubation constancy regardless of distance to center of the colony or proximity to nearest neighboring nest. Changes in recess number and duration may indicate shifts in resource availability to eiders in this colony prior to breeding and may play a role in observed annual variation of reproductive success and overall colony dynamics.

10.45: POSTER PRESENTATION**THE ENERGETIC COSTS AND REPRODUCTIVE BENEFITS OF MATE GUARDING IN A DIVING SEADUCK**

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Reproduction is an energetically demanding life history stage, with males and females exhibiting different types of costs. In species with female-based, mono-parental care, male reproductive investment often comes in the form of mate or territorial defense, which can often impact the reproductive success of their mate. Although there are substantial energetic costs predicted to be associated with mate guarding in the pre-breeding period, the mechanisms regulating energetics at this stage, and the mechanisms linking male condition to female reproductive success, are currently poorly understood. Common eiders nesting at East Bay Island are a model species to explore the relationship between male and female state because of both members of each pair are captured simultaneously during the pre-breeding period. Male eiders are expected to decline in condition during the pre-breeding period compared to an increasing condition of their paired female because males must expend significant amounts of energy defending their mate from extra-pair copulations or defending her foraging territory. Consequently, there will be an increasing disparity in relative state across the pre-breeding period as male condition declines. Here we examine whether variation in male energetic physiology (corticosterone, triglycerides, beta-hydroxybutyrate, non-esterified fatty acids and immunoglobulin Y) is able to predict the subsequent condition of their paired female, and by extension her subsequent breeding decisions (likelihood of breeding). We hypothesize that males in lower relative condition — with higher baseline corticosterone and beta-hydroxybutyrate, and lower triglycerides, non-esterified fatty acids, and immunoglobulin Y — may ultimately benefit via their females laying earlier and successfully breeding. These results will be important in explaining indirect drivers of reproductive timing and success in Arctic-nesting common eiders, and identifying mechanisms underlying sex-specific, reproductive trade-offs.

10.46: POSTER PRESENTATION**ASSESSING HUNTING SUSTAINABILITY IN A DECLINING FLYWAY POPULATION OF COMMON EIDERS *Somateria mollissima***

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For harvested species, management decisions have the power to greatly influence population dynamics. Therefore, managers must ensure that harvest is well balanced and does not remove more than a sustainable population surplus. Ideally, this assessment should investigate how much hunting harvest contributes to total mortality and ultimately how it affects population dynamics. We constructed ring-recovery and ring-recapture-recovery multistate models which account for cause-specific reporting probabilities to estimate unbiased proportions of the Baltic/Wadden Sea population of the Common Eider *Somateria mollissima* dying due to 1) hunting and 2) other causes. We first used a ring-recovery model and life histories of > 18.000 Eiders ringed at ten study sites to estimate annual proportions of adult female Eiders dying due to hunting (α_h) during 1971-2014. By means of a ring-recapture-recovery analytical framework we also estimated the proportion of ducklings (and adult females) dying due to hunting at two sites. We then extracted means of all available demographic data and specified population projection models that allowed us to investigate the effect of past and present hunting regulations on changes in population size at the flyway level. To account for uncertainties in flyway population size estimates, depending on the type of census, we modelled two scenarios. Our results indicate that even under a best case scenario a complete ban on shooting fecund females is not enough to stop the observed decline, because of increases in natural mortality of both adult females and immatures over the last 2 decades. Although, levels of natural mortality must decrease in order to fully halt the decline of the Baltic/Wadden Sea flyway population, we advocate to maintain and extent the current ban on hunting females to also apply to immature male age classes.

10.47: POSTER PRESENTATION**A SURVEY OF SEA DUCK PREY ITEMS ACROSS FOUR SITES ON THE YUKON-KUSKOKWIM DELTA, ALASKA**

Sadie E.G. Ulman, Elizabeth A. Ruffman, and Tuula E. Hollmén

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The Yukon-Kuskokwim Delta is a globally important area for wildlife, and supports a high biodiversity and abundance of migrating and nesting marine birds and waterfowl. Changes in the environment due to climate change affect wetland ecology in this region. The objective of this project is to identify potential diet items for ground nesting waterfowl across coastal areas in the central Yukon-Kuskokwim Delta, and support planning for potential Steller's eider (*Polysticta stelleri*) reintroduction efforts. In 2014 and 2015, four wetland sites were selected and sampled including Kigigak Island and three sites along the Kashunuk river system, representing a gradient of locations from close to shore to 13 miles inland. Ponds were randomly selected within a 1km radius of each of four established sites, with additional criteria of >500 m from same community type and >100 m from border of an adjacent community type. Two benthic samples (125 ml) were collected from each pond using a 0.5L Van Veen grab. Samples were cleaned, stained with Rose Bengal to identify seeds and invertebrates, separated, identified to family or species when possible, and dried and weighed to obtain dry weight. In 2014, 67 ponds were sampled, and in 2015 an additional 16 ponds were added. One hundred and fifty samples were processed and from those, 47 total potential diet items (35 invertebrates and 12 seeds) were found. Mean biomass (g/ml) was summarized for each item across the four sites and years. Across all pond samples in 2014, invertebrates with highest biomass (g/ml) included: Gastropoda, Chironomidae, Cladocera, Ostracoda, and Copepoda, and in 2015 Hydrozetes, Isopoda, Ostracoda, Chironomidae, and Gastropoda. In both years, the seeds with highest mean biomass (g/ml) in ponds were *Carex* species, *Hippuris* species, *Potamogeton* species, *Empetrum* species and an unknown seed species. This assessment provides information on prey biodiversity and biomass available during the waterfowl brood rearing period in locations on coastal Yukon-Kuskokwim Delta.

10.48: POSTER PRESENTATION**BREEDING AND MIGRATION DELINEATION OF SURF SCOTERS WINTERING IN SOUTHEAST ALASKA**

David H. Ward, Corey S. VanStratt, Daniel Esler, Katherine M. Brodhead, and Brian D. Uher-Koch

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Declines in sea duck populations have highlighted the need for additional basic research across the life cycle of these long-distance migratory birds. A lack of basic ecological information on Surf Scoters (*Melanitta perspicillata*), including the linkage between wintering and breeding areas is a major impediment to determining factors contributing to their decline. Therefore we marked Surf Scoters with satellite transmitters near Juneau, Alaska in 2008-2010 to describe their nesting location in the boreal forest and migration chronology and locations during fall and spring. Surf Scoters initiated spring migration in late April and early May, staged on lakes of the south central Yukon in mid May and reached the nesting grounds of Great Slave Lake and northern Yukon in late May. After breeding, some birds migrated west along the Arctic coast of Alaska and staged in Norton Sound and Bristol Bay, Alaska between July and September, while others retraced their spring migration southward to winter in southeast Alaska and Washington.

10.49: POSTER PRESENTATION**WHAT'S EATING COMMON EIDER EGGS? NEST CAMERAS TELL THE REAL STORY**

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Nest predation is a significant limiting factor to the reproductive success of Pacific common eiders (*Somateria mollissima v-nigrum*, COEI). COEIs nesting on barrier islands and spits in the Beaufort Sea may be at increased risk of predation due to changes in predator densities and distributions. Examples include reported increases of red fox (*Vulpes vulpes*) and polar bears (*Ursus maritimus*) on the coast during the nesting period. Observational studies of individual nesting colonies have identified arctic foxes (*Vulpes lagopus*) and glaucous gulls (*Larus hyperboreus*) as primary nest predators, but data on predator impacts at a larger scale is limited. Determination of nest predators at dispersed nest sites is traditionally accomplished by evaluating evidence left at the nest. However this method has been criticized for being subjective. Using quantitative analysis to evaluate predator evidence has been proposed as a more objective method and relies on development of predator-evidence profiles from observed depredation events. During June-July 2015 and 2016, we placed time-lapse cameras at approximately 150 COEI nest sites to record causes of nest fate. Glaucous gulls, arctic foxes, polar bears, grizzly bears (*Ursus arctos*), and golden eagles (*Aquila chrysaetos*), were the most common nest predators. In 2016, we also used both traditional and quantitative methods for evaluating evidence of nest predators and compared results to observations from time-lapse camera footage. Preliminary findings suggest that both the traditional and quantitative methods are unreliable for determining nest predators on the barrier islands. Flooding events, wind erosion, and multiple predators at individual nests lead to ambiguous or unclear evidence of nest fate.

10.50: POSTER PRESENTATION**AERIAL SURVEY DETECTION FOR SPECTACLED EIDERS AND OTHER WATERBIRDS ON THE ARCTIC COASTAL PLAIN OF ALASKA**

Heather M. Wilson, Robert A. Stehn, William W. Larned, Tamara K. Zeller, and Robert T. Platte

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We estimated detection probability of spectacled eiders and other waterbird species on aerial transect surveys flown on the Arctic Coastal Plain, Alaska. Our primary goal was to adjust the population index towards a less-biased population estimate in order to better measure recovery criteria for the threatened spectacled eider. A secondary goal was to determine relative detection rates for all large waterbirds on the Arctic Coastal Plain, and identify important sources of variation in perception bias. We conducted aerial surveys in early June 2015 and 2016 using fixed-wing aircraft with independent, simultaneous observations by front and rear-seat observers; aka the double-observer technique. We reconciled matched-sightings of front- and rear-seat observations post-hoc, using time of observation as the primary matching criteria. We analyzed over 5000 sightings of more than 20 species, including 5 sea duck species: king, spectacled, and common eiders, long-tailed ducks, and white-winged scoters. Using RMARK, we examined a suite of mark-resight models of detection probability relative to species, species group, crew, day, group size, and year. Support was highest for models with differences in detection between species type (e.g., swan, loon, eider, goose, gull, duck), group size (singles, pairs, small and medium flocks), and observer crew (front and back seat observer pairings). Average front-observer detection rates ranged from 40-50% in ducks, 50-60% in gulls, and 60-70+% in swans, loons, eiders, and geese. Our results provide visibility detection estimates for adjustment of aerial survey indices to population estimates, while also elucidating the influence of important covariates. Admittedly, our estimated detection rates are maximum values, as the methods we employed only correct for elements of perception bias, not availability bias.

10.51: POSTER PRESENTATION**KODIAK ISLAND COOPERATIVE BARROW'S GOLDENEYE NEST BOX PROJECT**

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In 2010, a project was initiated to provide nesting habitat and collect basic productivity information for Barrow's goldeneye (*Bucephala islandica*) by placing nest boxes on lakes along the Kodiak road system and in a remote area, Karluk Lake. The number of nest boxes available for use varied in road system (range 22-26) and remote locations (range 20-21) with an annual project average of 45 boxes available from 2010-2016. This cooperative effort is supported by the Alaska Department of Fish and Game, Kodiak National Wildlife Refuge, Lesnoi Corporation, Koniag Corporation, U.S. Coast Guard - Integrated Support Command Kodiak, and private individuals. Annual box occupancy rates by goldeneye ranged from 19% in 2011 to 45% in 2016 with a mean occupancy of 33% over the period. Barrow's goldeneyes using project boxes had an estimated average clutch size ranging from 5.9 eggs in 2011 to 9.3 eggs in 2016 with a mean of 7.6 eggs/clutch for project boxes to date. Estimated nest box mean hatching success for known outcome clutches (N = 86) was 84% and ranged from 62% in 2014 to 96% in 2012. Unhatched eggs (N = 75) from abandoned clutches (N = 1) and non-incubated "dump" clutches (N = 8) accounted for 63% of all unhatched nest box eggs (N = 120). Road system nest boxes located on lakes <10 hectares in size have had the majority of use by goldeneye to date. Four road system nest boxes, (1 box - 2014; 3 boxes - 2016) were used by common mergansers (*Mergus merganser*) and had a 97% hatching success of an average clutch of 8.3 eggs per box. Red squirrels (*Tamiasciurus hudsonicus*) have dominated occupancy of road system boxes located on lakes >10 hectares. Project nest boxes have produced over 550 Barrow's goldeneye young since 2011.