TUESDAY, 7 FEBRUARY 2017

07:30 - 08:30		*Breakfast, Grand Ballroom, upstairs @ Corinthian Yacht Club*	
08:30 - 08:45		Fritz Reid	**WELCOME TO SAN FRANCISCO 2017**
		Scott McWilliams	**INTRODUCTION TO THE SCIENCE PROGRAM**
8:45		Margaret Peterson **Plenary** Paul L. Flint	**POPULATION ECOLOGY OF SEA DUCKS: WHAT DEFINES THE POPULATION "BUS," WHO'S DRIVING IT, AND WHERE'S IT GOING?**
09:45 - 10:15		*Coffee break*	
10:15 - 12:00	**1.0**	**SPECIAL SESSION: PLANNING RESTORATION OF SEA DUCK POPULATIONS INJURED IN COASTAL OIL SPILLS**	
10:15	1.1	Carolyn Marn & Susan De La Cruz	**INTRODUCTION TO THE SESSION, *Carolyn Marn and Susan De La Cruz***
10:35	1.2	Dan Esler	**SEA DUCK TRAITS: THEIR INFLUENCE ON OIL SPILL VULNERABILITY AND RESTORATION POTENTIAL, *Dan Esler***
10:50	1.3	Stuart Slattery	**CHALLENGES AND OPPORTUNITIES IN THE WESTERN BOREAL FOREST FOR RESTORING DAMAGED SEA DUCK POPULATIONS *, Stuart Slattery***
11:05	1.4	Abby Powell	**THE CHALLENGES RESTORING POPULATIONS OF ARCTIC-BREEDING EIDERS, *Abby Powell***
11:20	1.5	Ramunas Zydelis	**EUROPEAN PERSPECTIVES ON RESTORATION AND RECOVERY OF SEA DUCK POPULATIONS, *Ramunas Zydelis***
11:35	1.6	*Discussion*	
12:00 - 12:30		*Lunch @ Grand Ballroom, upstairs, Corinthian Yacht Club - Included in registration*	
12:30 - 13:30		**PANEL DISCUSSION: PLANNING RESTORATION OF SEA DUCK POPULATIONS INJURED IN COASTAL OIL SPILLS** *Panelists: Dan Esler, Ramunas Zydelis, Stu Slattery, Abby Powell, Carolyn Marn, Susan De La Cruz*	
13:30 - 15:15	**2.0**	**POPULATION ECOLOGY & TRENDS** Session chair: Dana Kellett	
13:30	2.1	Andre Breault	**USING GIS TOOLS TO MAP SEADUCK DISTRIBUTION IN BRITISH COLUMBIA, *Andre M. Breault****, Bruce Harrison, and Darryl W. Kroeker*
13:45	2.2	Kylee Dunham*	**POPULATION DYNAMICS OF ALASKAN BREEDING STELLER'S EIDERS, *Kylee D. Dunham**** *and James B. Grand*
14:00	2.3	Leigh Fredrickson	**FIFTY YEARS OF OBSERVATIONS ON HOODED MERGANSERS FROM A SOUTHERN SWAMP POPULATION, *Leigh H. Fredrickson*** *and Peter Blums*
14:15	2.4	Sean Boyd	**SURVIVAL RATES OF HARLEQUIN DUCKS IN THE SALISH SEA, BRITISH COLUMBIA, AND THE EFFECTS OF CLIMATE AND FOOD*, W. Sean Boyd,*** *Scott Wilson, Greg Robertson, Ian Goudie, and Connie Smith*
14:30	2.5	Eric Reed	**POPULATION TRENDS IN PACIFIC COMMON EIDERS IN RELATION TO ANNUAL VARIATION IN ICE BREAK-UP OVER A 20-YEAR PERIOD, *Eric T. Reed,*** *Cindy Wood, Danica Hogan, Christian Roy, Myra Robertson, and D. Lynne Dickson*

14:45	2.6	Dana Kellett	**APPARENT SURVIVAL OF ADULT FEMALE KING EIDERS WINTERING IN EASTERN AND WESTERN NORTH AMERICA,** ***Dana K. Kellett*** *and Ray T. Alisauskas*
15:00	2.7	*Break early*	
15:15 - 15:45		*Coffee break*	
15:45 - 17:15	**3.0**	**PATTERNS OF DISTRIBUTION & ABUNDANCE** Session chair: Kjell Larsson	
15:45	3.1	Joseph Evenson	**NOCTURNAL SPACE USE BY SURF SCOTERS (*MELANITTA PERSPICILLATA*) AND CRUDE OIL SPILL RESPONSE PLANNING IN THE SALISH SEA,** *Lindsey Hamilton,* ***Joseph R. Evenson****, and Dina Roberts*
16:00	3.2	Vasiliy Baranyuk	**EIDERS OF WRANGEL ISLAND, RUSSIA,** ***Vasiliy V. Baranyuk***
16:15	3.3	Jeffrey Ball	**DISTRIBUTION AND ABUNDANCE OF SEA DUCKS ALONG THE HUDSON BAY COAST OF NORTHERN MANITOBA***,* ***Jeffrey R. Ball****, Frank B. Baldwin, Chris E. Smith, Stuart M. Slattery*
16:30	3.4	Scott Gilliland	**SOME HYPOTHESES BEHIND AN APPARENTLY COLLAPSING POPULATION OF COMMON EIDERS IN SW NEW BRUNSWICK,** ***Scott G. Gilliland****, Ray T. Alisauskas, Shawn M.C. Robinson, F. Patrick Kehoe, K. Conner, Peter W. Hicklin and C. Davison Ankney*
16:45	3.5	Kjell Larsson	**REPRODUCTIVE SUCCESS OF LONG-TAILED DUCKS WINTERING IN THE BALTIC SEA,** ***Kjell Larsson***
17:00		*Dinner, on your own*	
17:30 - 20:30		**WORKSHOP: LONG-TAILED DUCKS,** *Spinnaker Room @ Lodge at Tiburon*	
19:30 - 22:30		**POSTER SESSION,** *Main Sail Ballroom @ Lodge at Tiburon* *Light food and beer*	

2.1: POPULATION ECOLOGY & TRENDS

USING GIS TOOLS TO MAP SEA DUCK DISTRIBUTION IN THE BRITISH COLUMBIA

Andre M. Breault, *Bruce Harrison, and Darryl W. Kroeker*

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A landscape-level aerial survey of breeding waterfowl has been conducted annually from 2006 to 2016 in Central British Columbia. Approximately 3,000 geo-referenced duck sightings are collected each year using techniques outlined in the continental *Waterfowl Breeding Population and Habitat Survey.* Although the primary goal of the survey is to estimate population trends, we used GIS techniques to provide concise and powerful summaries of species abundance and distribution and how these change over time, at multiple spatial scales. This study reports on Barrow's Goldeneye, Bufflehead and Hooded Merganser at 3 different scales: the Interior B.C. (11 million ha), ecological units (ranging in size from 0.6 to 2 million ha, n = 8) and standardized 16x16 km squares (n = 468). Our results highlight differences in abundance and distribution at the three scales. This non-traditional reporting of population survey results aims at addressing environmental assessment and land use planning needs while paving the way for the web release of the data. Landscape-level GIS analyses also support the development of habitat-species and/or climate change models and guide habitat delivery for the Canadian Intermountain Joint Venture.

2.2: **POPULATION ECOLOGY & TRENDS**

POPULATION DYNAMICS OF ALASKAN BREEDING STELLER'S EIDERS

Kylee D. Dunham *and James B. Grand*

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The Alaskan breeding population of Steller's eiders *(Polysticta stelleri*) was listed as threatened under the Endangered Species Act in 1997 in response to perceived declines in abundance throughout their breeding and nesting range. Aerial surveys suggest the breeding population is small and breeds in highly variable numbers, with zero birds counted in 5 of the last 25 years. The primary objective of this research is to evaluate competing population process models of Alaskan-breeding Steller's eiders through comparison of model projections to aerial survey data. To evaluate model efficacy and estimate demographic parameters, we used a Bayesian state-space modelling framework and fit each model to counts from the annual aerial surveys using sequential importance sampling/resampling. The results strongly support that the Alaskan breeding population experiences population level non-breeding events, and is open to exchange with the larger Russian-Pacific breeding population. We estimated population viability using the open model with immigration and non-breeding, and a closed model to address beliefs of population closure. Closed model projections suggest this population has a 100% probability of extinction within 42 years. Projections from the open population model suggest that with immigration there is no probability of permanent extinction if the larger Russian population persists. Due to random immigration process and non-breeding behavior it is likely that this population will continue to be present in low and highly variable numbers on the breeding grounds in Alaska. However, monitoring the winter population, which contains both Russian and Alaskan breeding birds, may offer a more comprehensive indication of population viability.

2.3: POPULATION ECOLOGY & TRENDS

FIFTY YEARS OF OBSERVATIONS ON HOODED MERGANSERS FROM A SOUTHERN SWAMP

Leigh H Fredrickson *and Peter Blums*

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Nesting hooded mergansers were first studied intensively beginning in 1962 in SE Missouri by banding nesting females and web-tagging newly hatched ducklings. The study shifted to the use of plasticine- filled leg bands in 1998 and continued through 1915. Plasticine bands enhanced information on homing, dispersal, and nesting behavior. The species is exceptionally secretive and only one brood has been observed in 54 years within this forested habitat. Males and females return to the swamp in November and remain throughout the winter when open water is available or return when wetlands are ice free. Males leave to move north before or soon after egg laying is complete. Nesting females depart northward after nest failure or with completion of brood rearing. Yearling females return and practice nesting skills following completion of active nesting by adults. Hooded mergansers select nest sites where boxes are over water or immediately adjacent to water. Eggs are laid at a rate of one egg every 1.5 days. Feces of hooded mergansers is more fluid than feces of wood ducks and is dominated by two colors, a coarse red solution suggesting a crayfish diet and a more viscous black foul smelling form suggesting fish consumption. About 2/3 of the population primarily feeds on crayfish based on red fecal material. Merganser homing is less precise than wood ducks with local movements among years of eight or more miles. Merganser nest box use has gradually increased from about 10% to 30% of box use from the 1960s to recent years. Hooded mergansers have conspecific and interspecific (with wood ducks) brood parasitism. Wood duck and hooded merganser ducklings from both wood ducks and hooded mergansers incubated clutches reach flight stage. About 13% of the annual production of mergansers came from nests incubated by wood ducks. During a recent 7 year period, 11,682 day old ducklings with plasticine-filled leg bands included 3,417 hooded mergansers. There were 130 (5.7%) hunting recoveries and 33 (25%) of these were long distance natal dispersal recoveries. We were successful in capturing 124 yearling female hooded mergansers in an especially designed capture box over 5 nesting seasons. Of these 54 had been marked as day old ducklings within 7 km of the capture box site. We determined the fate of 63 mergansers that were captured over a 3 year period. Of these 34 were not seen again, whereas 24 were recruited into the local population and 5 were recaptured in the special traps. The secretive nature of hooded mergansers in southern flooded forests makes them challenging study subjects but their apparent abundance in some narrow riparian corridors may offer opportunities to gain more insights into this cavity nesting specialist.

2.4: POPULATION ECOLOGY & TRENDS

SURVIVAL RATES OF HARLEQUIN DUCKS IN THE SALISH SEA, BRITISH COLUMBIA, AND THE EFFECTS OF CLIMATE AND FOOD

***W. Sean Boyd**, Scott Wilson, Greg Robertson, Ian Goudie, and Connie Smith*

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Thousands of Harlequin Ducks (*Histrionicus histrionicus*) concentrate each spring over Pacific herring (*Clupea pacificus*) spawn at Hornby Island in the Salish Sea, British Columbia. We implemented a Bayesian capture-mark-resight (CMR) analysis to estimate apparent survival rates and re-sight probabilities of Harlequin Ducks marked and observed at least once in spring between 1993 and 2005 at Hornby Island. We incorporated a band wear (loss) function in the analyses to first correct for bias in apparent survival probabilities due to band wear. We then used the corrected estimates to examine how male and female apparent survival varied over time and in relation to banding location (Hornby, other coastal location, interior). We also tested whether apparent survival co-varied with several environmental indices including Pacific herring spawn, Pacific Decadal Oscillation (PDO), North Pacific Index (NPI) and sea surface temperature (SST).

Mean annual survival was 0.874 and 0.834, but declined by 1.4% and 0.7% annually for males and females, respectively. Survival was similar across banding locations and the only significant relationship between survival and the environmental indices tested was with PDO which was positively related to male apparent survival and explained 14% of the annual variance. While PDO was only influential for male survival, annual survival rates of males and females were correlated (r = 0.66) suggesting other factors influence the two sexes similarly across years.

Ecosystem management is an important approach for conservation of Harlequin Ducks in the Pacific Northwest because of the intense commercial fishery and history of stock collapses of Pacific herring. Demography and distribution of Harlequin Ducks, and likely other marine birds, are linked to this nutrient-rich food source, and vital demographic rates such as survival rate appear to be linked to climate, at least for males, and hence may be affected by climate change.

2.5: POPULATION ECOLOGY & TRENDS

POPULATION TRENDS IN PACIFIC COMMON EIDERS IN RELATION TO ANNUAL VARIATION IN ICE BREAK-UP OVER A 20-YEAR PERIOD

***Eric T. Reed**, Cindy Wood, Danica Hogan, Christian Roy, Myra Robertson, and D. Lynne Dickson*

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The majority of Pacific Common Eiders breed in Western Canada, mostly in Amundsen Gulf, Dolphin and Union Strait, Coronation Gulf, and Queen Maud Gulf. Population and distribution data are sparse for this population with infrequent surveys conducted at Point Barrow, AK, and the central Canadian Arctic. This population was monitored on its main breeding sites in Bathurst Inlet and Queen Maud Gulf in 1995 and 2007-08 by Dickson and collaborators, and a reduction of approximately 50% of breeding pairs was noted between these two periods. We conducted aerial surveys within the Bathurst Inlet and Queen Maud Gulf areas during the egg laying period between 2014 and 2016 using methodology comparable to that used in previous surveys. The number of eiders detected was relatively stable over this period in Bathurst Inlet but they were more variable in Queen Maud Gulf, where ice conditions were also more variable. Long-term trends indicate that declines observed between 1995 and 2007-08 (approx. 50% decline) have not reversed but that the population may have stabilized. Declines appear to be more important within the Queen Maud Gulf area, which may be subject to more variable ice conditions that may limit its potential as breeding habitat. This area is predicted to undergo important reductions in ice thickness under current climate change models which could have impacts on breeding eiders. Short- and long-term trends will be discussed in relation to annual variation in ice break-up as well as long-term trends and projections related to climate change.

2.6: POPULATION ECOLOGY & TRENDS

APPARENT SURVIVAL OF ADULT FEMALE KING EIDERS WINTERING IN EASTERN AND WESTERN NORTH AMERICA

Dana K. Kellett *and Ray T. Alisauskas*

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King Eiders in North America winter either in Pacific waters in the northern Bering Sea and coastal regions of southern Alaska, or in Atlantic waters in coastal regions of southern Greenland, Newfoundland, and Labrador. Overlap in breeding distribution between winter populations occurs in the central Canadian arctic. We estimated apparent survival and encounter probability of adult females nesting at Karrak Lake, Nunavut (67º 14' N, 100º 15' W) south of Queen Maud Gulf, 2001-2012. We captured 358 unique breeding female king eiders on 847 occasions, and used a discriminant function with stable isotopic 15N and 13C ratios in head feathers to assign individuals to Pacific and Atlantic winter regions, with classification accuracy of 99% and 94%, respectively. We used inferred winter area as an effect on variation in apparent survival and encounter probability. Although 95% confidence intervals often included zero, apparent survival increased linearly over time in the first-ranked model (model weight, w = 0.41, B_{Time}=0.010 (95% CI: -0.003, 0.022)), remained constant in the second-ranked model (w = 0.22, intercept=0.873 (0.849, 0.897)), and increased over time (w = 0.18, B_{Time} = 0.009 (-0.003, 0.021)) with an additive effect of winter area (Pacific > Atlantic, effect size = -0.024 (-0.089, 0.040)) in the third-ranked model. Encounter probability was best modeled as annually variable with an additive effect of winter area (Pacific > Atlantic, effect size = -0.136 (-0.204, -0.068)). Assumptions inherent in Cormack-Jolly-Seber models support use of encounter probability as an index of breeding probability in this system. Weak evidence for lower apparent survival for the Atlantic population may be explained by higher harvest pressure in Greenland. Substantial support for lower encounter probability (i.e., breeding probability) for the Atlantic population may also be a result of harvest pressure that disturbs birds, or less favorable environmental conditions during winter, both of which may impede females from storing nutrient and energy reserves required for breeding.

3.1: PATTERNS OF DISTRIBUTION & ABUNDANCE

NOCTURNAL SPACE USE BY SURF SCOTERS (MELANITTA PERSPICILLATA) AND CRUDE OIL SPILL RESPONSE PLANNING IN THE SALISH SEA

Lindsey Hamilton, ***Joseph R. Evenson,*** *and Dina Roberts*

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Sea duck movement, habitat use and population data are primarily collected during diurnal periods, constructing a biased understanding of their ecology and distribution. Diurnal distribution data currently guide conservation and management decisions regarding the recently declined population of surf scoters (*Melanitta perspicillata)* wintering in Puget Sound. To understand nocturnal distributions of surf scoters, our study 1) determined habitat characteristics of nocturnal use areas in the Salish Sea, 2) determined influencing factors of selection of nocturnal use, and 3) developed a predictive model to estimate likely nocturnal use areas across the Salish Sea and assess vulnerabilities to potential oils spills. We used surf scoter location data collected from Platform Terminal Transmitter (PTT) and various spatial layers in a GIS to identify habitat characteristics of nocturnal locations and to measure distances traveled between diurnal and nocturnal use areas. We developed a use versus pseudo-non-use resource selection design, using logistic regression, and Akaike's information criterion (AIC) to create a predictive model for nocturnal scoter presence in the Salish Sea. We found that distance to shore, water depth, tidal current and vessel traffic were strong predictors of nocturnal presence. In the Salish Sea, surf scoters will travel an average of 3,967 m between diurnal and nocturnal habitats, and mean distance traveled varied depending on local geography. Nocturnal use sites were characterized by greater distances from shore and deeper water; scoters avoided areas with strong tidal currents and heavy shipping traffic. These newly identified nocturnal habitat requirements expand on the knowledge of surf scoter winter ecology and provide sea duck management guidance in the Salish Sea, including information to improve oil spill response preparedness. These findings also highlight the need for a better understanding of the variation between nocturnal and diurnal habitat selection of other sea ducks to better inform management decisions for all sea ducks.

3.2: POPULATION ECOLOGY & TRENDS

EIDERS OF WRANGEL ISLAND, RUSSIA

Vasiliy V. Baranyuk

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Several species of eiders nest on Wrangel Island, Russia. Spectacled and Siberian (Steller's) Eiders are rare species on Wrangel Island, but King and Common Eiders are common breeding species. King Eiders breed mainly on the lakes in the coastal plains of Wrangel Island and do not occur in the interior mountainous areas. Common Eiders nest everywhere throughout the island. Common Eiders are less numerous than King Eiders in the lake areas, but they occur frequently along rivers and streams into the mountainous areas, and can nest as far as 50 km from the sea coast. Common Eider nests can be solitary or in colonies containing hundreds of nests. Common Eiders favor nest locations near the nests of Snowy Owls. On Wrangel Island, no habitats are inaccessible to Arctic Foxes. Snowy Owls nest on the ground and defend their territories from terrestrial predators such as the Arctic Fox. Snow Geese, Black Brant, and Common Eiders are often found nesting colonially in these protected areas around Snowy Owl nests. Although waterfowl benefit by this protection from Arctic Fox, Snowy Owls prey on waterfowl and waterfowl nesting near them are sometimes in danger of being eaten by their protectors. This happens with Common Eiders in the years with a deficit of other prey for Snowy Owls, such as lemmings. The need for food by Snowy Owls sharply increases in early July after the young hatch. During this time, Snow Geese with their goslings are already leaving the nesting areas, but Common Eiders are usually still incubating. Common Eiders which nest earlier have higher survival. In years with low lemming numbers, Snowy Owls near nesting Common Eiders gain an advantage by using the Eiders and ducklings for food. Because of these factors, survival of Common Eiders nesting in colonies, as well as solitary nesters, is dependent on lemming numbers on Wrangel Island.

3.3: POPULATION ECOLOGY & TRENDS

DISTRIBUTION AND ABUNDANCE OF SEA DUCKS ALONG THE HUDSON BAY COAST OF NORTHERN MANITOBA

Jeffrey R. Ball, Frank B. Baldwin, Chris E. Smith, Stuart M. Slattery

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Sea duck conservation is challenged with limited information on distribution, abundance and habitat use, particularly during the breeding, molt and migration periods. Recent research has highlighted the coastal waters of southern Hudson Bay and James Bay as important habitat for sea ducks. The Government of Manitoba identified the Seal River estuary on the Hudson Bay coast of Manitoba as an Area of Special Interest and a priority for protection based on an enduring features analysis. The Seal River is a designated Canadian Heritage River recognizing its natural, cultural and recreational values, and the estuary is an Important Bird Area based on a large number of Black Scoter recorded during spring migration. However, neither designation provides long-term protection. Our objective was to assess waterfowl use of this region to support designation of the Seal River estuary as a protected area and promote expansion of the boundary to include the adjacent Knife River delta and adjoining marine waters. During 2013 to 2015, we conducted aerial surveys of breeding waterfowl in coastal and adjacent terrestrial habitats surrounding Churchill. Survey coverage was approximately 4% of the region. We counted 22,617 total indicated birds over three years representing 25 species or species groups. Geese were most abundant (57%) followed by ducks (41%), nearly half (48%) of which were sea ducks (10 species). In 2015, we conducted additional surveys of near shore marine waters during the molt and migration periods. More than 6000 birds were recorded during 865 km of flying, approximately half of which were sea ducks. During all three sampling periods, sea duck density tended to be higher near the outlets of the Seal and Knife Rivers, particularly during the non-breeding period. Our results contribute to a growing understanding of this coastal region as an important area of biodiversity that merits designation as protected area.

3.4: POPULATION ECOLOGY & TRENDS

SOME HYPOTHESES BEHIND AN APPARENTLY COLLAPSING POPULATION OF COMMON EIDERS IN SW NEW BRUNSWICK

Scott G. Gilliland, *Ray T. Alisauskas, Shawn M.C. Robinson, F. Patrick Kehoe, K. Conner, Peter W. Hicklin and C. Davison Ankney*

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Common Eiders wintering in Maritime Canada have declined from 45,000 in 2006, to 25,000 and 26,000 birds in 2012 and 2016, respectively. Breeding pairs in southwestern New Brunswick were stable between 8,000 to 11,000 from 1984 to 2005. However, declines of 3%/yr since 2005 resulted in only 3,500 pairs by 2014. Here we review data on nutrient dynamics, and prey densities collected during the non-breeding period in southwestern New Brunswick in the mid-1980s compared to information available today. Adult females were relatively fatter than adult males over the entire period. Size-corrected lipid mass of adult females increased from ~100 g in September to ~335 g in February, but then declined to ~ 185 g by March. Females caught during the pre-RFG period at a local colony had average lipid mass of ~ 360 g. In contrast, juvenile females had ~60 g more lipid than adult females in September, but were similar by December. Lipid of adult females continued to increase until February, while lipid in juveniles declined to about half that of adults. As well, no juveniles could be collected after February despite them being up to 5 times more vulnerable to the gun than adults, suggesting absence of juveniles from the study area. During the winter of 1986, there 35 million blue mussels estimated on a study area of 11,000 m^2. Fewer than 10 mussels were detected in the same area in 2016. We used a drone in summer, 2016, to assess mussel beds over a much larger areas but none were found. Adult females may no longer be able to acquire adequate resources to breed; or, juveniles to survive through winter. We speculate that lowered breeding probability and lowered juvenile survival are behind declines in recruitment responsible for the decline of eiders breeding and wintering in southwestern New Brunswick.

3.5: POPULATION ECOLOGY & TRENDS

REPRODUCTIVE SUCCESS OF LONG-TAILED DUCKS WINTERING IN THE BALTIC SEA

Kjell Larsson

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Aerial and ship-based winter surveys have shown that the North European / West Siberian population of long-tailed duck, which mainly winters in the Baltic Sea, has decreased dramatically in numbers during the past 20 years. The decrease is most likely a result of extra anthropogenic mortality in combination with low reproductive success. Measures of juvenile proportions of wintering long-tailed ducks between 2008 and 2016 were obtained from analyses of photos of flying flocks. By this photo method, thousands of birds were sampled from boats in different parts of the wintering range each year. Three categories of birds were identified, i.e. adult males, juvenile males and females. The sex ratio of juveniles was assumed to be equal. The juvenile proportions varied between 4 and 25 % among years. The average level during the nine year period was too low to support a stable population. During five winters when comparisons were possible, the juvenile proportions were considerably lower in the southern than in the central Baltic Sea. The sex ratio of adult birds was also more male skewed in the southern part.

The main food of long-tailed ducks in winter and spring in the central Baltic Sea is blue mussels. The soft body content (condition) of blue mussels in spring was analysed. The condition of blue mussels varied greatly between years and sites but no clear relationship was found between the condition of blue mussels in spring and the reproductive success of long-tailed duck, measured as the juvenile proportion in the subsequent winter. To reverse the population trend one must reduce the known extra anthropogenic mortality, i.e. reduce operational oil pollution and modify ship routes, reduce bycatch in fishery and hunting mortality, as well as increase our understanding of large scale processes affecting the breeding sites in the Arctic.