Species Status Summary and Information Needs

Sea Duck Joint Venture, June 2015

Common Eider, Pacific Race *(Somateria mollissima v-nigrum)*

<u>Population Size and Trends</u>: There has been no systematic effort to census the entire population of Pacific Common Eiders, but based on compilation of data from different regions, the USFWS (2006) estimated the total North American population at 115,000-170,000 birds. The estimate for Alaska is ~45,000-53,000 birds, with the largest numbers (25,000-30,000) in the Aleutian Islands (USFWS 2006). The breeding population in the central Canadian Arctic was estimated at 37,000 birds in 1990s (L. Dickson, pers. comm. in CWS Waterfowl Committee 2013), but the total western Canadian population may be in the range of 70,000-110,000 birds (USFWS 2006).

Surveys of migrating birds at Point Barrow, Alaska during spring suggested significant declines (53%) from 1976 to 1996 (Suydam et al. 2000), but counts were higher in 2003 and 2004, indicating some rebound of Canadian Arctic and/or Arctic Coastal Plain breeding populations (Suydam et al. 2004; Quakenbush et al. 2009). The Point Barrow eider count was repeated in spring 2015, but estimates were not available at the time of this writing. Numbers of common eiders breeding in the Bathurst Inlet area in Arctic Canada declined by 43-50% between 1995 and 2007-2008 (from almost 17,000 to <10,000; Raven and Dickson 2009).

Annual aerial surveys of the Arctic Coastal Plain were conducted from1999-2009, covering coastlines of the Chukchi and Beaufort seas from Omalik Lagoon to the Canadian border (Dau and Bollinger 2009). During the 11 years of the survey, total numbers varied (likely due to migration phenology and ice conditions), with an overall annual decline of 1.4%. Numbers of indicated breeding pairs were less variable, with an overall annual increase of 3.0% (Dau and Bollinger 2009). Total numbers ranged from 1353-4449 birds and 572-1340 indicated breeding pairs (Dau and Bollinger 2009). During this period, however, a ground-based study of breeding ecology found that reproductive output was not sufficient to maintain current population levels (Flint et al. 2003). The aerial survey in this area was discontinued in 2010.

A survey was developed for coastal northwestern Alaska, from Point Romanof to Omalik Lagoon, to fill in the gap between the Yukon-Kuskokwim Delta and the Arctic Coastal Plain surveys; partial surveys were done in 2006 and 2007 and complete surveys in 2008 and 2009 (Bollinger and Platte 2012). In 2008-2009, total numbers averaged 4326 birds and indicated breeding pairs averaged 1426 (Bollinger and Platte 2012). This survey represented a 37% decrease from a comparable survey by Larned et al. in 1992, which estimated 6833 total eiders (Bollinger and Platte 2012).

Estimates from the Yukon-Kuskokwim Delta indicated declines of 50-90% from 1957 to 1992 (Stehn et al. 1993; Hodges et al. 1996). Aerial surveys of the coastal zone reported an increasing trend of of 3.5% per year (90% CI: 1.6-5.5) during 1988-2012 and 4.0% (90% CI: -2.5 - 10.9) during 2003-2012 (Platte and Stehn 2013). Nest surveys on the Yukon-Kuskokwim Delta yielded an estimated average of 3,500 Common Eider nests during 2008-2012 (after correcting for undetected nests); the average annual growth rate during 1985-2012 was estimated at 1.075 (90% CI: 1.050-1.101) and 1.055 (90% CI: 0.925-1.203) during 2003-2012 (Fischer and Stehn 2012).

Recent surveys on Nunivak Island (2001, 2009) detected several hundred nests (Bowman and Norment 2009), but trends are unknown. Population trends are also not available for the Aleutian Islands.

A survey of a large portion of the Canadian breeding range was conducted in 1995. This survey indicated that ~25% of the Canadian population breeds in the Bathurst Inlet area (16759 birds) and 11,500 eiders were observed on the offshore islands in Queen Maud Gulf. The Bathurst Inlet area was surveyed during 2006-2008; annual surveys were recommended, with at least 3 years of surveys every 10 years required (Raven and Dickson 2009). In 2014, surveys of the offshore islands suggested that over 5,000 eiders were present in the Queen Maud Gulf, which is less than half the numbers observed in the same area in 1995 (Canadian Wildlife Service, unpublished data). However, due to the late spring conditions in 2014, it is possible that not all of the eiders had arrived on the study area. This survey was repeated in spring 2015, but estimates were not available at the time of this writing.

Priority Information Needs:

1. Develop a comprehensive long-term monitoring plan for western Canadian Arctic and Alaska breeding populations.
    a. Continue surveys on YKD and resume surveys for Alaska Arctic Coastal Plain, and western Canadian Arctic.
2. Repeat spring migration counts at Point Barrow every 5-10 years, and evaluate the magnitude by which environmental variables influence counts.
3. Conduct exploratory breeding surveys of St. Lawrence Island, St. Matthew Island, and Nunivak Island, and re-evaluate at periodic intervals.

Population Definition/Delineation: Satellite telemetry studies of Pacific Common Eider suggest geographic structuring within the population. Specifically, those breeding in the western Canadian Arctic and Alaska Arctic Coastal Plain (as well as eastern Russia) winter along the coasts of eastern Russia and in the northern Bering Sea, while those marked on the Yukon-Kuskokwim Delta appear largely non-migratory, wintering mainly in the Bristol Bay, Alaska (Petersen and Flint 2002; Dickson 2012). Individuals marked at a breeding colony in central Canadian Arctic almost all wintered in polynyas and flaw leads southeast of Chukotsk Peninsula and near St. Lawrence Island (Dickson 2012). Common Eiders breeding in the Aleutians also winter within the Aleutians, and there has been no movement detected among island groups (Near Islands, Rat Islands, and Andreanof Islands), so they likely should be managed as separate subpopulations (Petersen et al. 2015). Winter affinities of Common Eiders breeding on the Seward Peninsula and Kotzebue Sound are mixed, with some wintering along the coast of eastern Russia, and others wintering off the coast of southwest Alaska (M. Petersen, USGS, pers. comm.).

Individuals exhibit fidelity to wintering locations (Dickson 2012; Petersen et al. 2012). Individuals marked with satellite transmitters at a nesting area at Cape Espenberg, Alaska wintered in the northern Bering Sea and95% of individuals returned to areas within their 95% utilization distributions of the previous year, and 90% wintered within their previous 50% utilization distribution (Petersen et al. 2012). Females also show high breeding site fidelity, while males disperse among areas year to year. In the central Canada, almost all females returned to the breeding colony where they had been captured the previous year, but no males returned and instead were located across the breeding range, up to 2970 km from the capture location (Dickson 2012). Even though males disperse widely, they do tend to stay within a breeding area used by a particular subpopulation (i.e., Beaufort Sea coast, Bering Sea coast, Yukon-Kuskokwim Delta, etc.) (Dickson 2012).

Most satellite transmitter marking of Pacific Common Eiders has been focused on females, and there are few data on movements of males within and between breeding areas. Furthermore, few birds have been tracked for more than one annual cycle. Breeding areas for a large proportion of the Canadian Pacific Common Eider population have not been located yet, and all satellite-marked birds were captured at a single breeding colony. Little information is available on molt site locations or staging areas, and affiliations among breeding, molting and wintering locations are not well-understood for some segments of that population (Dickson 2012).

Pacific Common Eiders exhibit fine-scale spatial genetic structuring for both mitochondrial (mtDNA) and nuclear markers (Sonsthagen et al. 2007, 2009, 2011, 2013; Petersen et al. 2015). Partitions in the nuclear genetic markers are concordant with wintering areas, supporting inferences that both sexes display some degree of winter site fidelity. High levels of microgeographic structure in mtDNA were observed among colonies in the Aleutian Islands, Beaufort Sea and Yukon–Kuskokwim Delta (Φ_{ST} = 0.135–0.866, F_{ST} = 0.074–0.709), indicating that females return to their natal colony to breed (i.e. philopatry). Significant, but lower, levels of structure were detected among Beaufort Sea colonies at nuclear microsatellite loci (F_{ST} = 0.009–0.029) and no structure observed among colonies in the Aleutian Islands or Yukon-Kuskokwim Delta, indicate that males disperse among colonies. Spatial population structuring between mainland sites and Kigigak Island at nuclear intron sequences are suggestive of assortative pairing on wintering grounds, even at this relatively small scale (Sonsthagen et al. 2007). Genetic capture-mark-recapture analyses on barrier islands in the Beaufort Sea did not detect dispersal between island groups (separated by ~90 km) and return rates to nesting islands were high – 62% of females nested on the same island in subsequent years, while 38% moved to a new island within the same island group, usually an adjacent island (Sonsthagen et al. 2009). Furthermore, molecular data indicate that Common Eider females nest in kin groups, which promotes microgeographic genetic structure within populations by the formation of spatially-close associations among individuals with shared maternal genetic lineages (Sonsthagen et al. 2010).

Priority Information Needs:

1. Determine the eastern extent of breeding range for Pacific Common Eiders in Canada.

<u>Population Dynamics</u>: Detailed studies on breeding biology and estimates of vital rates exist only for a few local breeding areas, most notably the Yukon-Kuskokwim Delta, Alaska north coast, and central Canadian Arctic. A generic population model has been developed for Yukon-Kuskokwim Delta Pacific Common Eiders, but some key population model parameters are missing or lack estimates of variation. At a single breeding area in central Canadian Arctic, average female annual survival was 0.84 ± 0.03 and Mayfield estimates of nest success ranged from 48.8-68.1% at a freshwater colony and 13.9-43.5% at marine nesting colonies (Hoover and Dickson 2007). On the Yukon-Kuskokwim Delta, apparent annual survival of adult females was 0.892 (SE=0.022) (Wilson et al. 2007). Average total clutch size ranged from 4.8 to 6.6 eggs, but after accounting for partial predation and non-viability of eggs, average clutch size at hatch ranged from 2.0 to 5.8 eggs; estimated nest survival averaged 0.55; and average productivity was 2.7 ducklings/hen (Wilson et al. 2012). Earlier breeding females likely have the highest reproductive output, as they lay larger clutches and have higher probability of successful hatch (Wilson et al. 2012). Population growth rate is most sensitive to changes in adult female survival, but this parameter is relatively invariant and retrospective variation in population growth rate can be primarily attributed to fecundity parameters, particularly nest and duckling survival (Wilson et al. 2012). On the Yukon-Kuskokwim Delta, the population declined 85-96% during 1955-1992; this could have been caused by a 1-2% higher adult mortality combined with a 10-20% lower fecundity, relative to estimates of those parameters during 1991-2004 (Wilson et al. 2012). During migration counts at Point Barrow, Alaska, the average sex ratio ranged from 51.0-51.2% male during spring and 59.5-76.6% male during summer/fall migration (Quakenbush et al. 2009).

Priority Information Needs:

1. Better estimates of geographic, temporal, and age-specific variation in vital rates necessary for population models.
    a. Determine reproductive success for this race in all major nesting areas.
    b. Determine age-specific survival rates throughout range.
    c. Estimate breeding propensity (percentage of hens attempting to breed in a given year) in declining vs. stable populations.
    d. Estimate recruitment rates in declining vs. stable populations.

<u>Population Ecology</u>: Potential limiting factors for Pacific Common Eider are numerous; however, the relative importance of factors is unknown. Potential threats include over-hunting, periodic severe ice conditions, predation, climate change impacts on prey availability or abundance, and coastal habitats (e.g. erosion and sea level rise), and marine pollution (e.g. oil spills) (USFWS 2007; Dickson 2012). Factors such as spring subsistence hunting, marine pollution, and disease (i.e. sources of additive mortality for adults) are predicted to potentially have large negative effects on population growth rates. Habitat changes on wintering grounds and brood-rearing areas were hypothesized to have contributed to past population declines (Wilson et al. 2012). There is also speculation that periodic catastrophic events (e.g. disease outbreak, unfavorable ice conditions, etc.) may limit population size (Hoover et al. 2010).

Little is known about molt or winter ecology, and only a few localized studies of nesting ecology have been conducted. Predation has been a major limiting factor for Common Eiders in the Aleutian Islands where foxes were introduced to most islands by the 1920s. Removal of foxes from some islands has demonstrated the potential rebound effect on population size (Petersen et al. 2015). Rats were also introduced to many of the Aleutian Islands, and have been known to prey on eider nests, but population-level effects are unknown (USFWS 2006). On the Yukon-

Kuskokwim Delta, 73% of nest failures were attributed to predation, but the relative importance of specific predators and other factors was unclear (Wilson et al. 2012). Egg predation by brown bear, wolverine and arctic fox was the primary cause of nest failure in central Canadian Arctic, and wolverines may also kill adult male and female eiders (Hoover et al. 2010). Avian predators (e.g. Glaucous Gull and Common Raven) were also common, but generally depredate only one or two eggs from a nest, while mammalian predators would destroy all eggs in a nest, and sometimes all nests on an island. Duckling depredation has been reported by avian predators (e.g. Glaucous Gull, Peregrine Falcon, etc.) (Hoover and Dickson 2007). In some areas, Common Eiders delay nesting until after ice break-up, perhaps to avoid egg predation by mammalian predators (Hoover and Dickson 2007). In areas with a short breeding season, however, birds may have to begin laying while ice allows mammals to access breeding islands (Hoover and Dickson 2007). Nest success may be correlated to lemming cycles in some areas; in one study, the two years of highest nest success corresponded to years of moderate to high lemming observation (Hoover and Dickson 2007).

To promote population growth of Pacific Common Eiders on the Yukon-Kuskokwim Delta, efforts should focus on increasing reproductive output (i.e. increasing fecundity and nest survival), perhaps through predator control on breeding grounds (Wilson et al. 2012). This recommendation is based on model assumptions of density independence, and if monitoring indicates density-dependence, then habitat improvement may be more effective (Wilson et al. 2012).

Priority Information Needs:

1. Determine important factors (weather, predators, food, etc.) affecting survival and reproductive success (fitness) of the species throughout its range during the breeding period.
2. Determine important factors (weather, predators, food, etc.) affecting survival on both North American and Russian wintering areas.
3. Determine important factors (weather, predators, food, etc.) affecting survival of adult males and adult females during the molting period.
4. Determine important factors (weather, predators, food, etc.) affecting survival of sub-adults.
5. Identify the most efficient methods to enhance production and survival during breeding season.
6. Study feeding ecology on spring staging areas in Chukchi Sea and in southeastern Beaufort Sea to assess importance of areas as an energy source for survival and productivity.

Habitat requirements: Nesting habitats are described fairly well for most breeding areas. However, habitat use during other periods of the annual cycle has not been adequately described and threats to many important habitats are unknown. Satellite telemetry has provided insights into seasonal habitat use by some populations at a relatively coarse scale. Pacific Common Eiders breeding in western Canadian Arctic used four spring staging areas – east coast of Chukotsk Peninsula, Russia; Ledyard Bay, Alaska in the eastern Chukchi Sea; Tuktoyaktuk Peninsula, Canada in the southeast Beaufort Sea; and Lambert Channel in Dolphin and Union Strait, Canada (Dickson 2012). Early departure from wintering areas and protracted spring migration suggest that prey may become depleted on wintering areas and that foraging opportunities during spring migration enable accumulation of reserves necessary for breeding (Dickson 2012). During spring staging in the Beaufort Sea, Common Eiders showed a strong preference for flaw lead habitats (rather than pack ice), were generally close to the landfast ice edge, and in average water depth of 22 m (SE = 2) (Dickson and Smith 2013). Densities were low off the Mackenzie River Delta, possibly because of highly turbid water which limits visibility for foraging (Dickson and Smith 2013). High concentrations were found along the landfast ice edge of the flaw lead off the Tuktoyaktuk Peninsula, even in years when ice conditions were more severe there than elsewhere in the Beaufort Sea; use of this staging area was influenced by the presence of open water but also by the availability of benthic prey and locations of eiders within the flaw lead were likely influenced by water depth, water clarity, and prey densities (Dickson 2012). In the central Canadian Arctic, nest success was higher at sites concealed by rye grass or willows than at exposed nest sites (Hoover and Dickson 2007).

Priority Information Needs:

1. Characterize (i.e., describe important biotic and abiotic features of) habitats preferred by breeding pairs and by broods.
2. Estimate the effects of climate change on coastal nesting habitats, including barrier islands and near-coastal tundra wetlands.
3. Characterize molting sites of adult males and adult females.
4. Characterize and quantify benthic communities in seasonally important use areas.
5. Build predictive model of potential impacts to nesting and wintering habitats due to climate change.
6. Document annual migration patterns and habitat use of subadults.

<u>Harvest Assessment</u>: Pacific Common Eiders are harvested primarily in the spring and summer by Aboriginal and Native people of northern communities, and to a small extent by sport hunters. Estimates of subsistence harvest have been derived by periodic, directed studies in specific locales and by more systematically sampling rural communities. Estimates of subsistence harvest in Alaska were 4,461 birds per year (data from 2004-2012), with most of the harvest split between the North Slope and Bering Strait-Norton Sound areas (Rothe et al. 2015). Estimated harvest of Common Eider eggs was 3,496 eggs/year, mostly in the Bering Strait-Norton Sound (Rothe et al. 2015). The population-level effect of Alaska subsistence harvest is unknown, but is likely additive mortality and more precise estimates are needed (Wilson et al. 2007). Sport harvest of Pacific Common Eider averages about 324 per year (2002-2011) (Rothe et al. 2015). The Russian harvest of North American breeding Pacific Common Eiders is likely in the low thousands but reliable data are not available (SDJV 2007; Hoover et al. 2010). The total subsistence harvest of all four eider species in Chukotka, Russia was roughly estimated at 115,000 in 2001, but it is unknown what proportion of this is from North American breeding populations (E. Syroechkovski Jr., pers. comm., in CWS Waterfowl Committee 2013). Approximately 3,600 eiders are harvested by Aboriginal people in western and central Canadian, although it is uncertain what portion of these eiders are Common Eiders compared to King Eiders (Inuvialuit Joint Secretariat 2003, Priest and Usher 2004).

Priority Information Needs:

1. Update and improve estimates of subsistence harvest in Alaska and western Canada.

2. Improve estimates of eider harvest in Russia.
3. Develop population models to determine the sustainability of various harvest levels on recognized subpopulations.

Parasites, Disease, Contaminants: The vulnerability and threats from offshore oil and gas development and contamination are increasing on the Alaska Arctic Coastal Plain and Mackenzie River Delta. Oil and gas leases in other parts of its range (e.g., Bristol Bay, Alaska and Chukchi Sea) may eventually put some populations at increased risk during certain periods of the year. There is general concern about contamination of benthic foods in northern areas. Lead (Pb) and selenium (Se) appear to be the most prevalent trace elements found in Pacific Common Eiders. Lead poisoning has caused direct mortality of Pacific Common Eiders in Alaska. Nesting female Common Eiders sampled near Prudhoe Bay had average blood selenium concentrations of 8.6 (SE = 0.34) µg/g wet weight but no relationship between selenium levels and glutathione peroxidase activity was detected (Franson et al. 2011). On the Yukon-Kuskokwim Delta, lead concentrations were elevated in 3.6% of females and selenium concentrations elevated in all females, with 81% having selenium at or above levels associated with death in captive waterfowl (Wilson et al. 2007b). The probability of a nest containing at least one non-viable egg was positively related to blood selenium levels, but high rates of nonviability were unlikely and inconsequential to overall population dynamics (Wilson et al. 2007b). Adults and eggs collected from Amchitka and Kiska Islands in the Aleutians were tested for radionuclides and metals; levels of radionuclide isotopes were below minimum detectable activity levels but levels of cadmium and mercury in eggs were above the median levels for these metals found in other studies (Burger and Gochfield 2007). Levels of mercury and lead were within the range that has been shown to be deleterious in other species (Burger and Gochfield 2007). Levels of mercury, lead and cadmium in feathers were below levels that have been shown to have adverse effects, while selenium levels were in the range that may cause adverse effects (Burger and Gochfield 2009).

Pacific Common Eiders sampled in Alaska had ~90% seroprevalence rates for avian influenza virus (Wilson et al. 2013). There is concern that the avian cholera outbreak in the Northern Common Eider in Hudson Bay could spread westward into the Pacific Common Eider breeding population.

Priority Information Needs:

1. Examine exposure to avian cholera, avian influenza, and other communicable diseases.
2. Determine prevalence and effects of acanthacephalan (and other) parasite loads.
3. Determine physiological effects of selenium and other contaminants on Common Eiders.
4. Opportunistically sample birds for contaminants, diseases, and parasites.

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