Species Status Summary and Information Needs

Sea Duck Joint Venture, March 2015

Long-tailed Duck *(Clangula hyemalis)*

Population Size and Trends: The breeding range of the Long-tailed Duck is extensive and occurs mostly outside of areas covered by most established waterfowl surveys, so there is very little information available to accurately and reliably quantify population size and trends for this species. The North American population of Long-tailed Duck has been crudely estimated at one million birds. The Waterfowl Breeding Population and Habitat Survey (WBPHS) indicates large declines from the early 1950s but a relatively stable population since 1989 (Flint 2013); on a shorter time-scale, the population appears to have declined from 1980 to 2002 and then increased from 2007 to 2012 (Bowman et al. 2015). Population trends vary among regional surveys; breeding numbers on the Arctic Coastal Plain were stable during 1986-2012 but increasing 2003-2012; on the Yukon-Kuskokwim Delta breeding numbers were stable during 1988-2012 but decreased during 2003-2012; on western Victoria Island, Northwest Territories breeding numbers probably decreased from 1992-94 to 2004-05; and on Kodiak Island, Alaska wintering numbers were stable during 1991-2005 (Raven and Dickson 2006; Zwiefelhofer et al. 2008; Stehn et al. 2013; Bowman et al. 2015). There essentially are no population trend data for Long-tailed Ducks breeding within eastern North America.

Because the WBPHS does not provide adequate coverage of their breeding areas, the SDJV and Arctic Goose JV collaborated on aerial surveys intended to provide indices of Long-tailed Duck breeding population size in the western and central arctic Canada, from 2002 to 2011. Those data are still being analyzed. Combined with survey data for western and northern Alaska, these surveys would cumulatively cover a substantial portion of the breeding range of Long-tailed Ducks in western North America.

Priority Information Needs:

1. Recommend implementation of winter sea duck surveys into areas of known concentrations to sample a greater proportion of the Long-tailed Duck population along the Atlantic coast (e.g., Chesapeake Bay, Southern New England, Great Lakes, Gulf of St. Lawrence).
2. Continue to investigate the potential for developing waterfowl breeding population surveys for arctic Canada in cooperation with Arctic Goose Joint Venture, as a means of monitoring population trends of Long-tailed Ducks for breeding areas in Canada that are not included in other surveys.

Population Delineation: Satellite telemetry studies undertaken to date suggest that there may be segregation in dispersal patterns for eastern and western populations in North America, although sample sizes are small, particularly for western North America, and the zone of overlap is poorly defined.. Female Long-tailed Ducks marked on the Yukon-Kuskokwim Delta used molt locations on the Y-K Delta, in coastal lagoons on St. Lawrence Island, and along the coast of the Chukotka Peninsula, Russia; an autumn staging area on the east coast of the Chutkotka Peninsula was used by 7 of 10 birds marked with satellite transmitters; and wintering locations were widely

distributed in coastal waters north of 50°N and between 150°E and 130°W (Petersen et al. 2003). Adult females marked with satellite transmitters in the western Beaufort Sea wintered in coastal waters of the Sea of Okhotsk, Sea of Japan, Bering Sea, Gulf of Alaska, southeast Alaska and British Columbia; during the following spring migration and breeding season, individuals were located from the Tuktoyaktuk Peninsula to the Kamchatka Peninsula and likely molted in Russia, western Alaska and the western Beaufort Sea (Blake Bartzen, CWS, unpublished data). It is noteworthy that none of the Long-tailed Ducks marked with transmitters on molting areas in western North America have wintered in eastern North America.

Female Long-tailed Ducks marked with satellite transmitters during winter at Lake Ontario migrated to Georgian Bay in Lake Huron and western James Bay, which appeared to be important spring stopover sites, enroute to possible breeding areas inland of western Hudson Bay (Mallory et al. 2006). They used molting areas near Bibby Island in western Hudson Bay and a variety of sites in Hudson Bay during fall migration (Mallory et al. 2006). Female Long-tailed Ducks marked with satellite transmitters on the Great Lakes and Atlantic coast used breeding areas in northeastern Manitoba, southeastern Northwest Territories, Nunavut and northern Québec; there did not appear to be geographic segregation between birds wintering on the Great Lakes versus the Atlantic coast, but sample sizes were small (SDJV 2014). There appears to be an important molting area for male Long-tailed Ducks near Adelaide Peninsula and King William Island, Nunavut; sample sizes are small, but there were high between-year return rates (average distance between years for individuals = 50 km). Long-tailed Ducks marked on the Great Lakes and Atlantic coast intermingled on molting areas (SDJV 2014). Hudson Bay, especially the Belcher Islands, was a key stopover site on fall migration and both males and females showed high return rates to wintering areas (average between-year difference = 26.6 km) (SDJV 2014).

Aerial surveys indicate wintering Long-tailed Ducks along the New Jersey coast and in Delaware Bay (Silverman et al. 2012); these areas not represented in satellite tagged samples and additional marking efforts may be needed in these and other underrepresented areas (e.g. Maine and Nantucket/Cape Cod, areas of Great Lakes, Maritime Canada; SDJV 2014). There is some evidence that the Cape Cod/Nantucket and Chesapeake Bay wintering populations follow different migratory routes during spring and fall and if so, limiting factors, including hunting, may need to be evaluated separately for these areas (SDJV 2014).

Analysis of Long-tailed Duck samples from Indigirka River Delta, Russia, western Beaufort Sea, Yukon-Kuskokwim Delta, and Queen Maud Gulf, Nunavut indicate significant genetic differentiation between Yukon-Kuskokwim Delta and other populations, suggesting high female philopatry to Yukon-Kuskokwim Delta, but not to other areas (Robert Wilson, USGS, pers. comm).. Isotopic analysis suggests that many Long-tailed Ducks breeding in the western Canadian Arctic and Hudson Bay overwinter in the Great Lakes (Braune et al. 2005).

Priority Information Needs:

1. Mark additional female Long-tailed Ducks wintering along the Atlantic coast and in the Great Lakes west of Lake Ontario to determine migration routes and affiliations among breeding, molting and wintering areas.

2. Complete satellite telemetry studies on the Atlantic coast to determine affiliations among breeding, molting, staging, and wintering areas.
3. Investigate use of stable isotopes to determine broad-scale dispersal patterns of long-tailed ducks throughout North America.

Population Dynamics: There are few data on population dynamics for this species. The most important limiting factors are unknown. One study on the Yukon-Kuskokwim Delta estimated annual adult female survival at 0.74, nesting success at 0.30 and duckling survival to 30 days averaged 0.10 but varied from 0 to 0.25 among years (Schamber et al. 2009). Population modeling indicated an annual population decline of 0.19, and the model predicted population stability would require 0.91 female annual survival, 0.36 nest success and 0.12 duckling survival (Schamber et al. 2009). The model was most sensitive to adult female survival but duckling survival was a potential limiting factor in some years (Schamber et al. 2009). Most duckling mortality occurred in the first week after hatching, when broods travel overland to brood-rearing areas and low adult female survival rate may be related to high subsistence harvest and ingestion of lead shot on Y-K Delta (Schamber et al. 2009).

Priority Information Needs:

1. Estimate demographic parameters and annual survival rates of birds from various areas throughout the breeding range.
2. Evaluate the feasibility of estimating age ratios of wintering birds as an index to annual productivity.
3. Once necessary demographic parameters have been estimated, develop a demographic model for the species.

Population Ecology: A few studies of nesting ecology have been done, but larger studies over a broader geographic area are needed. Breeding, molting, migration, and wintering ecology need to be better documented. Data have been collected on food habits and feeding ecology in breeding and wintering areas. The effects and magnitude of fishing net entanglement mortality are unknown. At coastal sites on the Yukon-Kuskokwim Delta, nest predators were primarily avian (likely Mew Gulls, Glaucous Gulls, and Parasitic Jaegers) as well as arctic foxes in some years while at inland sites red foxes were the primary nest predators (Schamber et al. 2009). At Igloolik Island, Nunavut, 40% of nests were destroyed by predators, primarily arctic foxes (Forbes et al. 1992). Near Churchill, Manitoba, apparent nest success was 58.9%, with island nests slightly more successful than mainland nests; in mainland areas, nest success was highest in marshland, then under trees, and lowest in open tundra (Alison 1975). In some areas, Long-tailed Ducks often nest in association with Arctic Terns (which perhaps provide warning and/or protection from aerial predators) and they may avoid nesting on islands with nesting Herring Gulls or Common Eiders (Baldassare 2014). In Sweden, duckling growth rates were slower when duckling production was high, indicating food limitation occurred in brood-rearing areas (Pehrsson and Nystrom 1988). Also, duckling production was highest in years of peak small rodent abundance, as mammalian and avian predators of nests/ducklings focused on rodents, but loss of ducklings was also high in the same years, probably due to food competition (Pehrsson and Nystrom 1988).

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. Estimate incidental take from gill nets, particularly on the east coast.

Harvest Assessment: The sport harvest appears to be low in comparison with apparent overall population levels. From 1999-2008, the average sport harvest was 22,702 in US (83.5% in the Atlantic Flyway) and 2,612 in Canada (Baldassare 2014). Subsistence harvest is incompletely documented throughout its range, but estimated at 6,000 in Canada and 13,000 in the Alaska region (11,000 in Alaska, 2,000 in Russia) (SDJV 2007). At present, estimates of sport and subsistence harvests are poor. Accurate estimation of Russian harvest rates may be important, as a large proportion of Long-tailed Ducks that breed in North America appear to winter in Russia (M.R. Petersen, and B. Bartzen, unpublished data) .

Priority Information Needs:

1. Assess and improve the surveys of sport harvest for this species.
2. Improve and expand surveys of subsistence harvest in Alaska and Canada.

Habitat Requirements: Breeding, molting, migration and winter habitat needs are not well documented, although the locations of some key areas have been documented. In the Queen Maud Gulf area, Northwest Territories, Long-tailed Ducks were found throughout the area, including inland areas, with no direct relationship to elevation, latitude or longitude (Conkin and Alisauskas 2013). They were positively associated with wet sedge meadow habitat, marine ice and associated meltwater, as well as hummock graminoid tundra and lichen-heath tundra and they avoided areas of exposed peat (Conkin and Alisauskas 2013). However, habitat model performance was poor, and did not predict distribution patterns in the Rasmussen Lowlands, NWT, perhaps because Long-tailed Ducks were selecting habitat at a finer scale than used in the model and/or because the species does not have very specialized habitat requirements, making it difficult to predict distribution based on habitat variables (Conkin and Alisauskas 2013). Locations from female Long-tailed Ducks implanted with satellite transmitters plotted on digital land cover mapping indicated use of wet sedge meadows, hummock and tussock graminoid tundra, low shrub tundra, and shrub thickets surrounded by a mosaic of exposed peatlands and wetlands (SDJV 2014).

Surveys of wintering sea ducks on the east coast of the US found highest densities of Long-tailed Ducks around Nantucket Shoals (50% of observations) and Cape Cod, followed by Chesapeake Bay, Long Island Sound, and the Maine coast, with relatively consistent densities over the four year study (Silverman et al. 2013). Wintering flocks were generally found from 2.4- 31.2 km from shore, in water depths of 7.3-22.6 m, with a bottom slope of 0.3-1.9° (Silverman et al. 2013). Higher abundances of Long-tailed Ducks were observed closer to shore in years with positive values for the North Atlantic Oscillation (Zipkin et al. 2010). A large proportion of the North American population winters near Nantucket Island, Massachusetts and forages offshore on Nantucket Shoals, where they appeared to feed heavily on gammarid amphipods; flocks were found primarily over shallower portions of the shoals (≤20 m depth) and up to 70 km offshore (White et al. 2009). Long-tailed Ducks wintering on Lake Ontario fed primarily on Chironomidae and Amphipoda, even though dreissenid mussels were much more abundant (Schummer et al. 2008a) and they congregated in mixed flocks in nearshore areas

where high densities of prey accumulated (Schummer et al. 2008b). A study of sea duck habitat selection in southeast Alaska found no relationship between Long-tailed Duck presence and the habitat variables tested (Gunn 2009). A similar analysis, but using BC Coastal Waterbird Survey data, is being undertaken by Ducks Unlimited Canada and the Canadian Wildlife Service; results are not yet available for Long-tailed Ducks.

Priority Information Needs:

1. Characterize wintering habitats and identify the factors responsible for their selection.
2. Determine whether wintering habitat for Long-tailed Ducks is limiting, and where.
3. Assess spatial and temporal variation in diets throughout the range of this species

Parasites, Disease, and Contaminants: Little is known about parasites, disease, and contaminants. Large numbers of Long-tailed Ducks have died in cholera outbreaks in Chesapeake Bay. Long-tailed Ducks carried the highest heavy metals burden of all sea ducks tested in Québec. A die-off of molting Long-tailed Ducks in the Beaufort Sea was linked to a previously unidentified adenovirus (Hollmen et al. 2003) and it was estimated that >12,000 Long-tailed Ducks died of Type E botulism in Lakes Erie and Ontario in 2002.

In Long-tailed Ducks captured in the Beaufort Sea, Alaska selenium levels averaged 9.4µg/g wet weight; concentrations of this magnitude are toxic in freshwater birds, but marine birds are known to tolerate higher selenium levels (Franson et al. 2011). A positive relationship between blood selenium levels and plasma activities of total glutathione peroxidase and Se-dependent glutathione peroxidase suggested that some birds may be in the early stages of oxidative stress (Franson et al. 2011). Long-tailed Ducks accumulate selenium during winter on Lake Ontario and selenium concentrations averaged 22.7 µg/g dry weight; 14% had levels >33 µg/g, this concentration has been found to cause acute health problems in Mallards (Schummer et al. 2009). In northern Canada, male Long-tailed Ducks had higher concentrations of hepatic mercury, copper, selenium and renal cadmium than females but concentrations of mercury, copper and cadmium were well below published toxicological thresholds (Braune et al. 2005). Hepatic selenium exceeded 10 µg/g dry weight in 64% of females and exceeded 33 µg/g in 8% of females, high enough to cause concern (Braune et al. 2005). On Lake Ontario, 5.1% of collected Long-tailed Ducks contained ingested lead shot and only 1 of 256 contained an ingested lead fishing weight, which suggests that lead toxicosis from spent shotgun pellets is low to non-existent in this area (Schummer et al. 2011).

Priority Information Needs:

1. Opportunistically screen Long-tailed Ducks for diseases and parasites.
2. Opportunistically collect blood samples from captured birds to determine contaminant levels on breeding, wintering, molting, and staging areas.
3 Expand laboratory studies to determine effects of specific contaminants and exposure levels on physiological functions, reproduction and survival. Particular emphasis should be given to crude oil, heavy metals, and compounds that accumulate in invertebrate foods.
4. Opportunistically sample birds for avian influenza where adequate samples can be obtained.

Literature Cited

Alison, R. M. 1975. Breeding Biology and Behavior of the Oldsquaw (*Clangula hyemalis* L.). Ornithological Monographs18. American Ornithologists' Union, Tampa, Florida.

Baldassare, G. A. 2014. Ducks, Geese, and Swans of North America. John Hopkins University Press, Baltimore, MD. 1027 pp

Bowman, T.D., E.D. Silverman, S.G. Gilliland, and J.B. Leirness. 2015. Status and trends of North American sea ducks: reinforcing the need for better monitoring. pp. 1-27 *in* J.-P.L. Savard, D.V. Derksen, D. Esler and J.M. Eadie (editors). Ecology and conservation of North American sea ducks. Studies in Avian Biology (in press), CRC Press, New York, NY.

Braune, B. M., K. A. Hobson and B. J. Malone. 2005. Regional differences in collagen stable isotope and tissue trace element profiles in populations of long-tailed duck breeding in the Canadian Arctic. Science of the Total Environment 346(1): 156-168.

Conkin, J. A. and R. T. Alisauskas. 2013. Modeling probability of waterfowl encounters from satellite imagery of habitat in the central Canadian arctic. Journal of Wildlife Management 77(5): 931-946.

Flint, P. L. 2013. Changes in size and trends of North American sea duck populations associated with North Pacific oceanic regime shifts. Marine Biology 160(1): 59-65.

Forbes, G., K. Robertson, C. Ogilvie, and L. Seddon. 1992. Breeding densities, biogeography, and nest depredation of birds on Igloolik Island, N.W.T. Arctic 45: 295– 303.

Franson, J. C., D. J. Hoffman and P. L. Flint. 2011. Selenium Concentrations and Enzyme Activities of Glutathione Metabolism in Wild Long-Tailed Ducks and Common Eiders. Environmental Toxicology and Chemistry 30(6): 1479-1481.

Gunn, T. 2009. Habitat correlates of wintering sea duck occurrence in southeast Alaska. MSc. Thesis, Simon Fraser University, Burnaby, BC. 44 pp.

Hollmén, T. E., J. C. Franson, P. L. Flint, J. B. Grand, R. B. Lanctot, D. E. Docherty and H. M. Wilson. 2003. An adenovirus linked to mortality and disease in long-tailed ducks (*Clangula hyemalis*) in Alaska. Avian diseases 47(4): 1434-1440.

Mallory, M. L., J. Akearok, N. R. North, D. V. Weseloh and S. Lair. 2006. Movements of long-tailed ducks wintering on Lake Ontario to breeding areas in Nunavut, Canada. Wilson Journal of Ornithology 118(4): 494-501.Pehrsson, O., and K. G. Nyström. 1988. Growth and movements of Oldsquaw ducklings in relation to food. Journal of Wildlife Management 52: 185– 191.

Petersen, M. R., B. J. McCafferey and P. L. Flint. 2003. Post-breeding distribution of Long-tailed Ducks Clangula hyemaIis from the Yukon-Kuskokwim Delta, Alaska. Wildfowl 54(54): 103-114.

Raven, G. H. and D. L. Dickson. 2006. Changes in distribution and abundance of birds on western Victoria Island from 1992-1994 to 2004-2005. Canadian Wildlife Service, Prairie and Northern Region, Edmonton. Technical Report Series No. 456.

Schamber, J. L., P. L. Flint, J. B. Grand, H. M. Wilson and J. A. Morse. 2009. Population Dynamics of Long-tailed Ducks Breeding on the Yukon-Kuskokwim Delta, Alaska. Arctic 62(2): 190-200.

Schummer, M. L., S. A. Petrie and R. C. Bailey. 2008a. Dietary overlap of sympatric diving ducks during winter on northeastern Lake Ontario. Auk 125(2): 425-433.

Schummer, M. L., S. A. Petrie and R. C. Bailey. 2008b. Interaction between macroinvertebrate abundance and habitat use by diving ducks during winter on northeastern Lake Ontario. Journal of Great Lakes Research 34(1): 54-71.

Schummer, M. L., S. S. Badzinski, S. A. Petrie, Y.-W. Chen and N. Belzile. 2009. Selenium Accumulation in Sea Ducks Wintering at Lake Ontario. Archives of Environmental Contamination and Toxicology 58(3): 854-862.

Schummer, M. L., I. Fife, S. A. Petrie and S. S. Badzinski. 2011. Artifact Ingestion in Sea Ducks Wintering at Northeastern Lake Ontario. Waterbirds 34(1): 51-58.

Sea Duck Joint Venture. 2007. Recommendations for Monitoring Distribution, Abundance, and Trends for North American Sea Ducks. December 2007. <http://seaduckjv.org/monitor.htm>

Sea Duck Joint Venture. 2014. Atlantic and Great Lakes sea duck migration study: progress report February 2014. < http://seaduckjv.org/atlantic_migration_study.html>

Silverman, E.D., J. B. Leirness, D. T. Saalfield, M. D. Koneff, and K. D. Richkus. 2012. Atlantic Coast wintering sea duck survey, 2008-2011. US Fish and Wildlife Service report, Laurel. MD. 27 pp + appendices.

Silverman, E. D., D. T. Saalfeld, J. B. Leirness and M. D. Koneff. 2013. Wintering sea duck distribution along the Atlantic Coast of the United States. Journal of Fish and Wildlife Management 4(1): 178-198.

Stehn, R. A., W. W. Larned and R. M. Platte. 2013. Analysis of aerial survey indices monitoring waterbird populations of the Arctic Coastal Plain, Alaska, 1986-2012. US Fish and Wildlife Service, Migratory Bird Management, unpublished report. 56 pp.

White, T. P., R. R. Veit and M. C. Perry. 2009. Feeding ecology of long-tailed ducks Clangula hyemalis wintering on the Nantucket Shoals. Waterbirds 32(2): 293-299.

Zipkin, E. F., B. Gardner, A. T. Gilbert, A. F. O'Connell Jr, J. A. Royle and E. D. Silverman. 2010. Distribution patterns of wintering sea ducks in relation to the North Atlantic Oscillation and local environmental characteristics. Oecologia 163(4): 893-902.

Zwiefelhofer, D.C., J. H. Reynolds and M. J. Keim. 2008. Population trends and annual density estimates for select wintering seabird species on Kodiak Island, Alaska. US Fish and Wildlife Service Region 7 Technical Report. 109 pp.