C.1: Current Issues in the Conservation and Management of Sea Ducks (Organizer: Chris Dwyer)

C.1.1: Koneff

Prioritizing Research and Monitoring to Improve Sea Duck Harvest Management

Mark D. Koneff[1]*, Chris P. Dwyer[2], Guthrie S. Zimmerman[3], Kathleen K. Fleming[4], Paul I. Padding[4], Patrick K. Devers[4], Fred A. Johnson[5]

[1] U.S. Fish and Wildlife Service, Division of Migratory Bird Management, 17 Godfrey Drive, Suite 2, Orono, ME 04473, USA, mark_koneff@fws.gov
[2] U.S. Fish and Wildlife Service, Northeast Region, 300 Westgate Center Drive, Hadley, MA 01035, USA
[3] U.S. Fish and Wildlife Service, Division of Migratory Bird Management, 3020 State University Drive, East, Modoc Hall Suite 2007, Sacramento, CA 95819, USA
[4] U.S. Fish and Wildlife Service, Division of Migratory Bird Management, 11510 American Holly Drive, Laurel, MD 20708, USA
[5] U.S. Geological Survey, Wetland and Aquatic Research Center, 7920 NW 71 Street, Gainesville, FL 32653, USA

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We compiled estimates from published and unpublished literature and used them to develop probability distributions for each parameter that reflected uncertainty about true mean values for each population.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 (rmax), 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.

C.1.2: Dwyer

Defining Sea Duck Populations: What We Wish We Could Measure and How to Interpret What We Can Measure

John M. Pearce[1]*, Paul. L. Flint[1], Sarah S. Sonsthagen[1] (Presented by Chris Dwyer)

[1] U.S. Geological Survey, Alaska Science Center, Anchorage, Alaska, USA, jpearce@usgs.gov

A population is composed of individuals that share resources such that they have the same expectation of survival and fecundity. If each group of individuals segregates spatially throughout the annual cycle, then identification and description of populations is a relatively simple task. If spatial segregation is temporally variable then the definition of a population becomes nebulous and management complicated. For migratory wildlife, understanding levels of migratory connectivity between breeding and wintering areas is a first step in describing populations. Determining levels of mixture or gene flow between groups is the next step because a group of birds present at any given location and time, may not represent a single population. Sea ducks have been little studied up until the recent past. Through the efforts of the Sea Duck Joint Venture and partners, a great deal has been learned about the migratory movements of individuals and levels of site fidelity for a variety of sea duck species throughout North America. It is now time to summarize the state of our knowledge regarding population delineating to inform management units, harvest assessments, and determining which surveys are most informative for tracking status and trends of sea duck species. Methods for determining levels of migratory connectivity and population definition include genetic markers, band-recovery or band-resight data sets, and satellite telemetry. However, what is less well-understood is the methods of quantification of these data streams into metrics of population subdivision that can be used for informing management decisions. In this talk, we will summarize recent research on sea duck population delineation and discuss metrics that should and should not be used to define population structure of sea duck species.

C.1.3: Rothe

Understanding Diverse Sea Duck Harvest Communities for Responsive Management and Conservation

Tom Rothe[1]*, Liliana C. Naves[2]

[1] Pacific Birds Habitat Joint Venture, 11828 Broadwater Drive, Eagle River, Alaska, 99577, USA, tom_rothe@pacificbirds.org
[2] Alaska Department of Fish and Game, Division of Subsistence. Anchorage, Alaska, 99518, USA

In recent decades, dedicated efforts have broadened knowledge on sea duck ecology and conservation status. However, our understanding of the role of harvest in sea duck population dynamics is limited and little is known about the relation of hunter behavior to regulatory regimes. In the Pacific Flyway, the total sea duck harvest (168,000 birds/year) has four components differing in species composition and harvest amount: Alaska subsistence harvest, Alaska sport harvest, sport harvest in coastal Lower-48 states, and sport harvest in inland Lower-48 states. The Alaska subsistence harvest accounts for 44% of the total sea duck harvest in this Flyway. Since the Alaska spring-summer subsistence harvest of migratory birds was first authorized in regulation in 2003, much progress has been made in communication and collaboration among stakeholders and data on subsistence harvest have become more available. Processes, partnerships, and subsistence harvest regulations are still evolving. In this multi-cultural landscape, efforts to include western science and local and traditional ecological knowledge (TEK) face challenges. While western management is concerned with large scale, quantified biological and ecological data, TEK deals with smaller geographic scales integrating qualitative information and historical, socio-economic, and spiritual dimensions. In harvest management, issues related to knowledge, communication, decision-making power, and resource allocation are intertwined and dynamic. A better understanding of cultures and traditions of subsistence users, sport hunters, and wildlife biologists and managers is key to ensure genuine exchanges of information among individuals and organizations to establish mutual understanding of resource status and shared conservation goals, develop transparent expectations about allocation, and maintain management regimes that build trust and collaboration. Stakeholders must clearly frame perspectives and develop cross-cultural negotiation skills to be able to collectively solve socio-economic and resource sustainability issues. This involves commitment from all stakeholders, processes that are inclusive, and leadership.

C.1.4: McLellan

Identifying Areas of Importance for Sea Ducks Throughout Their Annual Cycle

Nic McLellan[1]*, Tim Bowman[2], Sean Boyd[3], Shannon Badzinski[4], Christine Lepage[5], Scott Gilliland[6]

[1] Ducks Unlimited Canada, Amherst, NS, B4H 3Z5, Canada, n_mclellan@ducks.ca
[2] US Fish and Wildlife Service, Anchorage, AK, 99507, USA
[3] Environment Canada, Science and Technology Branch, Delta, BC, V4K 3N2, Canada
[4] Environment Canada, Canadian Wildlife Service, Ottawa, ON, K1A 0H3, Canada
[5] Environment Canada, Canadian Wildlife Service, Québec, QC, G1J 0C3, Canada
[6] Environment Canada, Canadian Wildlife Service, Sackville, NB, E4L 1G6, Canada

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 into one or more geospatial databases 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 presentation we highlight some of the most important habitats/areas for sea ducks in North America.

C.1.5: Silverman

Sea Duck Habitat Associations Along the Atlantic Coast of the United States

Emily Silverman[1]*, Anthony Roberts[1], Kyle Detloff[1]

[1] U.S. Fish and Wildlife Service, 11510 American Holly Drive, Laurel, MD 20708-4016, USA, emily_silverman@fws.gov

Recent aerial survey efforts along the Atlantic coast of the United States, as well as an effort to integrate all marine bird data for the coast into a single 'seabird compendium,' are allowing researchers to map the distribution of wintering sea ducks and understand their association with features of the marine environment. These analyses should provide planners charged with decisions about permitting energy development critical information relevant to potential impacts on sea duck wintering habitat. Understanding sea duck-habitat associations will also improve our ability to predict distribution shifts that may occur as climate changes. We characterize the winter range and distribution of four species of sea ducks (long-tailed duck, and surf, white-winged, and black scoter) and present results highlighting relationship between the abundance and habitat characteristics including depth, bottom slope, sea surface temperature, and the strength of the North Atlantic Oscillation. We include a detailed exploration of the distribution of black scoters in the southernmost portion of their wintering range (along the coast of South Carolina and Georgia); the importance of this region to black scoters is not well characterized, while changes in winter use could provide early indication of range shifts.

C.1.6: Boyd

Pacific Harlequin Ducks are Altering their Molt Behavior

W. Sean Boyd[1]*

[1] Science & Technology Branch, Environment Canada, Pacific Wildlife Research Centre, Delta, BC, Canada, sean.boyd@ec.gc.ca

A small population of harlequin ducks (*Histrionicus histrionicus*) has been surveyed intensively over the last 30+ years at White Rock in the Salish Sea (B.C.). From the early 1980s to the early 2000s adult males consistently returned from their breeding areas to the coast in June-July to molt their body and flight feathers. Females followed 1-2 months later and long-term pair bonds were re-established once they completed their own molts, usually by mid-late October. However, since the mid-2000s the males have been avoiding White Rock completely, molting at some unknown location(s) and returning to the study area ca. 2+ months later than usual. Coinciding with this change in molt pattern, the number of males declined, resulting in a local population level effect. Recent surveys at two nearby coastal sites indicate similar delayed return patterns by males, suggesting a larger, regional population level effect. In contrast to males, the adult females in the study area have not altered their return times, molt patterns, or abundance level. Research is needed to determine if this altered male molt pattern is happening over an even larger geographic scale such as the Salish Sea and, if so: what are the ultimate and proximate driving factors and what, if anything, can be done management-wise? In spring 2015 we marked adult males with satellite transmitters and discovered that they migrated to largely uninhabited coastal locations 100s of km north of their capture sites to molt. The following factors are suspected to be responsible for this change in behavior during what may be considered a vulnerable (flightless) period: 1) increasing levels of recreational disturbance from humans and/or 2) increasing levels of predation risk from bald eagles (*Haliaeetus leucocephalus*). Results of this study have implications for conservation efforts in regions where both human and eagle populations are increasing.

D.1: Current Issues in the Conservation and Management of Sea Ducks (Organizer: Chris Dwyer)

D.1.1: Hindman

Avian Cholera Epizootics in Sea Ducks and Sea Birds on Chesapeake Bay

Larry J. Hindman[1]*, Gary Costanzo[2], William F. Harvey[1], Mark A. Wilson[3]

[1] Maryland Department of Natural Resources, 828B Airpax Road, Suite 500, Cambridge, Maryland 21613, USA, larry.hindman@maryland.gov
[2] Virginia Department of Game and Inland Fisheries, 5806 Mooretown Road, Williamsburg, Virginia 23188, USA
[3] U.S. Department of Agriculture, National Veterinary Services Laboratories, P.O. Box 844, Ames, Iowa 50010, USA

An epizootic of avian cholera (*Pasteurella multocida*), in sea ducks, diving ducks, and sea birds occurred on Chesapeake Bay, during late February - early April 1994. More than 36,700 carcasses of 57 bird species were recovered during shoreline surveys. Of those identified long-tailed duck (*Clangula hymalis*) (86%), scoters (*Melanitta* sp.) (4%), bufflehead (*Bucephala albeola*) (3%), and common goldeneye (*Bucephala clangula*) (2%) suffered the highest mortality. Based upon aerial survey estimates of waterfowl and sea bird populations at risk, published methods to measure the losses of carcasses at sea or on beaches, applied models to account for such losses, and extrapolating from the number of dead birds recovered, we estimated that the total mortality from the1994 epizootic to be >179,000 birds. Stresses caused by low winter temperatures, limited open water due to extensive ice cover, and overcrowding of birds are believed to have contributed to the 1994 epizootic. Common *P. multocida* serotypes 3,4 and 3, affecting waterfowl and sea birds were identical to serotypes found in nearby commercial poultry rearing facilities where rodents serve as the source of infection. We compare the timing of epizootics, *P. multocida* serotypes, bird species affected, and environmental parameters during the 1970, 1979, and 1994 avian cholera epizootics on Chesapeake Bay.

D.1.3: Wiese

Are Common Eider Nest Predators Limiting Species Recovery?

Wilhelm L. Wiese[1]*, Christopher J. Latty[1]

[1] U.S. Fish and Wildlife Service, Arctic National Wildlife Refuge, Fairbanks, AK, 99701 USA, wilhelm_wiese@fws.gov

The Pacific common eider (Somateria mollissima v-nigrum; COEI) population declined by 50–90% since the 1950s, and has since stabilized at these reduced numbers. It is a USFWS Bird of Management Concern, Tier 1 Priority Species, and pilot Flagship Surrogate Species for the barrier islands and associated lagoons. COEI breeding on barrier islands in the Beaufort and Chukchi Seas are uniquely at risk due to small population size and genetic and physical segregation throughout the annual cycle. The intensity and frequency of storm surges along the Beaufort Sea Coast is increasing, which may lead to a rise in flooding events. Nest predator populations are also reportedly increasing on the North Slope of Alaska and some species may be becoming more reliant on eggs for food. To assess the role of depredation as limiting factor for COEI recovery, we placed ~100 time-lapse cameras 2-5 m from COEI nests across 120 miles of barrier islands in the Eastern Beaufort Sea. Our objectives were to identify the causes of nest failure (abandonment, depredation, flooding, etc.) and quantify predators. We also assessed the effectiveness of traditional nest fate assessment methods. Preliminary results suggest abandonment and flooding events were low in 2015 and glaucous gulls and arctic fox were the primary nest predators. Video evidence also suggests that traditional methods of identifying nest fate and causes of nest failure may introduce bias. For example, we found that most abandoned nests were soon depredated, instances of egg membranes being removed by avian predators post-hatch, and occurrences of both avian and mammalian predators depredating the same nest.

D.1.4: Bowman

What Tools Do We Have for Sea Duck Conservation and What Constituencies Do We Need To Engage?

Timothy D. Bowman[1]*, Christine Lepage[2], John Y. Takekawa[3]

[1] U.S. Fish and Wildlife Service, Anchorage, Alaska 99503, USA, tim_bowman@fws.gov
[2] Canadian Wildlife Service, Quebec, Quebec, G1JOC3, Canada
[3] National Audubon Society, San Francisco, California, 94104, USA

Sea duck science and conservation, although still in its infancy relative to other waterfowl, has advanced to the point where managers are now able to focus on a few specific management actions or conservation issues. We highlight potential management tools that can be used to advance conservation of sea ducks or their habitats, and identify certain constituencies that could be influential in implementing conservation measures.

D.1.6: Dwyer

Industrial Interests within Arctic and Marine Environments of Importance to Sea Ducks

James Woehr[1], Mary Boatman[2], H. Grant Gilchrist[3] (Presented by Chris Dwyer)

[1]Division of Environmental Sciences, Bureau of Ocean Energy and Management, 45600 Woodland Road, Sterling, Virginia 20166, USA, James.Woehr@boemre.gov
[2]Office of Renewable Energy Programs, Bureau of Ocean Energy Management, 45600 Woodland Road, Sterling, Virginia 20166, USA
[3]Environment Canada, Science and Technology Branch, National Wildlife Research Centre, 1125 Colonel By Drive, Raven Rd., Carlton University, Ottawa, ON K1A 0H3, Canada

Expanding interests in alternative energy and resource extraction within marine and Arctic environments will likely create both issues and opportunities for sea duck conservation in North America. Within the U.S., efforts are underway among State and Federal partners to conduct monitoring and research programs that will help inform decisions about ocean planning, public interests and marine resources, including sea ducks. Across northern Canada and Alaska, a reduction in sea ice is creating an increasing interest in access, resource extraction and shipping in Arctic environments. This may also create issues and opportunities for the conservation of marine birds and sea ducks across the Arctic.

We provide an overview of the growing interests in marine and Arctic habitats for industrial use and development, and the potential threats or stressors they may create for sea ducks.

Are We Addressing the Right Things at the Right Scale?

Chris Dwyer[1*]

[1] U.S. Fish and Wildlife Service, Division of Migratory Birds, Northeast Region, 300 Westgate Center Drive, Hadley MA 01035, USA, chris_dwyer@fws.gov

Despite our increasing knowledge base for sea ducks, future efforts to conserve and manage each of the 15 species under the revised objectives of the North American Waterfowl Management Plan will require much different approaches, partners and public engagement than we've previously experienced or implemented.

The objective of maintaining long-term average populations of breeding sea ducks is certainly a primary interest. However, determining what the population estimates are for sea ducks during any portion of the annual cycle have been constrained by factors that are logistically and financially difficult to overcome. Without greater focus on the need to align population data with information necessary for supporting clear and explicit management (or policy) decisions, it will be difficult to accomplish this objective and measure our success over the next 25 years. The spatial and temporal scale at which we address this objective for sea ducks will be important, given our limited resources.

Conserving a habitat system with the capacity to maintain long-term average populations of sea ducks is vital. Efforts that are currently underway to improve our knowledge and understanding of the key geographic areas and habitats of importance to sea ducks in North America will increase our ability to focus on avenues of protection, provide information to support management and policy decisions, and help identify the appropriate constituencies to engage with. More critical for this

broader audience is our ability to effectively communicate what the “conservation ask” actually is, and why they should care. Once again, the scale and approach that we use to protect or increase habitat for sea ducks, and the public support needed to accomplish that objective will be important given our limited resources.

This presentation will wrap up the session by highlighting key accomplishments in our knowledge of sea ducks, and propose novel ideas for moving forward in the conservation and management of sea ducks to achieve the objectives of the North American Waterfowl Management Plan.