G.3: Management (Chair: Jim Anderson)

G.3.1: Hindman

Control of Mute Swans in the Upper Chesapeake Bay

Larry J. Hindman[1]*, William F. Harvey, IV[1], Hutchison R. Walbridge[1]

[1] Maryland Department of Natural Resources, 828B Airpax Road, Cambridge, MD 21613, USA, larry.hindman@maryland.gov

During the 1980s and 1990s, non-native mute swans (*Cygnus olor*) increased dramatically in the Maryland portion of the Chesapeake Bay. This population increase led to interspecific competition with colonial waterbirds, conflicts between territorial swans and people, and loss of submerged aquatic vegetation. In 2001, the Maryland General Assembly directed the Maryland Department of Natural Resources (MDNR) to control the growing number of mute swans. The MDNR initiated a large scale, integrated control program aimed at reducing the mute swans in the upper Chesapeake Bay beginning in 2005. We used a combination of oiling swan eggs to reduce swan recruitment and the culling of swans by shooting and live capture and euthanasia. Between 2002 and 2015, we treated 1,672 mute swan nests containing 9,450 eggs and culled 5, 355 swans. Egg-oiling prevented an estimated 6,200 mute swans from entering the non-breeding population that would have required culling. Using this integrated approach we reduced the State's mute swan population from 3,995 in 1999 to 25 in 2015. The control program resulted in the complete removal of mute swans from most areas of the upper Chesapeake Bay. Annual control program costs ranged from about $128,906 in 2005 to about $4,300 in 2015. Although control continues, the serious impact of mute swans on the Bay's submerged aquatic vegetation beds and colonial waterbird nesting sites has been eliminated. The control program has also eliminated the conflicts between territorial swans and citizens' recreational use of riparian waters. Although successful at achieving a significant reduction in swan numbers, we will continue to prevent swan recruitment and cull the remaining breeding swan pairs and those that immigrate from Virginia. Our success provides a model to other state and provincial wildlife agencies in North America that are considering or undertaking the implementation of mute swan control programs.

G.3.2: Nichols, T.

Mute Swan Management in New Jersey: Lessons Learned

Ted Nichols[1]*

[1] New Jersey Division of Fish and Wildlife, Woodbine, NJ, 08270, ted.nichols@comcast.net

Mute swans (*Cygnus olor*) are a non-native, invasive species, brought to North America from Eurasia during the late 1800s for ornamental purposes. Several studies have shown that mute swans cause a variety of conflicts, primarily destruction of submerged aquatic vegetation, displacement of native wildlife species, and aggressive behavior towards people, thus necessitating management in North America. The Migratory Bird Treaty Reform Act of 2004 affirmed that mute swans are a non-native species in North America and therefore not protected by federal regulation. Thus, it is up to the states to adopt policies, either individually or collectively (i.e. Flyway Councils), to implement measures to achieve management goals. However, given the perceived charisma of mute swans by some publics, enacting management strategies can be challenging for wildlife managers. Periodic surveys beginning in the 1980s indicated that the mute swan population in New Jersey was growing at about 7% per year and peaked at 1,890 birds during 2005. From 2007-14, New Jersey culled 1,662 mute swans in tandem with several disease surveillance research projects. Annual cull rates ranged from 13-18%. From 2007-14, the mute swan population declined at 10% per year to a 2014 estimate of 850 birds. Without management, the 2014 population could presumably have been 3,515 birds based on growth rates observed during the 1990s. Past, present and future issues concerning mute swan management in New Jersey and the Atlantic Flyway will be discussed.

G.3.3: De La Cruz

Diving Duck Response to Mixed-Species Habitat Management in an Urban Pacific Flyway Estuary

Susan E.W. De La Cruz[1]*, Lacy Smith[1], Stacy Moskal[1], John Krause[2], Mason Hill[1], Ashley Smith[1], Kyle A. Spragens[1], John Y. Takekawa[1,3]

1 U.S. Geological Survey, Western Ecological Research Center, San Francisco Bay Estuary Field Station, Vallejo, CA 94592, USA, sdelacruz@usgs.gov
2 California Department of Fish and Wildlife, Region 3, Napa, CA 94558, USA
3 Present address: National Audubon Society, Science Division, San Francisco, CA 94104, USA

San Francisco Bay is a critical wintering site for waterfowl and shorebirds of the Pacific Flyway. Waterbirds in this highly urbanized estuary rely on mudflat and managed salt pond habitats for roosting and foraging. The San Francisco South Bay Salt Pond Restoration Project is the largest tidal marsh restoration project on the Pacific coast, with an objective of maintaining current bird numbers on salt ponds while converting 50 to 90% of them to tidal marsh. Habitat managers are working to achieve this goal through multiple methods, including mixed-species management on a subset of ponds that are partially drained to create western snowy plover (*Charadrius alexandrinus nivosus*) nesting habitat in summer, and filled to create diving duck foraging habitat in winter. Our objective was to evaluate the response of diving ducks and their invertebrate prey to these management actions. During winter (Oct – April) 2013 - 2015 we measured duck abundance, behavior, and diets, benthic invertebrate density and community composition, and water quality in three mixed-species treatment ponds and in three reference ponds that were filled throughout the year. The most abundant divers in treatment ponds were scaup (*Aythya affinis* and *A. marila*) and ruddy ducks (*Oxyura jamaicensis*). Treatment ponds were used mainly for roosting, while foraging occurred more frequently in reference ponds. Benthic invertebrate species diversity and density increased from fall to spring and was greatest in deep areas of treatment ponds; however, diversity, density and spatial extent were greater in reference ponds. Scaup and ruddy duck diets consisted predominantly of ostracods and seeds in treatment ponds, versus amphipods and seeds in reference ponds. Preliminary results suggest that treatment ponds provide mainly roosting habitat for wintering waterfowl; however, foraging may be enhanced by increasing water circulation in deep borrow ditches during summer to maintain invertebrate populations.

G.3.4: Perry

Research and Management of Ducks on a Private Ranch in Argentina

Don Pablo Research Team: Andrea Amaiden[1], Alicia Berlin[1], Josh Bueth, Enrique Bucher[1], Anibal Carbajo[1], Erio Curto[1], Marcelo Janik[1], Alan Jolicoeur[1], Scott McWilliams[1], Glenn Olsen[1], Christopher Perry[1], Matthew Perry[1]*, Marcelo Prodel[1], Marcelo Romano[1], Sarah Sandoval-Mohapatra[1], Edward Soutiere[1]

[1] USGS Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, Maryland 20708 USA, mperry1209@verizon.net

A private 6300 hectare cattle ranch in Argentina (lat. -29.5) was converted to a duck hunting management area in 2007. Rice cultivation on large impoundments created in 2007-10 attracted up to 50 thousand ducks of 11 species. Objectives of research were to learn about movements of ducks, both local and long-distant, and habitat preferences to better manage their populations. Satellite telemetry with implanted 26-gram PTT-100 transmitters in rosy-billed pochard (*Netta peposaca*; n=16), white-faced whistling duck (*Dendrocygna viduata*; n=34), black-bellied whistling duck (*D. autumnalis*; n=14), and fulvous whistling duck (D. bicolor; n=29) in 2008-10, revealed random movements within an 850 km distance from the ranch, but an average of only 66 km. Although there was a tendency for the ducks to move south, there were no clear north/south movements as seen with ducks in the northern hemisphere. The distribution of ducks in the spring (Oct-Dec) in South America may reflect less dependency on specific habitats for breeding or because South America was less affected by recent ice age periods. Instrumentation of 3 Brazilian ducks (*Amazonetta brasiliensis*) in 2012 and 15 ringed teal (*Callonetta leucophrys*) in 2014-15 with 12-gram PTT-100 solar-powered satellite transmitters with loop harnesses, showed more local movements, 82% within 160 km of the ranch, for both species, but one ringed teal moved 400 km from ranch. Satellite-determined locations of all six species indicated strong selection of cultivated rice habitat by the ducks. Predation by fish and reptiles maybe an important factor in habitat use by ducks. Over 360 artificial nest boxes have been established on the ranch and provide nesting habitat for ringed teal and black-bellied whistling ducks. The ranch management has been a model for good wildlife management that is benefiting numerous species, including some species that have not been recorded in the area in many decades.

G.3.5: Elmberg

Success Factors Behind Multi-Stakeholder Multi-Species Management of Geese in an Agricultural Landscape

Johan Elmberg[1]*

[1] Kristianstad University, Kristianstad, SE-29188, Sweden, johan.elmberg@hkr.se

On both sides of the Atlantic, geese are a major management challenge, not least because of shifting distributions, increased availability of nutritious agricultural forage, and unprecedented growth of some populations. In northwest Europe, managers face the task of devising management strategies for areas with up to 10 co-occurring goose species. These taxa range from being globally threatened to over-abundant, usually present in mixed-species assemblages whose composition change seasonally. I present a case study from a densely populated agricultural region in south Sweden where goose numbers and damage by geese on crops have increased dramatically during recent decades. A goose management group (GMG) was founded in 2002 comprising landowners, farmers, hunters, ornithologists, conservation NGOs, and local and county level administration. The GMG has autonomy to self-organize and a key point is that it has neither legal jurisdiction nor authority to make formal decisions. This makes the GMG adaptive, free to react quickly to signals from the socio-ecological system. In essence, the GMG provides a collaborative arena for sharing experiences and discussing conflicts. With time this has built trust between stakeholders so that there is no longer any disagreement over input variables such as goose numbers, bag size, and magnitude of crop damage. Further GMG success factors are its continuity over time, that it is embedded in the local community, and that some of its members also represent authorities that do have jurisdiction over hunting permits and crop damage reimbursement. This is an example of how human-wildlife conflicts can be reduced and defused by simple means. Interestingly, GMG members as well as people outside the group consider it a success even though it has not led to reduced goose numbers locally, illustrating that understanding the sociology of management conflicts is often just as important as understanding biological details of the system.

G.3.6: Olson, A.^

Hot Ducks: Are Unshaded Nest Boxes an Ecological Trap for Wood Ducks?

Ami C. Olson[1]*^, John M. Eadie[1], Gary R. Hepp[2], Brian W. Olson[3]

[1] Wildlife, Fish, and Conservation Biology, University of California, Davis, CA, 95616, USA, amiolson@ucdavis.edu
[2] School of Forestry and Wildlife Sciences, Auburn University, Auburn, AL, 36849, USA
[3] Roosevelt Ranch LLC, Zamora, CA, 95698, USA

In California's Central Valley, availability of natural nest cavities appears to be limited and Wood Ducks (*Aix sponsa*) rely heavily on nest box programs. Current nest box management strategies commonly place nest boxes on poles away from trees to reduce access by nest predators. However, placing nest boxes in direct sun, where summer temperatures can reach around 45° C in the Central Valley, strongly influence the internal ambient temperature, and in turn, the incubation temperature in the nest. Current research has shown that slight changes in lab-controlled incubation temperatures can have adverse effects on duckling development and survival. In this study, we examined whether placing nest boxes in full sun versus shade can have similar detrimental impacts on duckling hatch success, development, and survival. We investigated the effect of nest box placement in 2014 and 2015 by randomly assigning nest boxes to a shade or no-shade treatment. Artificial shade structures were installed on approximately half of all active nests, while the other half remained unshaded. Shades were installed shortly before or after the onset of incubation; therefore, hens were unable to choose a shaded or unshaded box prior to egg-laying. Both incubation temperature and ambient temperature inside the nest box were recorded using iButtons. Each iButton recorded one temperature reading every ten minutes throughout the entire incubation period. Within 12-hours of hatch, ducklings were weighed, measured, assessed for neuromuscular development, and injected with a Passive Integrated Transponder (PIT) tag to uniquely mark each duckling. The PIT tags also enable long-term tracking, without the need of recapture, of all females returning to the breeding population in subsequent years. This is accomplished by installing Radio Frequency Identification (RFID) readers on each box within the study site. The RFID reader records the time, date, and unique PIT tag number each time a hen passes through the entrance of a nest box. Several results have emerged from our 2014 data: (1) Internal ambient nest box temperature in shaded nest boxes can be up to 6° C lower than that of unshaded boxes. (2) Hens are more easily able to regulate the incubation temperatures in cooler boxes. (3) Hatch rate and nest box exodus are higher in cooler boxes. (4) Cooler boxes produce more ducklings that are both structurally larger (have longer tarsus measurements) and weigh more. (5) Finally, neuromuscular reaction times are quicker for ducklings hatching from cooler boxes. Our results in 2014 suggest that unshaded boxes within California's Central Valley produce fewer and lower quality ducklings than boxes provided with shade. We are currently analyzing data from 2015, including assessment of return rates and survival of PIT-tagged ducklings from 2014.