P.4: Energetics (Chair: Brandt Meixell)

P.4.1: Mini^

From Equations to Reality: Building a Bioenergetic Model to Improve Waterfowl Conservation

Anne E. Mini[1]*^, Blaine Elliott[1], Dale James[2], Keith McKnight[3], Luke Naylor[4], John Tirpak[5]

[1] Lower Mississippi Valley Joint Venture, 193 Business Park Drive Suite E, Ridgeland, MS, 39157, USA, amini@abcbirds.org
[2] Ducks Unlimited, 193 Business Park Drive Suite E, Ridgeland, MS, 39157, USA
[3] Lower Mississippi Valley Joint Venture, 11942 FM 848, Tyler, TX, 75707, USA
[4] Arkansas Game and Fish Commission, 2 Natural Resources Drive, Little Rock, AR, 72205, USA
[5] U.S. Fish and Wildlife Service, Gulf Restoration Program, 700 Cajundome Boulevard, Lafayette, LA, 70506, USA

The Mississippi Alluvial Valley (MAV) is an ecologically rich wetland ecosystem, encompassing 25 million acres and wintering up to 40% of the waterfowl in the Mississippi Flyway. To support the mission of the North American Waterfowl Management Plan (NAWMP), the Lower Mississippi Valley Joint Venture uses a bioenergetic model to derive goals for waterfowl conservation. The difference between energy demand and energy supply represents state-level Duck Energy Day (DED) goals to achieve NAWMP objectives. Energy demand of the wintering waterfowl population is calculated for 110 days. Energy supply is estimated for foraging habitat on naturally flooded land and managed impoundments on private and public lands. The bioenergetic model includes acreage of each habitat and its energetic carrying capacity, while incorporating decomposition rates, disturbance, and the probability of flooding based on Monte Carlo simulation. Satellite imagery (1999-2005) and geospatial data (2010-2014) indicate that naturally flooded habitats provide 30% of energy on the landscape, managed private lands 17% and public managed lands 53%. Forested wetlands comprise a significant portion (55%) of all naturally flooded habitats. The Wetland Reserve Program (29%) and riceland agriculture (28%) provide most DEDs on private land, whereas cropland (60%) and moist-soil wetlands (36%) supply DEDs on public managed land. Current modeling estimates that 327,309,371 DEDs are available within the MAV, meaning that partners have achieved 70% of the NAWMP objective of 469,336,891 DEDs. Partners currently manage ~174,000 acres on public lands alone to provide impounded waterfowl habitat, so securing capacities to maintain these areas, as well as numerous private lands sites, is a high priority. However, all strategies to improve delivery of waterfowl conservation represent tradeoffs in acres and DEDs. With this process, the Joint Venture continues to refine its application of science to inform planning, and work through partnership to leverage planning into meaningful conservation for waterfowl.

P.4.2: Garrick, M.^

Dynamics of Nutrient Reserves and Digestive Tract of Female Northern Pintails Wintering Along the Texas Coast

Matthew J. Garrick[1]*^, Nathaniel R. Huck[1], Bart M. Ballard[1], Kevin J. Kraai[2]

[1] Caesar Kleberg Wildlife Research Institute, Texas A&M University–Kingsville, Kingsville, TX, 78363, USA, mjgarrick@gmail.com
[2] Texas Parks and Wildlife Department, Canyon, TX, 79015, USA

Unlike other dabbling ducks in North America, abundance of the northern pintail (Anas acuta) has remained below long-term average population levels and well below population objectives established by the North American Waterfowl Management Plan. A large proportion of pintails in the Central flyway winter along the Texas Coast where changes in land use over the last few decades have greatly changed the capacity of the region to support wintering pintail populations. Our objectives are to investigate several aspects of nutrition and energetics of pintails during winter. We collected pintails along the Texas coast from mid-October to mid-March during 2012-15. We estimated molt intensity using a grab sampling technique from 9 major plumage regions composed of 29 feather tracts. Specimens were plucked and necropsied to determine digestive-organ and muscle mass dynamics. Following necropsies, we dried carcasses and ground them into a fine powder to estimate fat content with ether extraction, and estimate protein content by ashing in a muffle furnace. Preliminary analysis on about 40% of our sample suggests that female pintails maintain protein reserves and catabolize 25% ($P < 0.001$) of their somatic fat reserves across winter. Digestive track mass declined by 18% ($P < 0.001$), primarily as a result of atrophy of the gizzard. Further analyses on molt intensity, blood metabolites, and the remainder of our sample will help reveal patterns in nutrient reserves of female pintails across winter.

P.4.3: McClain

Using Plasma-lipid Metabolites to Predict Lipid Reserve Dynamics in Free-living Lesser Scaup

Douglas R. McClain[1]*, Heath M. Hagy[1], Joshua M. Osborn[1], Aaron P. Yetter[1], Chris Hine[1], Michelle Horath[1], Jamison C. England[2], Jeffrey Levengood[2]

[1] F.C. Bellrose Waterfowl Research Center, Prairie Research Institute, University of Illinois at Urbana-Champaign, Havana, IL, 62644, USA, drmcclai@illinois.edu
[2] Illinois Natural History Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign, Champaign, IL, 61820, USA

The “Spring Condition Hypothesis” suggests that midcontinent foraging habitat has declined in quality, negatively impacting survival, reproductive success, and ultimately population size of migratory birds. Extended declines in species like lesser scaup (*Aythya affinis*) have been attributed to low lipid reserves during spring migration due, in part, to poor habitat quality. Current methods relating habitat quality to bird physiology may be influenced by habitat used in previous regions and highly variable among individuals. Recently, researchers noted a relationship between plasma-lipid metabolite changes, notably triglycerides (TRIG) and β-hydroxybutyrate (BoHB), and body mass of small-bodied wild birds. Using similar methods, metabolites explained daily mass changes in free-living lesser scaup at Pool 19 of the Mississippi River. To validate spatial and temporal robustness of this model, we constructed a similar index to detect whether lesser scaup accumulate or catabolize lipid reserves in the Illinois River Valley. During February–April 2015, we captured and banded lesser scaup (n = 130) at the Emiquon Preserve and Chautauqua National Wildlife Refuge near Havana, Illinois. We extracted approximately 1 mL of blood from brachial veins and measured mass of captured and recaptured birds. We regressed plasma-lipid metabolites, TRIG and BoHB, on daily changes in body mass. We excluded birds caught repeatedly (n = ≥4) as well as birds with palpable corn in their crop. Triglyceride and β-hydroxybutyrate explained variation in daily mass change (R2 = 0.23, F = 3.13, P < .005). Change in body mass ranged from -72 to +149 g, and 30% of 130 recaptured lesser scaup experienced body mass gains. Triglycerides were positively correlated (P = 0.009) and β-hydroxybutyrate negatively correlated (P = 0.028) with daily mass changes. Our results provide support for triglycerides and β-hydroxybutyrate as predictors for daily changes in lipid reserves and may aid in assessing the quality of migration habitat for waterfowl.

P.4.4: Open

P.4.5: Fino^

The Energetic Value of Mid-Atlantic Forested Wetlands to Wintering American Black Ducks

Samantha Fino[1]*^, Christopher K. Williams[1], Mark Livolsi[1], Kevin M. Ringelman[1], John M. Coluccy[2], Patrick K. Devers[3], Paul M. Castelli[4]

[1] Department of Entomology and Wildlife Ecology, University of Delaware, Newark, DE, 19716, USA, srfino@mix.wvu.edu
[2] Ducks Unlimited, Great Lakes/Atlantic Regional Office, 1220 Eisenhower Place, Ann Arbor, MI 48108, USA
[3] Black Duck Joint Venture, Laurel, MD, 20708, USA
[4] Edwin B. Forsythe National Wildlife Refuge, Galloway, NJ, 08205, USA

Wintering populations of American black ducks (*Anas rubripes*) have declined throughout their range since the 1950s. Currently, habitat conservation for wintering black ducks is based largely on bioenergetics models of carrying capacity, and managers seek to provide sufficient energy in the form of preferred food items. The importance of saltmarsh habitats to wintering black ducks along the Atlantic Coast is well documented, but, recent evidence also suggests that forested wetlands are important wintering habitats for black ducks, yet their foraging value and energetic potential is unknown. Quantifying the energetic value of forested wetlands is important for estimating black duck carrying capacity. We collected 46 soil core samples taken from forested wetlands on Prime Hook National Wildlife Refuge in Milton, DE in 2014 to estimate food biomass and quantify the energetic capacity of forested wetlands in the Mid-Atlantic region. The energetic value per hectare is 16.064 ± 4.93 kg. In considering forested wetland habitats that are potentially available to coastal black ducks, we estimated that forested wetlands within a 24.1 km distance from the coast provide between 31,181,117 – 54,098,939 duck use days. Forested wetlands may be an important foraging resource for wintering black ducks, and the estimates provided here will help to refine bioenergetic models for black ducks in the Atlantic Flyway.

P.4.6: Henson

Does Hunting Alter Waterfowl Body Condition and Stress Physiology?

Jerad R. Henson[1]*, Christopher Sims[2], Stephan Schoech[1]

[1] Department of Biological Sciences, University of Memphis, Memphis, TN 38152, USA, Jrhenson@memphis.edu
[2] Department of Mathematical and Natural Science, The University of Arkansas Monticello, Monticello, AR 71656, USA

Waterfowl face a multitude of stressors while in the Mississippi Alluvial Valley (MAV). These stressors include energetic demands associated with life history stage, weather, habitat availability, and waterfowl hunting seasons. Many studies have examined the effects of hunting on waterfowl, but very few have focused on how hunting affects the stress physiology of waterfowl. Any stressful stimulus will elicit a physiologic stress response and activate the sympatho-adrenal system. This culminates with the release of epinephrine and corticosterone (CORT). These hormones aid in survival and recovery over the short-term but if CORT is elevated over a long period it can lead to decrements in health. Importantly, maintenance of body condition through winter and spring is well-known to affect reproduction. The aim of this ongoing study is to determine how hunting pressure and duration of hunting pressure alter body condition and stress physiology of mallards (*Anas platyrhynchos*) while in the MAV. Mallards were collected before, during, and after the waterfowl hunting season in eastern Arkansas via hunting methods. Only clean, one-shot killed birds were sampled. A blood sample was taken immediately, and then morphometrics and a breast fat score were recorded for each bird. Blood samples were then analyzed for plasma triglycerides and baseline CORT. Morphometrics were used to create a body condition index. We hypothesized that baseline CORT and body condition would change as the season progressed. Thus far, our data does not support our hypothesis and indicates that hunting and hunting duration do not alter baseline CORT or body condition.