O.4: Foraging Ecology (Chair: Heath Hagy)

O.4.1: Vanderhorst^

True Metabolizable Energy of Submersed Aquatic Vegetation for Dabbling Ducks

Sarah E. Vanderhorst[1]*^, Heath M. Hagy[1], John W. Simpson[2], Chris N. Jacques[3]

[1] Illinois Natural History Survey, Forbes Biological Station-Bellrose Waterfowl Research Center, Prairie Research Institute, University of Illinois at Urbana-Champaign, P.O. Box 590, Havana, IL, 62644 USA, sevander@illinois.edu
[2] Winous Point Marsh Conservancy, 3500 S Lattimore Road, Port Clinton, OH 43452 USA
[3] Western Illinois University, 1 University Circle, Macomb, IL, 61455 USA

Aquatic systems in the Midwest have been highly modified since the beginning of the 20th century, including channelization, damming, and dredging of most large rivers (e.g., Illinois, Mississippi, Ohio, Missouri) and disconnection from their natural floodplains with networks of levees. While the loss of submersed aquatic vegetation from hydrologically-connected wetlands and backwater lakes along the Illinois and Mississippi rivers is well-documented, information is unavailable to determine the implications of these losses on energetic carrying capacity for waterfowl, especially dabbling ducks. The objective of this study is to estimate true metabolizable energy of species of submersed aquatic vegetation common to the Upper Midwest for dabbling ducks. We will conduct feeding trials using wild-strain mallards (*Anas platyrhynchos*) during autumn 2015. Feeding trials consist of a 48-hour fasting period followed by precision feeding of seven species of submersed aquatic vegetation (e.g., *Stuckenia pectinata, Ceratophyllum demersum*) and a 48-hour period in a metabolic chamber where excreta is collected. We will estimate gross energy of test foods and excreta using a Parr adiabatic oxygen bomb calorimeter and adjust estimates for digestion efficiency to ascertain true metabolizable energy. We expect the true metabolizable energy of submersed aquatic vegetation to be less than that of seeds, tubers, and other hard mast. Our data may be useful to conservation planners for estimating energetic carrying capacity of semi-permanently-flooded marsh habitats, projecting impacts of wetland management alternatives such as semi-permanently-flooded marsh verses moist-soil management, assessing the tradeoffs in habitat quality for dabbling ducks of hydrologic connectivity with rivers and lakes, and as input parameters in models predicting habitat change over time or in response to stressors (e.g., climate change).

O.4.2: Behney

Worth the Reward? An Experimental Assessment of Risk-taking Behavior in Foraging Ducks

Adam C. Behney[1,3]*, Ryan O'Shaughnessy[1,4], Michael W. Eichholz[1], Joshua D. Stafford[2,5]

[1] Cooperative Wildlife Research Laboratory, Center for Ecology, Department of Zoology, Southern Illinois University, Carbondale, IL, 62901, USA, adam.behney@state.co.us
[2] Frank C. Bellrose Waterfowl Research Center, Illinois Natural History Survey, Institute of Natural Resource Sustainability, University of Illinois, Havana, IL, 62644, USA
[3] Present affiliation: Colorado Parks and Wildlife, Fort Collins, CO, 80526, USA
[4] Present affiliation: Borderlands Research Institute, Sul Ross State University, Alpine, TX, 79832, USA
[5] Present affiliation: U.S. Geological Survey, South Dakota Cooperative Fish & Wildlife Research Unit, Department of Natural Resource Management, South Dakota State University, Brookings, SD, 57005, USA

The way predators influence prey behavior is central to many components of basic and applied ecology. Foraging ducks face a fundamental tradeoff between food consumption and predation risk. Factors that influence ducks' perceived predation risk or valuation of energy may affect how they approach this tradeoff. We manipulated food abundance in wetlands differing in vegetation structure to assess the merits of life history theory, perceived predation risk, and energetic demand in explaining how much risk five duck species during spring migration were willing to engage in while foraging. We found some evidence consistent with our life history prediction; species with a faster life history strategy were willing to engage in riskier behavior, by feeding more intensively, for a greater food reward. Mallards (*Anas platyrhynchos*) and wood ducks (*Aix sponsa*) exhibited risk-taking behavior consistent with perceived predation risk. Mallards devoted more time to feeding when in areas with less cover indicating that they perceive open habitats as safer. Wood ducks devoted more time to feeding in treatment plots, when in shallow areas, and larger flocks. Wood ducks exhibited behavior that was also consistent with an increase in energetic demand as observed by an increase in the proportion of time devoted to feeding later in the spring as they approached nesting. Habitat management for nonbreeding ducks typically focuses on providing large quantities of high quality food. We demonstrate that habitat structure can limit the efficiency with which ducks exploit this food resource due to perceived predation risk. Furthermore, we found that the way ducks balance the risk-reward tradeoff while foraging is dependent on a variety of factors and different for different species.

O.4.3: DuBour^

Dietary Patterns of Lesser Scaup Ducklings in a Heterogeneous Landscape

Adam J. DuBour[1]*^, Kirsty E. Gurney[2], Mark S. Lindberg[1]

[1] Department of Biology and Wildlife, University of Alaska Fairbanks, Fairbanks, AK 99775, USA, ajdubour@alaska.edu
[2] Environment Canada, Science and Technology Branch, Saskatoon, SK, S7N 3R2, Canada

Lesser scaup (*Aythya affinis*) (hereafter scaup) have experienced prolonged population declines since the 1980's. Declines in scaup populations have been blamed on changes in boreal wetland breeding habitats and food resources related to climate warming. Scaup ducklings require abundant aquatic invertebrate prey for growth and survival and spatiotemporal changes in availability of important prey may result in a mismatch with duckling demand. On the Yukon Flats National Wildlife Refuge in interior Alaska scaup broods are associated with lakes with high Amphipod densities. However, scaup duckling diet is known to be diverse and densities of potential prey items on brood-occupied lakes are highly variable. Understanding how ducklings respond to natural variations in food abundance may aid in predictions as to how ecosystem change will affect scaup populations. The objectives of this study are to examine the degree of specialization and variation in diet of scaup ducklings across lakes with varying prey community composition and densities. We used MixSIAR, a Bayesian-based stable isotope mixing model, to estimate the proportional contribution of three broad invertebrate groups [Predatory(Odonata larvae), Pelagic(Gastropods, Corixids and Conchostraca) and Benthic(Amphipods and Chironomid larvae)] to scaup duckling diet. Additionally, the hierarchical nature of MixSIAR allowed us to estimate the variation within and among lakes by modeling "Lake" and "Individual" as random effects. At the population level, scaup ducklings consumed significant proportions of all three prey groups with the highest proportion coming from the Pelagic group, followed by the Benthic group and then the Predatory group. "Lake" accounted for the majority of the variation in the population diet indicating that individuals within lakes had relatively similar diets compared to individuals from other lakes. Together, these findings suggest that scaup ducklings are generalist consumers and that prey availability drives selection.

O.4.4: Marty^

Waste-Rice and Natural Seed Abundance in Rice Fields in the Gulf Coast Prairies of Louisiana and Texas

Joseph R. Marty[1]*^, J. Brian Davis[2], Richard M. Kaminski[3], Michael G. Brasher[4], Guiming Wang[5]

[1] Department of Wildlife, Fisheries, and Aquaculture, Mississippi State University, Mississippi State, MS, 39762, USA, jrm803@msstate.edu
[2] Department of Wildlife, Fisheries, and Aquaculture, Mississippi State University, Mississippi State, MS, 39762, USA
[3] James C. Kennedy Waterfowl & Wetlands Conservation Center, Belle W. Baruch Institute of Coastal Ecology and Forest Science, Clemson University, Georgetown, SC, 29585, USA
[4] Gulf Coast Joint Venture, Ducks Unlimited, Inc., Lafayette, LA 70506, USA
[5] Department of Wildlife, Fisheries, and Aquaculture, Mississippi State University, Mississippi State, MS, 39762, USA

Commercial rice production and idled ricelands provide important habitats for waterfowl and waterbirds in the Chenier Plain (CP) of Louisiana and Texas and the Texas Mid Coast (TMC). Spatio-temporal dynamics of waste rice and natural seeds have not been previously estimated in CP and TMC regions as in other rice growing regions of North America. Nonetheless, contemporary evidence posits that abundance of waste rice is variable and influenced by region, month, and post-harvest treatments. Ricelands in the CP and TMC are assumed to provide approximately 42% of the estimated carrying capacity for wintering waterfowl in this region; thus, precise estimates of waste rice and natural seed densities are necessary for habitat conservation planning by the Gulf Coast Joint Venture. We conducted a spatially stratified multi-stage sampling survey to estimate waste rice and natural seed densities in production and idled rice fields in the CP and TMC. We collected 8,750 soil cores from production and idled rice fields during August, October, and November 2010-2013. We washed cores through a series of graduated sieves to recover rice and natural seeds. We manually removed rice and natural seeds from samples and dried seeds to constant mass (± 0.5 mg) at 87º C before weighing to the nearest 0.0001 g. We used PROC SURVEYMEANS to estimate mean waste rice and natural seed abundance among geographic regions, time-periods, and post-harvest treatments. Analyses of soil cores through 2012 indicated that abundance of waste rice in the CP declined 59% from 525 kg(dry)/ha (CV = 32.1%) in August following the first harvest to 215 kg/ha (CV = 25.6%) after a second crop was harvested in November. In fields without a second rice crop, abundance declined 87% to 66 kg/ha by November (CV = 69.7%), similar to waste rice abundance in the Mississippi Alluvial Valley (78.4 kg/ha, CV = 15%). In the TMC, waste rice abundance increased 120% from 221 kg/ha (CV = 20.3%) following the first harvest to 488 kg/ha (CV = 40.8%) after a second crop was harvested. Rice abundance was greatest in fields with a standing unharvested second crop in both the CP (366 kg/ha; CV = 28%) and the TMC (1,137 kg/ha; CV = 81%) regions. Natural seed abundance ranged from 142 kg/ha (CV = 32.5%) in disked idle fields in the CP to 355 kg/ha (CV = 23.6%) in standing idle fields in TMC. Overall, seasonal trends of waste rice in fields with a harvested second crop decreased in the CP and increased in the TMC, and natural seed abundance was greatest in idled fields with standing vegetation as anticipated. Growing and harvesting a second crop of rice in November likely mitigates rice loss due to decomposition, germination, or granivory that may occur between the first and second harvests. Our results will be critical metrics for daily ration models used to estimate foraging carrying capacity of ricelands in these regions.

O.4.5: Drahota

Anas spp. Body Condition and Ingested Foods During Spring Stopover

Jeff L. Drahota[1]*, Dustin Casady[2], Mery Casady[3], Ryan Walters[4]

1 U.S. Fish and Wildlife Service, Rainwater Basin Wetland Management District, Funk, Nebraska, 68940, USA, jeff_drahota@fws.gov
2 U.S. Fish and Wildlife Service, Buckley Air Force Base, Colorado, 80011, USA
3 U.S. Fish and Wildlife Service, Rocky Mountain Arsenal National Wildlife Refuge, Commerce City, Colorado, 80022, USA
4 Creighton University, Department of Medicine, Omaha, Nebraska,68178, USA

Supporting spring migration by providing adequate wetland-derived food resources is assumed to be an important strategy to support North American Waterfowl populations. Yet little is known about food selection for many puddle ducks while staging on spring mid-latitude habitats. Furthermore, little is known about spring puddle-duck body condition at mid-latitudes. We examined ingesta from 6 species of puddle ducks that fed in wetlands to determine if forage selected is different between early and late arriving ducks. Peak migrations were determined by tri-weekly waterfowl surveys in 2012 (n = 31 wetlands) and 2013 (n = 32 wetlands) during spring migration. The most frequently consumed items were wetland-derived seeds (73.7 ± 1.8% aggregate mass) for all 6 species collected, second was corn at 21.7% ± 1.8% aggregate mass during these two dry springs. Invertebrates comprised 1.4% aggregate mass consumed by all ducks, even norther shoveler who are typically considered invertebrate specialists only consumed 12.4% by mass. Seed mass for all wetlands sampled was 635.6 ± 58.8 kg/ha. The amount of seed mass removed was correlated to the amount of mass available (r^2 = 0.605, P = 0.0001). Mean seed abundance across wetlands sampled was 3.14 ± 0.39 seeds/cm^2. The most abundant seeds found were annual smartweeds (23.8%) and sedges (21.1%). The numbers of seeds removed was also correlated to the number of seeds available (r^2 = 0.320, P = 0.0007) and the mean number of seeds removed from all wetlands available (ponding depth >0.5 - <30.0 cm) was 2.1 ± 0.39 seeds/cm2. Significantly more seeds were removed (Z = -4.33, P = 0.0001) from annual stands ($\bar{X}$ = 3.83 ± 0.54 seeds/cm2) than from perennial stands ($\bar{X}$ = 0.69 ± 0.48 seeds/cm2). Body condition (mass, fat, and protein) did not influence dietary preference for any species (n = 471 ducks) or either sex (n = 220 hens and 251 males) within species. Ducks appear to be focusing on the most efficient foraging habitats during spring stopover. Wetland management is used as a method to increasing wetland-derived energy for waterfowl; however, we recommend future conservation delivery programs focus on wetland restoration practices that increase ponding frequency during spring migration to support population goals identified in the North American Waterfowl Management Plan.

O.4.6: VonBank^

Food Habits and Availability for Lesser Scaup (*Aythya affinis*) During Spring

Jay A. Vonbank[1]*, Heath M. Hagy[1], Joshua M. Osborn[1], Jamison C. England[1], Aaron P. Yetter[1], Michelle M. Horath[1], Chris S. Hine[1], Douglas R. McClain[1]

[1] Illinois Natural history Survey, Bellrose Waterfowl Research Center-Forbes Biological Station, Prairie Research Institute, University of Illinois Urbana-Champaign, Havana, IL 62644, USA, jayvonbank@gmail.com

The Illinois and Mississippi River corridors provide critical stopover habitat for migrating waterfowl. However, recent evidence suggests that wetlands associated with these river systems provide limited seed and invertebrate biomass for waterfowl in spring. The “Spring Condition Hypothesis” states that these declines in midcontinent foraging habitat quality may explain extended declines in species like lesser scaup (*Aythya affinis*). We experimentally collected lesser scaup (n = 232) from foraging flocks throughout the Illinois and Upper Mississippi River valleys during February–April 2014–2015. We extracted upper digestive tracts and collected benthic food samples at collection sites to evaluate food use and selection. Further, we compared food items at collection sites to foods from randomly-collected samples throughout wetlands. Lesser scaup collected in 2014 contained plant material more frequently (92%) and at a greater percent aggregate mass than invertebrates (63%). Digestive tracts also frequently contained invertebrates (87%), but overall aggregate percent biomass (33%) was less than plant material. Overall food density was greater in the Upper Mississippi River Valley (321.6 kg/ha) than the Illinois River Valley (205.1 kg/ha). Food density at collection sites was greater than those from randomly-collected samples in 52.7% of wetlands. However, this frequency was much lower in the Upper Mississippi River (33.3%) than the Illinois River Valley (57.9%). The Upper Mississippi River appeared to be of greater foraging quality during spring than the Illinois River, perhaps contributing to lesser scaup’s lower frequency of selecting sites with greater foods than randomly available in this region. Moist-soil seeds and other plant material were important food items for lesser scaup, but overall food availability was low and likely a limiting factor of diving duck abundance.