University of Manitoba | Faculty of Graduate Studies

Ph.D. Oral Examination

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Biological Sciences

The oral examination of the doctoral thesis titled

The development and maintenance of migratory timing programs in a songbird

will be held on

Friday, April 29, 2022, at 09:00 AM

via Zoom https://zoom.us/j/98953146616

Examining Committee

Advisor: Dr. Kevin Fraser, Advisor Biological Sciences

Examiners:
Dr. Gail Davoren, Biological Sciences
Dr. Colin Garroway, Biological Sciences
Dr. Saman Muthukumarana, Statistics

External Examiner:
Dr. Joseph J. Nocera
Forestry and Environmental Management
University of New Brunswick

Thesis Abstract

Advancing spring phenology due to climate change can result in different behavioural responses in long-distance migratory birds, such advancement in their spring arrival date. However, the degree to which timing is flexible to environmental change and the underlying mechanisms require further investigation. To investigate timekeeping systems in free-living long-distance migratory birds (purple martin *Progne subis*) in a natural ecosystem, this thesis used the 'wild clock' approach, which is the combination of chronobiology and ecology. Birds may flexibly respond to advancing springs if earlier first egg dates expose hatched birds to different environmental cues, such as photoperiod, which they may use to synchronize their internal clock time (ontogenetic effect). I found that nest timing (first egg date) was an influential factor on the post-breeding movement timing (fledge date and colony departure date) in a wild population of purple martins. I used an experimental approach to further explore the phenotypic plasticity of young purple martins to photoperiod experienced in the nest. With a simulated, early photoperiod I found that exposed nestlings had a longer nesting period and later fledge and autumn departure dates than birds that experienced natural day length. I also found that an anthropogenic light at night (ALAN) treatment changed the timing of post-breeding movements, where nestlings exposed to white light had higher weight and later colony departure date than young who experienced green light and natural darkness. Lastly, I investigated the impact of aging on timing. Using data for 1-5 year old birds, I found that spring migration timing and the timing of nesting advanced as birds age, which may reflect the effects of experience or that optimal time is under different time selection pressures as birds age. Overall, this study contributes to our understanding of the synchronization of internal clock time during nestling development with one of the most important *zeitgebers*, photoperiod, and its carry-over effects on migration timing as well as the impact of age on migratory strategies. Future research could investigate whether timing developed in the nest to photoperiod continues into adulthood providing further insight into climate change impacts on migration timing.