Ketterson / Nolan Research Group Collection

This document is part of a collection that serves two purposes. First it is a public archive for data and documents resulting from evolutionary, ecological, and behavioral research conducted by the Ketterson-Nolan research group. The focus of the research is an abundant North American songbird, the dark-eyed junco, *Junco hyemalis*, and the primary sources of support have been the National Science Foundation and Indiana University. The research was conducted in collaboration with numerous colleagues and students, and the objective of this site is to preserve not only the published products of the research, but also to document the organization and people that led to the published findings. Second it is a repository for the works of Val Nolan Jr., who studied songbirds in addition to the junco: in particular the prairie warbler, *Dendroica discolor*. This site was originally compiled and organized by Eric Snajdr, Nicole Gerlach, and Ellen Ketterson.

Context Statement
This document was generated as part of a long-term biological research project on a songbird, the dark-eyed junco, conducted by the Ketterson/Nolan research group at Indiana University. For more information, please see IUScholarWorks (https://scholarworks.iu.edu/dspace/handle/2022/7911).

GOALS 99, May 1, 1999

Each year we prepare the study area by creating T- and C-males; then we monitor the relative reproductive success and survival of males of both types. This work, done by the group as a whole, allows us to assess annual variation in the impact of testosterone on population structure (age ratio, return rate) and components of fitness (EPF rates, predation rates, survival of adults, mass of nestlings at fledging, etc.). To this end, we all implant birds, map territories, find nests, bleed/band/weigh nestlings, enter data into the computer, and take a hand at the daily list.

Each year we also pursue sub-projects that serve to document the multiple effects of T on the phenotype. These may lead to publishable papers or lay the groundwork for future studies. In 1999, we will continue to quantify effects of testosterone on male behavior and physiology and their relationship to fitness. We will also measure aspects of the male's 'extended phenotype' in his neighbors, mate, and offspring. Simultaneously we will analyze demographic and other kinds of data collected since 1994.

Listed here are projects for the summer, not all of which we will be able to pursue. Much will depend on how many birds we implant, whether predators are abundant this year, and the interests of members of the crew. Projects marked with ** are must do. Those followed by an @ are tentative or on hold. Please read the list and offer suggestions.

I. Map study area

- Map locations of all nests using GPS.**

II. Male phenotype: Susceptibility to disease and survival, song system

- Compare treatments with respect to cell-mediated and humoral immunity in captive and free-living juncos. For cell-mediated immunity, measure response (wing web swelling) to a foreign protein. For humoral immunity, measure ability of captive males to form an antibodies against KLH (keyhole limpet hemocyanin?) and SRBC (sheep red blood cells). Compare direct and indirect effects of corticosterone and testosterone (Casto). **
- Compare song control system in T- and C-males (Casto and Hopenstand)(TBA)

III. Male phenotype: Mating effort vs. parental effort

- Further document link between T- and C-males and offspring. Compare treatment males for load size and actual feeding behavior at the nest (video) with or without temporary removal of female (Clotfelter).**

- Compare treatment males for flexibility in their response to mating and parental opportunities by observing their behavior at the nest when there is a fertile female nearby [coordinate with Neudorf] or before and after their broods have been enhanced in size. Possibly compare the response (hyperactivity) of recently captured parental males from 714 to tapes of begging calls, then return to field (Clotfelter).@

IV. Extended phenotype: females

- Impact of male's treatment on movements by females when they are fertile (Neudorf, Ziolkowski).**

- Measure cell-mediated immunity in free-living females at nest-leaving(Casto).**

- Measure possible impact of male's treatment on degree of hatching asynchrony by noting differences in hatching times (team).**

- Depending on results from last year (Buerkle, Casto, Grindstaff and team), continue determination of whether male's treatment affects sex ratio of female's offspring. This requires bleeding nestlings when quite young, measuring survival during the fledgling stage, and measuring rate of return of male and female nestlings (team). **

- Collect plasma from nest-building and laying females to document hormone levels during laying (team).@

V. Extended phenotype: offspring

- Complete an earlier project by comparing vocalizations of fed and deprived nestlings from T- and C-nests, especially with respect to duration and amplitude of begging (Ketterson). **

- Compare nestling mouth coloration as an indicator of relative condition of T- and C-nestlings (Clotfelter).**

VI. Extended phenotype: male neighbors

- Compare T-levels in control males with and without T-neighbors. @

VII. Constraints, heritability (also colony and colony maintenance)

- Mate choice trials: are females with experimentally enhanced T less or more attractive than controls? (Jones and Ian).**

- Rear young in Bloomington to produce experimental system and opportunity to compare siblings.**

- Possibly transport newly caught juncos to Bloomington in late summer to help maintain a colony of juncos there, study autumn Zugunruhe. Perhaps hand-rear related (sibling) fledglings and transport to Bloomington to lay groundwork for measures of heritability of T and T-mediated traits, depending on success of breeding efforts in Bloomington.

VIII. Demography and data analysis

- Continue to compare treatments with respect to reproductive success, analyze new paternity data from Parker lab.**

- Analyze data from nest watches from 96 and 97, evening, inter-feeding intervals (IFIs).

- Demographic data, 94-present, return rates of adults and young**, mate fidelity**, fledgling mass and numbers, annual variation in rates of predation, opportunities for EPFs, etc.

- Keep up with USFWS banding schedules, fitness correlates sheets, and other summary sheets as we go.

- Compare tail white measurements in males that return from having been T- and C- in a previous year. Quantify comparison of molt in males whose implants were not removed. Compare pox, condition, clo pro, fat class, etc. of T- and C-males.

IX. Possible additional or alternative sub-projects for this or another year. @

- Compare effect of treatment with T on plumage. This would be an excellent year because so many males are new (young) so it would be possible to get a before after with and without T, could do base color of plumage and tail whites.

- Assess importance of early condition to later fitness by obtaining plasma hormone samples from juveniles to see whether cort or T predicts which return.

- Measure begging response of hand-reared young to simulated treatment-specific feeding schedules to see how nestlings "learn to beg." Would require analyzing data already collected that compare T- and C-males for the schedules on which they feed their young.

- Attempt to document natural co-variation between control levels of plasma T and behavior.

- Attempt to determine repeatability of plasma T levels within control individuals across conditions and similarities in T-levels among relatives.

- Does experience with having been mated to a T-male affect whether a female finds T-males more attractive than C-males?

- Compare levels of cortiocosteroid binding globulin (CBG) in free-living T- and C-males by collecting plasma at nest-leaving. Consider whether to collect fresh blood at nest-leaving for this purpose.

- Compare treatment males for copulation frequency: do sperm reserves re-fill more rapidly in T- than C-juncos? Are T-males more likely to mount a stuffed female either in captivity or in the field? [coordinate with Neudorf].