TITLE: Effects of Operational Sex Ratio on Spatial Learning Ability in Prairie Voles

Introduction: Prairie voles (*Microtus ochrogaster*), are a commonly used model of nonhuman social monogamy. Traditional monogamous systems are comprised of male-female pairs that share territory and care for offspring. Operational sex ratio (OSR), the relative ratio of males to females that are sexually receptive, can affect sexual selection, and in monogamous systems, OSR tend to be about 1:1. However, population densities with male-biased OSR generate more male-male competition, thereby increasing variance in reproductive success and mating tactics. Cognitive characteristics, such as navigational skills, may increase males reproductive success by increasing their ability to navigate the social world. We hypothesized that prairie voles placed in a complex social and spatial environment will have better navigation skills and perform better in the Morris water maze (MWM).

Methods: Fifty prairie voles were distributed into two groups: high density (18 M : 12 F) and low density (8M : 12 F) in semi-natural outdoor enclosures for four weeks. Males were returned to the lab and MWM was used to asses spatial memory. Spatial learning was tested twice a day for five days, and memory was tested in a final trial.

Results: A repeated measures ANOVA showed high density males learned faster and better than low density males ($P = 0.03$). High density males also spent more time in the area where a submerged platform was removed, indicating that they had better memory for the location of a target ($P = 0.01$).

Discussion: Our findings support the hypothesis that males in a male-biased OSR have superior spatial learning and memory than males from a non-male-biased OSR. These data indicate that holding environmental complexity constant, the social environment can influence the spatial memory of males. Future work will investigate paternity analysis among these males to determine if a reproductive advantage relates to spatial memory, and comparisons of the hippocampus – a brain area closely associated with spatial memory – to determine if size or hormonal expression within the hippocampus related to the difference in cognition in these males.