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Breeding Stage and Parentage Affect Tameness in Common Loons

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Introduction

Tameness is an important behavioral attribute in animals that measures tolerance towards human disturbance. Understanding factors associated with tameness can help us understand behavioral changes of animals to human disturbance as well as aid in conservation strategies to minimize the dangers to animals caused by humans. Flight initiation distance (FID), defined as the distance at which an animal moves away from an approaching human, is a common way of measuring tameness[1]. Studies investigating tameness have reported weak correlations with a multitude of factors including age, sex, size and reproductive period[2,3]. Species have also been shown to adapt to changes in human disturbance. For example, populations of the same species of birds have been shown to be more tame in urban environments than rural ones[4]. Identifying the factors associated with tameness will tell us how animals respond to human disturbance.

The effect of breeding stage on tameness has been poorly understood. Previous studies have shown either increased[5] or decreased[6] tameness for animals with offspring than those without. Another factor that has been largely overlooked has been the similarity between tameness of parents and offspring[7]. A high correlation in tameness between parents and offspring may suggest that tameness is heritable. This would mean that populations may be able to adapt to increasing human disturbance. We investigated tameness correlates in a population of common loons (Gavia immer) in Northern Wisconsin. A large subset of the population has been banded and monitored through field observations for the past 24 years.

Our objectives were to investigate tameness by measuring FID in common loons. Specifically we determined whether tameness was similar between parents and offspring and whether it was influenced by breeding stage.

Fig. 1 A loon with its chick. Loons remain in close proximity to their chicks especially during the first few weeks when the chicks cannot dive efficiently to escape predators and feed for themselves.

Methods

The common loon (*Gavia immer*) is an aquatic bird that winters along the Pacific and Atlantic Oceans and breeds on glacial lakes in the northern US and Canada[8]. Our study area consisted of 120 lakes within Oneida County, Wisconsin.

Between 1993 and 2016, loons were captured at night from motor boats and marked with unique combinations of four leg bands consisting of three colored plastic bands and one US Fish and Wildlife Service metal band.

Weekly observations between April-August every summer from 2014-2016 provided us with the four leg band combinations of territorial pairs on each lake. Tameness was measured on loons as part of the weekly observations when a loon was preening, resting or locomoting and at least 50m from any conspecifics.

Fig. 3 A preening loon with its colored bands visible.

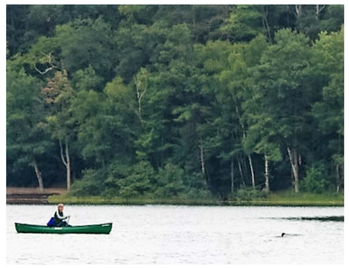

Fig. 2 An observer approaching a loon.

Tameness Approach

An observer first identified a loon by noting their four leg band color combination. The observer then approached the loon in a solo canoe at a steady pace of 0.5-1.0 m/s. The observer measured the distance between the loon and himself using a laser rangefinder incrementally every 4-6m. The shortest distance collected between the loon and the observer before the loon dove was used as the FID value.

Results

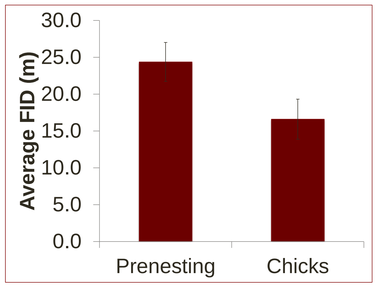

Figure 1. The average FID value in meters for loons in the prenesting stage (n = 54) and loons that are rearing chicks (n = 50). (t-test, p = 0.04).

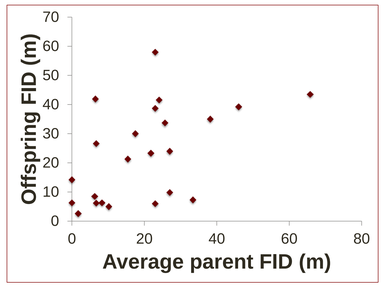

Figure 2. Linear regression of parent and offspring FID in meters. Multiple FID measurements of the same loon were averaged. (n = 23, $r^2 = 0.26$, p = 0.01).

Loons in the prenesting stage had higher FID values than loons rearing chicks indicating that they were less tame (t-test, p = 0.04, Figure 1).

Offspring FID was positively correlated with parent FID (Linear regression, n = 23, $R^2 = 0.26$, p = 0.01, Figure 2) indicating that parents and offspring have similar tameness. Mid-parent FIDs were used when FID was collected for both parents.

Discussion

Animals in their non-breeding stage generally compare the risks of an approaching threat with the benefits of remaining, fleeing when the risks outweigh the benefits[1]. The addition of rearing offspring complicates the matter as now they have to decide whether to stand ground and protect their offspring or flee leaving the offspring to fend for itself. It is known that the chances of survival of offspring is diminished severely when abandoned by their parents[10]. The increased tameness during the chick rearing period could be as a result of loons exhibiting defensive behaviors such as vocalizations to fend off conspecific intruders[9]. In a previous study, loons spent more time in proximity of a decoy when rearing chicks[9]. This indicates that as well as being not afraid to face intruders, loons are willing to tolerate increased threat from humans when rearing chicks. Also, given that FID was only measured on parents at least 50m from their chicks, loons show elevated tameness whether they are in proximity of their chicks or not.

The similarity of tameness between parents and offspring could indicate one of two hypotheses. Firstly, tameness may be heritable indicating that loons can adapt to human disturbance. A previous study reported that tameness is heritable in burrowing owls[7]. The second hypothesis is that tameness may be learned from parents during a chick's early stages or be a result of environmental cues associated with their parents such as size or boating activity on their natal lake. In fact, loons have been shown to settle on lakes similar to their natal lake[8]. Both hypotheses indicate the ability of loons to change their behavior in response to changes in levels of human disturbance. Loons can change their tameness over generations if the heritability hypothesis is true or change their tameness within a generation if the learned hypothesis is true. Cross-fostering studies may allow us to find out which hypothesis holds.

Acknowledgments

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