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Preliminary Report

A survey of aggressive behaviors in the American coot (*Fulica americana*) at Ballona Wetlands, California

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Abstract. Understanding interspecific and intraspecific aggression is important for wildlife management and sustainability of populations. The objective of this study was to evaluate whether there is a difference in number of occurrences of interspecific aggression between American coots (*Fulica americana*) and mallard ducks (*Anas platyrhynchos*) and intraspecific aggression among American coots in the Ballona wetland habitat of Southern California. Trends in literature describe coots as highly aggressive toward other coots year-round and toward other bird species during the breeding season. Because we conducted observations outside the breeding season, we hypothesized that more instances of intraspecific aggression would be observed. We found a significant difference between the number of occurrences of interspecific and intraspecific aggression based on four behaviors specific for American coots: charging, paired display, splattering, and churning. There were more instances of intraspecific aggressive encounters than interspecific aggressive encounters, which indicate the interacting species at Ballona are not competing for resources and their respective niches may not overlap.

Introduction

Understanding interspecific and intraspecific relationships is especially important for managed habitats such as the Ballona Wetlands (Chapin et al., 2000; Reiter et al., 2013). Allocation of resources for growth, defense, and reproduction has been observed for the American coot (*Fulica americana*). American coots are known to be highly aggressive due to the variable food resources of marshes, and limited resources can sometimes result in favoritism or the uneven allotment of

resources to offspring (Ryan and Dinsmore, 1979; Shizuka and Lyon, 2013). Coots are highly aggressive toward other coots year-round and toward other bird species during the breeding season (Gullion, 1953). The implications of inter- and intraspecific interactions on population distribution and habitat management have been observed in various waterfowl, but this has not yet been used to evaluate niche overlap in a managed habitat involving the American coot (Reiter et al., 2013). Niche can be evaluated by studying intra and interspecific interactions because energy and resources would not be allocated to aggressive defense maneuvers unless competition for resources was necessary for survival (Hurlbert, 1978). Aggressive behaviors directed to members of a different species are indicators of competition

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for a shared resource, signaling that niche overlap is occurring (Korsu et al., 2008; Robinson and Terborgh, 1995; Pérez-Crespo et al., 2013). Aggressive behaviors directed to members of the same species suggest that there may not be sufficient resources available for all members of a population, which can provide important insights for interventions on managed habitats.

Proposals for innovative ways to enhance sustainability of the Ballona Wetlands are currently under discussion (The Bay Foundation, 2011). Since the 1900s, over half of the world's wetlands have disappeared, so the Ballona Wetlands is a valuable, yet vulnerable, freshwater marsh (Beck et al., 2013). Therefore, it is important to document current interactions between and among local species, both native and non-native, in order to understand the impact of habitat changes and gain an understanding of how intra- and interspecific interactions may change over time. The Ballona Wetlands are frequented by many birds and waterfowl, including the Great Blue Heron (*Ardea herodias*), the Red-Tailed Hawk (*Buteo jamaicensis*), and the California Towhee (*Pipilo crissalis*) (Cooper, 2006; 2008). The objective of this study is to evaluate whether there is a difference in number of occurrences between interspecific aggression with mallard ducks (*Anas platyrhynchos*) and intraspecific aggression among American coots in the Ballona wetland habitat of southern California by characterizing four types of displays of aggression as defined by Gullion (1952). We hypothesized that we would observe more instances of intraspecific aggression outside the coot breeding season based on observations of the aggressive and territorial behaviors of the species (Gullion, 1952; Ryan and Dinsmore, 1979; Valente et al., 2012).

Materials and Methods

We observed American coots at the Ballona Wetlands habitat adjacent to Loyola Marymount University in Los Angeles, California during a 96-minute observation session in early November 2013. Observation was from a cement

platform adjacent to the cross streets of West Jefferson Boulevard and Lincoln Boulevard. The open water area was surrounded by reeds. Observations were made outside of the breeding season in order to analyze aggressive interactions unaffected by the peak in interspecific aggression during nesting and hatching (Ryan and Dinsmore, 1979). Two observers used a spotting scope and binoculars to track 8 coots each, totaling 16 American coots. Each coot was tracked for 12 min, and the instances of four particular aggressive behaviors were tallied. Because we were unable to tag or otherwise indicate which coots were already observed, it is possible that data were collected from the same coot more than once. These behaviors were described and then characterized as either related to interspecific or intraspecific aggression per Gullion (1952). The four aggressive behaviors observed were charging, paired display, splattering, and churning. Charging involves swimming rapidly toward the antagonist with the neck extended forward horizontally and ruff upright. Paired display is characterized by the coot's head held low with wings arched above the back, and is usually followed by displacement feeding. Splattering is similar to a charge except that the coot, with its head held horizontally, runs over the water with flapping wings. During churning, the coot moves in reverse up out of the water.

The distribution of observances of interspecific interactions and intraspecific interactions was analyzed using a one-factor Chi-square analysis. We also analyzed the difference in the means of the four types of interactions that occurred intraspecifically to determine which aggressive behavior was performed most consistently. Normality was analyzed using a Shapiro-Wilks test. The difference in means among the four behavior types was evaluated using a Kruskal-Wallis test for both interspecific and intraspecific aggressive observations. To measure observer bias, the difference between the two observers was evaluated using a Kruskal-Wallis test. An ANOVA test was not used because the data were not normally distributed. Differences in variance within specific behaviors were evaluated using an F-

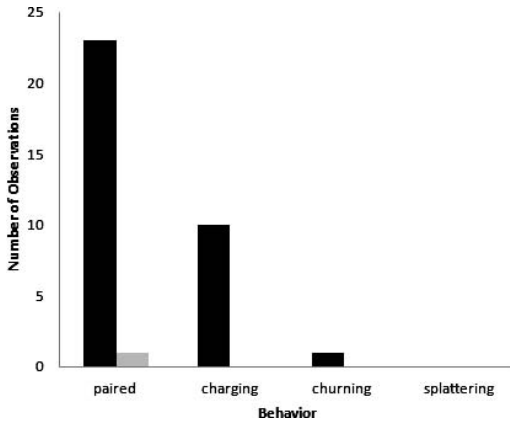


Figure 1. The number of observations of the four types of aggressive displays for intraspecific (black bars) and interspecific (gray bars) interactions of American coots in the Ballona Wetlands during a 96-minute observation session.

test. A 95% confidence interval indicated significance. The alpha level for statistical tests was 5%.

Results

A significant difference was found between the number of inter- and intraspecific aggression observations ($p < 0.05$; Fig. 1). The number of aggressive behaviors for intraspecific interactions is not normally distributed ($p < 0.05$). The number of observations of intraspecific behavior differed with respect to type of behavior ($H [2, N = 48] = 8.8125, p = 0.0122$). We did not detect an observer bias between the mean observations of the four aggressive behavior types collected by Observer 1 and Observer 2 ($H [15, N = 48] = 11.2525, p = 0.7345$). There was a difference in the variance of the two most common intraspecific aggressive activity types: paired display and charging ($F=4.1885, P=0.0087$).

Discussion

This study documents significant differences between the number of interspecific and intraspecific aggressive behaviors of American coots in the Ballona Wetlands. Interspecific interaction occurred with mallard ducks, the only other

waterfowl present during the time of observation. A majority of the observations involved charging and paired display, so we are able to exclusively use these four behavior types (paired display, charging, splattering, and churning) as indicators of aggression in coots. The differences in both mean and variance in paired display and charging indicate that although paired display occurs more often, charging is a more consistent indicator of aggression (Fig. 1). Coots displayed more instances of intraspecific aggressive behavior than interspecific aggressive behavior, suggesting that the niches are not overlapping with mallard ducks (see how intra- and interspecific aggression indicates niche overlap in Korsu et al., 2008). This suggests that the Ballona wetlands may have enough resources to provide for both species populations, noting that mallard ducks and American coots overlap in diet because they both eat aquatic plants, and in habitat because they both nest on or near water surrounded by tall grasses (Brisbin et al., 2002; Drilling et al., 2002). Friends of Ballona, an organization dedicated to the restoration and protection of the wetlands, discourages supplemental feeding of waterfowl, although visitors to the wetlands may do so, which may result in an abundance of resources for waterfowl. Studies have looked into this long-time issue in the industrialized world and have discussed ecological dangers of disturbing waterfowl habitats with human interaction such as feeding, disturbances that can impact both mallard ducks and American coots (Chapman and Jones, 2009; Korschgen and Dahlgren, 1992). This feeding can make interspecific aggression over food resources unnecessary and may also attract a greater population of waterfowl than the wetlands' natural resources could sustain alone.

The characterization of the interactions between these two coexisting species is important as efforts for restoration of the Ballona wetland environment are underway. It is important to monitor intraspecific aggressive behaviors to ensure that females are not restricted to sub-optimal water space by aggressive males, as this could cause uneven mortality rates among sexes, a concern mentioned in a

study on aggression in South Carolinian ducks (Alexander, 1987). American coots displaying interspecific aggression can displace or diminish resource availability for other waterfowl species, which parallels researchers' concerns for Mute Swans (*Cygnus olor*) in New England (Conover and Kania, 1994). Gullion (1953) references that researchers have previously considered that American coots may drive out other water fowl from preferable resource areas. He also discusses how interspecific aggression by American coots increases during the breeding season, so comparing our results to data collected during the breeding season would be beneficial for a more detailed assessment of resources in the Ballona Wetlands managed habitat (Gullion, 1953). Continued studies on inter- and intraspecific aggression can contribute to the ongoing dialog on directions for of the restoration of the Ballona Wetlands. Concerns for the well-being of waterfowl species should be taken into consideration when analyzing action proposals. Future studies can track changes in aggressive behavior in American coots during the breeding season or other species of waterfowl, both native and non-native, residing in the Ballona Wetlands habitat as this habitat is modified in the future.

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