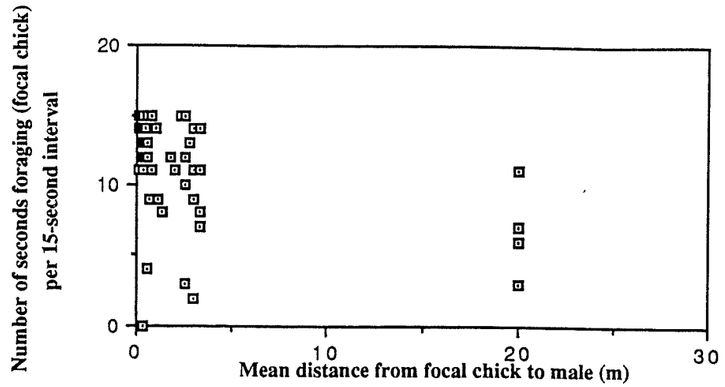
Figure 2 Chick distance to male vs. proportion of time chick spent foraging.



NON-BREEDING SEASON AGGRESSION IN FEMALE JACANA SPINOSA

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Abstract (G.K.)

We addressed the question of why Female Northern Jacanas (Jacana spinosa) continue to show aggressive interactions after their breeding season has ended. We hypothesized that females in highly productive feeding areas would undergo more frequent aggressive interactions than females in areas of lower productivity. We found no significant correlation. It appears that the females continue their aggressive interactions in order to maintain their mating status for the next breeding season.

Introduction (T.Y.)

Protecting a territory is an essential function in the behavior of many animals. The purpose of protecting an area is to guard something that contributes to fitness be it young progeny or a good nesting site. Our study focused on the aggressive behavior in the Northern Jacana (J. spinosa). In Costa Rica the Northern Jacana is found in all types of wetlands and is known to feed by pecking at insects found in floating vegetation, submerged weeds, and wet grass (Janzen, 1983).

Breeding occurs in the wet season which lasts from April to late November. During the breeding season, females exhibit aggressive behavior to protect territories thereby maintaining access to mates. In an aggressive interaction, the defending female flies, shrieking at the intruder, and elevates its wings after landing. We observed that in the nonbreeding season, females continue to display aggressive behavior. We investigated whether this aggression may have been food related. We hypothesized that a female foraging in a more productive feeding area will undergo more frequent aggressive interactions than a female foraging in a less productive feeding area.

Methods (G.K.)

We conducted our study in the marsh in front of the OTS Field Station at Palo Verde National Park, Costa Rica, between 0800 and 1600 h. on 10 January 1991. We made our observations from the bird tower peninsula and from the NE corner of the cleared part of the marsh.

We worked in a team of three: two observers, watching different birds, counted aggressive interactions and measured feeding rates; the third person recorded the data and

kept track of the time. For each trial we observed an individual female for 30 minutes. Since the only observable physical difference between males and females is the female's larger size, positive identification of a female is difficult. We considered a bird to be female if a) we saw it near enough to a male that the size difference was apparent, or b) if the bird was seen in an aggressive interaction. Since females are dominant over males and male-male aggression is infrequent outside of the breeding season, we assumed the bird that won an aggressive interaction (i.e. was not chased off) was a female.

Once a female was positively identified, the trial began. We watched the same female for 30 minutes, keeping a running total of the number of aggressive interactions it underwent. For each 30 minute trial we recorded the female's feeding rate at 5 minute intervals. We determined feeding rate by counting the number of pecks the bird made during 30 seconds of foraging. We conducted 11 trials.

We analyzed our data by testing for a correlation between the bird's mean feeding rate and the number of aggressive interactions it underwent during the 30 minute trial.

Results (G.G., G.K.)

We correlated the mean peck rate for each female with the number of aggressive interactions it underwent. The result was not statistically significant ($r^2 = 0.036$, $p > .05$). This finding suggests that the frequency of the females' aggressive interactions are unrelated to the productivity of their feeding areas.

Discussion (G.G.)

It does not appear from our results that the number of aggressive interactions undergone female N. Jacanas is correlated with the productivity of the habitat. Furthermore, over a given 30 minute trial, we often observed the focal female foraging > 10m away from her initial location. It seems logical that a bird holding a specific feeding territory would display more localized foraging behavior. Accordingly, it is doubtful that the females' aggression toward other N. Jacanas served to defend feeding territories.

The question still remains unanswered then - why do female N. Jacanas display aggressive behavior in the non-breeding season? Each aggressive interaction requires energy and puts the female at potential risk of injury.

One explanation for aggressive behavior during the non-breeding season relates to the nature of polyandry. In this polyandrous system, the female N. Jacanas mate with multiple males. Because there is an approximately even sex ratio across the N. Jacanas population, not all females mate each year (Janzen, 1983). Accordingly, the non-breeding

season females may establish dominance that carries over to the following breeding season.

An alternate possibility explaining female aggressive behavior in the non-breeding season is that there is a gradual transition between the breeding and non-breeding periods. During this transition period the female continues to display aggressive behavior to defend her former breeding territory. Our sightings of several young clutches (estimated age 1-2 weeks) well into the period known as the non-breeding season lends support to the hypothesis of gradually declining aggression in the non-breeding season.

The major sources of error in this project were:

1) Difficulty in sexing N. Jacanas and
2) Difficulty in discerning whether the bird was pecking at a prey item or simply probing (searching) in the weeds. This was particularly a problem when our line of vision was partially obstructed.

Table 1 Mean peck rate and number of aggressive encounters in each trial.

Trial	Mean Peck Rate	Number of Aggressive Encounters
1	8.4	4
2	5.3	0
3	14.3	1
4	8.0	10
5	13.0	0
6	11.3	2
7	9.0	0
8	10.0	3
9	5.2	1
10	12.4	0
11	10.0	6

Literature Cited

Janzen, D.H. 1983. Costa Rican Natural History, pp. 584-6.