

# THE EFFECT OF GROUP SIZE ON THE FORAGING BEHAVIOR OF *ENDOCIMUS ALBUS* AND *BUBULCUS IBIS*

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**Abstract.** Predation risk to foraging birds should decrease with increasing group size. We therefore hypothesized that the percentage of time during which individuals were vigilant would decrease as group size increased. Individuals of two species of wading birds, *Endocimus albus* and *Bubulcus ibis*, were observed in foraging groups of several sizes in a marsh environment. No correlation was found between decreasing vigilant behavior and increasing group size, possibly due to biased sampling techniques. (JLB)

## INTRODUCTION (SAW)

Being in a large group may allow for more efficient foraging in social birds, including Cattle Egrets (*Bubulcus ibis*) and White Ibis (*Endocimus albus*). Larger groups might allow these birds to spend more time foraging and less time looking out for predators, and by working together in larger groups, dense food patches might be more efficiently exploited.

Both species occur in varying sized groups, giving us the chance to investigate the effect of group size on a bird's need to be vigilant in an effort to avoid being preyed upon. Observing two different species allowed us to make interspecific comparisons regarding the hypothesis that birds in smaller groups will need to be more vigilant and will have less time to forage for food than birds in larger groups.

## METHODS (ABS)

Our study was conducted on two consecutive mornings (7 and 8 January 92) in the marsh near the airstrip of OTS' Palo Verde Field Station in Costa Rica. Individual birds

were selected for observation from groups ranging from solitary individuals to a maximum group size of 18 for *Endocimus albus* and 60 for *Bubulcus ibis*. Which individuals comprised a group was subjectively based on proximity to one another – birds that were 5-10 bird lengths apart were considered part of separate groups. Changes in group size (the departure and/or arrival of individuals) were recorded throughout the observation period.

Individuals were selected subjectively for observation, based on the ease with which they could be viewed. An individual's behavior was recorded every 10 seconds for 10 minutes, or until the bird's departure, using the "focal animal technique". The minimum observation time per bird in a particular group size was two minutes to ensure an accurate representation of behavior. Behavior was described as: "foraging," if the individual was searching for or assimilating prey; "vigilant," if the individual was erect and monitoring its surroundings; or "other," if the individual was exhibiting a different behavior.

## RESULTS (EWG)

We found no correlation between the percent time spent vigilant and group size for the White Ibis ( $r^2=0.002$ ,  $p>0.5$ ) or for Cattle Egrets ( $r^2=0.001$ ,  $p>0.9$ ). Records of the miscellaneous behavior category were rare.

The mean percent time spent vigilant differed between the Cattle Egrets ( $n=16$ , mean= $61.0\pm18.9\%$ ) and White Ibis ( $n=27$ , mean= $13.5\pm8.5\%$ ). Mann-Whitney U analyses revealed this difference as significant ( $U=5.46$ ,  $p<0.001$ ).

Finally, for the White Ibis, there was no significant correlation between the number of strikes per minute and group size ( $n=27$ ,  $r^2=0.001$ ,  $p>0.5$ ). Because the Cattle Egrets were generally observed at too great a distance for accurate assessment of strikes, the strike rate for them was not analyzed.

## DISCUSSION (JVK)

Our results failed to support our hypothesis that vigilant behavior is reduced with increased group size. While having more eyes to locate predators may allow each bird to forage more frequently, we found no such correlation in either White Ibis or Cattle Egret groups. This may be explained by the fact that large groups may cause competition for food while attracting predators, forcing these groups to be more vigilant as group size increases. Foraging (strike) rate also was not correlated with group size

for the White Ibis. It is possible that we defined group size inappropriately for these birds. Perhaps we should have studied the effect of flock size on vigilant behavior instead of the varying groups within a flock.

There was a significant difference in vigilant behavior between White Ibis and Cattle Egrets. Egrets spent much more time overall scanning for predators. A physical disadvantage in escape response may explain the Cattle Egret's wary behavior, such as a slower take-off speed or poorer eyesight. Cattle Egret behavior may sometimes be mistakenly described as vigilant when they are really searching for food since they did have a noticeably different foraging behavior than the White Ibis.

There may be a negative slope within smaller group sizes but it was disrupted by the larger groups. Why would the larger groups cause this interference? One reason could be observer bias in sample selection. Cattle Egrets on the outer edge of larger groups may have been more frequently chosen for observation because they are closer and easier to see in the tall grass. However, these peripheral birds may exhibit different behavior than those in the middle since they are most vulnerable to predation. This would not affect smaller group sizes as predation risk should be more uniform among group members. Future studies should use a more random process in selecting individuals for observation to reduce this effect.

# FORAGING PATTERNS OF THE TROPICAL KINGBIRD, *TYRANUS MELANCHOLICUS*, IN WET AND DRY HABITATS

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**Abstract.** The Tropical Kingbird is a territorial insectivore which feeds in a variety of habitats. According to the optimal foraging theory, individuals should have a higher attack rate and a shorter giving-up-time in a habitat of high prey density than in one of low density. We compared Kingbird foraging behavior in wet and dry habitats in Palo Verde National Park, Costa Rica, and found no difference in attack rate or giving-up-time. We believe that the birds are more affected by weather and territoriality than by differences in prey density between these two environments. (SLS)

## INTRODUCTION (JLD)

The Tropical Kingbird (*Tyrannus melancholicus*) is a large (21cm) flycatcher that occupies many different open habitats. It forages for flying insects by sallying from exposed, elevated perches (Stiles and Skutch 1989). It is reasonable to believe that kingbirds may exhibit different foraging behavior among their various habitats. In locations where the average prey density in a patch is greater, a foraging kingbird should have a higher attack rate and a shorter time-of-no-capture before abandoning the patch (giving-up-time or GUT).

In our study area, kingbirds occupied both wet and dry environments. Assuming that there might be a greater insect density in the wet environment, we hypothesized that the inter-attack-interval (IAI) and GUT should be lower in the wet area.

## METHODS (TCB)

Tropical Kingbirds were observed on and near marsh habitat in Palo Verde National Park, Guanacaste Province, Costa Rica. The birds were observed foraging over wet areas of

the marsh as well as over dry land in the marsh and in dry fields adjacent to the marsh. They foraged in patches no larger than 20m in diameter, sallying out for prey and returning to nearby perches. When a bird flew to a perch more than 20m away, we considered it to have changed patches. The time interval between the bird's last sally and a patch change was the GUT for that patch.

Between 0700 and 1000 birds were observed for approximately 20min each. During this time we noted the bird's behavior and the time since previous movement. For the purposes of data analysis we assumed that all sallies were of equal length, and that each represented a prey attack, whether or not there was a successful capture. We derived IAI and GUT for each bird and then calculated attack rates.

## RESULTS (ALG)

We observed 28 birds at 36 perches for a total of 427min in the wet habitat, and 8 birds at 11 perches for 76min in the dry habitat (Table 1).

We analyzed the differences in attack rate, IAI and GUT between the

dry and wet habitats. All comparisons were done with a Mann-Whitney U test where the U value was transformed to a t-value.

Our analysis showed no difference between the habitats for attack rate ( $t=0.94$ ,  $p>0.9$ ), IAI ( $t=0.03$ ,  $p>0.995$ ), or GUT ( $t=0.16$ ,  $0.5<p<0.9$ ).

Table 1. Summary of Data Collected

Habitat	Wet	Dry
# Perches	36	11
# Birds	28	8
Time Observed for all Perches	427 min.	76 min.
#Attacks/min /perch(mean)	$0.48 \pm 0.42$	$0.6 \pm 1.2$
Mean IAI (s)	$134 \pm 158$	$137 \pm 138$
Mean GUT (s)	$115 \pm 101$	$99 \pm 48.3$

## DISCUSSION (CNO)

According to our results, there is no significant difference in the foraging patterns of Tropical Kingbirds in the dry and wet habitats selected for study. There are several reasons why this may have been.

The first cause of inconsistency between our hypothesis and results lies in the initial assumption that insect availability is greater in wet areas than in dry areas. Without obtaining an insect census, we do not know that there is a difference in prey densities, and an even prey distribution could

account for similar foraging patterns in the two areas.

Two other factors might have affected kingbird foraging behavior. First, the presence of a strong wind may have caused abnormal foraging behavior. Sallying into the wind may be less energetically profitable, and thus the birds may wait until the wind lessens to sally. This could result in abnormally long IAI's.

Second, territorial behavior may have been important because sometimes when the birds left their perches they were defending their territories from invaders. The time spent on the defense of a patch may take away from the bird's foraging time. Further studies may wish to compare the effects of weather and territoriality on foraging behavior.

## LITERATURE CITED

- Fitzpatrick, J. W. 1983. *Tyrannus melancholicus*. In *Costa Rican Natural History*, ed. D. H. Janzen, 611-13. Chicago: University of Chicago Press.
- Stiles, F., and A. Skutch. 1989. *A Guide to the Birds of Costa Rica*. Ithaca, NY: Comstock Publishing Associates.