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COOPERATIVE HUNTING OF AVIAN PREY BY A PAIR OF BALD EAGLES

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Bald Eagles (*Haliaeetus leucocephalus*) are primarily fish-eaters, but they also will take avian prey (McEwan and Hirth 1980, Gerrard and Bortolotti 1988). Accounts of individual Bald Eagles preying on Cattle Egrets (*Bubulcus ibis*) in Florida have been noted (Knight 1976, Layne et al. 1977, Jennings and Jennings 1982), and a study of prey remains in nests (McEwan and Hirth 1980) suggests that some Bald Eagles in Florida specialize in preying on Cattle Egrets. However, cooperative (tandem) hunting of Cattle Egrets by Bald Eagles has not been well documented. Predictable daily presence of a pair of Bald Eagles in a relatively small area presented an unusual opportunity for multiple observations of their foraging behavior. In this paper I describe cooperative hunting by a pair of Bald Eagles and document the importance of Cattle Egrets as their prey.

A territorial pair of Bald Eagles was observed southwest of Gainesville, Alachua County, Florida on Kanapaha Prairie. Observations were opportunistic during 33.2 h and intensive for 39.5 h during 22 days from 17 April to 12 May 1991. Mean time spent on the study area was 3.3 h (SD = 1.7) per day. The pair of eagles hunted daily over 250 ha of open pasture and wetlands about 700 m from their nest. During the period of observation the nest contained two young within four weeks of fledging. I witnessed a cooperative hunt by the pair of eagles on 17 April, which prompted more intensive monitoring. These observations ended 12 May, when the adult eagles stopped hunting over the prairie. The dramatic change in their daily behavior pattern was probably in response to fledging of their two young about that time. No adult eagles were observed on the prairie during subsequent visits throughout May.

Fourteen (87%) of 16 hunts witnessed were for avian prey (Table 1). Of 13 avian prey that could be identified, 11 (85%) were Cattle Egrets. Of 14 hunts where it was apparent if one or both of the eagle pair hunted, five (36%) were cooperative hunts. Four of these five tandem events were aerial pursuits for Cattle Egrets or White Ibises (*Eudocimus albus*), while the fifth effort resulted in harassment of an Osprey (*Pandion haliaetus*) to steal its recently captured fish.

Eagles spent most of the day perched in live oak trees (*Quercus virginiana*) that permitted an open view across the prairie. Hunting bouts ranged from 5 to 11 min ($\bar{x}$ = 6.3, SD = 2.2, n = 7). All but one of the capture attempts of wading birds took place with the prey in flight, at altitudes from 5 to 50 m. The one exception was a White Ibis taken from the surface of a wetland where it landed while being pursued by an eagle. During each of nine hunts for avian prey, 1-7 (median = 4) brief "stoops" or capture attempts occurred with the eagle(s) following closely behind or slightly above and behind. After capturing prey, the eagle usually flew toward the nest without landing; the prey appeared dead immediately after capture.

Foraging by eagles was observed mainly in morning and evening; 15 (94%) of 16 hunts took place before 1100 or after 1600 (Table 1). The one observation of hunting between those times (at 1300) took place immediately after a morning rain. Although these findings suggest temporal preferences by foraging Bald Eagles, the data were not completely representative because observations were conducted more in mornings and late afternoon/evenings. There were no obvious patterns of dates and times when the pair hunted cooperatively.

Table 1. Outcomes of hunts by a territorial pair of Bald Eagles on Kanapaha Prairie, Alachua County, Florida, 1991.

Date	Time	No. of eagles	Prey	Success
17 April	1814	2	Cattle Egret	Yes
18 April	0920	Unknown[a]	Cattle Egret	Yes
20 April	1300	2	Cattle Egret	Yes
21 April	0917	2	Cattle Egret	Unknown[b]
23 April	1820	1	Unknown[c]	Yes
24 April	1842	1	Cattle Egret	No
24 April	0927	1	Cattle Egret	Yes
25 April	1034	1	Cattle Egret	No
29 April	1656	1	Cattle Egret	No
1 May	1730	1	Cattle Egret	No
4 May	0820	1	White Ibis	Yes
4 May	1045	1	Cattle Egret	No
5 May	1719	2	Fish taken from Osprey	Yes
5 May	1907	2	White Ibis	Yes
8 May	1750	1	Cattle Egret	Yes
11 May	0740	Unknown[a]	Unknown bird	Yes

[a]Individual eagle was observed with prey, but capture was not witnessed.
[b]Pursuit went out of sight.
[c]Small item plucked from wetland surface.

During solo and tandem hunts for avian prey, the eagles typically singled out an individual from flocks of about 15-50 individuals. Some pursuits, successful and not, were over within one minute and little ground was covered. However, two protracted pursuits extended $\geq$ 1 km and were of 5 and 6 min duration.

In three of four tandem hunts for birds, the eagle pair alternately stooped at the prey. This method of "double teaming" was referred to as relay attack in Harris' Hawks (*Parabuteo unicinctus*, Bednarz 1988) and sequential stooping in Bald Eagles (Sherrod et al. 1976). During the other cooperative hunt, one of the pair captured the prey, while the other seemed to "herd" the prey. This cooperative tactic has been described for Bald Eagles hunting waterfowl (McIlhenny 1932, Thiel 1983).

Avian prey capture attempts with known outcomes were used to compare hunting success for solo versus tandem hunts. Three (37%) of eight solo hunts were successful, compared to three (100%) of three tandem hunts (Table 1). Even if the tandem effort with unknown outcome on 21 April was successful, the difference in success rate between the two hunting techniques was not statistically significant ($P = 0.071$; one-tailed Fisher exact test).

Nevertheless, greater success through cooperative hunting may be biologically significant. Cooperative hunting was more successful than solo hunting when Aplomado Falcons (*Falco femoralis*) pursued avian prey (Hector 1986). Tandem hunts were less successful than solo hunts in Golden Eagles (*Aquila chrysaetos*), but this may have resulted from pursuit of larger, more elusive prey during tandem hunts (Collopy 1983). Advantages of cooperative hunting by raptors may include distraction and exhaustion of prey (Bednarz 1988). Published accounts of cooperative hunting by Bald Eagles are few and may be indicative of the rarity of this behavior. Bald Eagles are predominantly fish-eaters and they frequently scavenge food items (Gerrard and Bortolotti 1988), therefore cooperative hunting is probably not an advantage in this situation. However, when avian prey items are an important food source, cooperative hunting may be the most efficient foraging technique.

The pair of Bald Eagles at Kanapaha Prairie apparently benefited by having Cattle Egrets as a readily available food source in a pasture near their nest. Even though a nearby 16 ha permanent wetland contained catfish (*Ictalurus* spp.) (pers. obs.), the most common prey item in nests of Bald Eagles in northern Florida (McEwan and Hirth 1980), the eagles in this study appeared to rely primarily on avian prey. McEwan and Hirth (1980) noted specialization on Cattle Egrets by Bald Eagles nesting in pastures; Cattle Egrets comprised 10% of avian prey items found in 16 nests, but all egrets came from only three nests. My observations suggest that when Cattle Egrets are an abundant and nearby food source, nesting eagles may take advantage of this by shifting to a cooperative hunting strategy.

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Ecosystems of Florida.—Ronald L. Myers and John J. Ewel (editors), with forward by Marjorie H. Carr, 1990. University of Central Florida Press, Orlando. ISBN 0-8130-1022-5. Soft Cover, 765 pages, 246 text figures (136 black-and-white photographs), 34 tables and 2 text appendices. $31.00.—Prior to the publication of this book, no single reference existed reviewing the present state of knowledge of Florida's most important ecosystems. That void is now adequately filled. The book's major strong points are: 1) the text covers physical and climatic parameters of a variety of ecosystems, their faunal and floristic composition, habitat descriptions and their productivity or significance, and anthropogenic effects, 2) the text is well illustrated with ample photographs and illustrations, 3) the text is well written, indexed and edited, easy to read, and is directed at informed