it to one of the young. At 16:17 the A-male chased the B-male. Again on 18 July between 17:40 and 19:40, I observed a pair of grebes with three, 3-week old young. At 18:27 the A-female chased a B-male. Between 18:29 and 19:31 the A-male captured 12 fish and took two feathers. The A-male ate five fish, gave three fish and the two feathers to the young, and gave four fish to the A-female; the A-female dropped one of these and gave the other three to the young. At 19:31, while the A-male was diving about 20 m from the A-female, the A-female took a 6-cm yellow perch from the B-male and fed it to one of the young. At 19:35 the A-male returned and gave a 4-cm yellow perch to the A-female. The B-male moved away from the A-pair when the A-male returned.

Without marked birds of known genealogy the significance of this behavior cannot be known, though two possibilities seem likely: (1) B-males may be related to one or both A-pair birds and are attempting to increase their inclusive fitness by enhancing the breeding success of their kin, or perhaps by gaining experience in rearing young, or both (e.g., Brown, Am. Zool. 14:63–80, 1974; Woolfenden, Auk 92:1–15, 1975). (2) B-males may be attempting to procure mates. White-fronted Bee-eater (*Merops bulockoides*) auxilliary males may also engage in attempted mate procurement (Emlen 1978). The second possibility is consistent with the observed aggressive behavior of A-males toward B-males.

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An auxiliary with a mated pair and food-caching behavior in the Fish Crow.—Auxiliaries or helpers are documented for many North American birds. Auxiliaries are especially frequent within the family Corvidae (Goodwin, Crows of the World, Cornell Univ. Press, Ithaca, New York, 1976; Brown, Ann. Rev. Ecol. Syst. 9:123–156, 1978; Verbeek and Butler, Ibis 123:183–189, 1981; Kilham, Florida Field-Nat. 12:25–31, 1984). Corvids are also known to cache food (Goodwin 1976; Roberts, Am. Nat. 114:418–438, 1979; Hewson, Br. Birds 74:509–512, 1981; James and Verbeek, Behaviour 85: 276–291, 1982; Kilham 1984). Neither helpers nor food caching have been documented previously for Fish Crows (*Corvus ossifragus*).

Evidence of an auxiliary.—Two pairs of Fish Crows nested 30 m apart in the crowns of tall (32-m) loblolly pines (*Pinus taeda*) in a small pine grove beside the Clemson University Cemetery, Clemson, South Carolina, in 1984. I watched one pair for a total of 50 hr from 12 April to 14 June. No crows were marked.

In Fish Crows only the female incubates and broods the young (Goodwin 1976). The male supplies the female with food during the period in which she is engaged in these activities. The pair was physically distinguished from a third individual (see below) by their glossier plumage, other plumage characteristics (e.g., missing right inner secondary of male), and by their behavior. In all observations described below, the pair and a third individual were seen at the same time.

While the female was brooding at 16:39 EST on 20 May, the male returned to the vicinity of the nest and a brief (2-sec) low intensity chase ensued between him and a second individual. The chase ended in a mutual display near the nest-tree. Both birds glided parallel to each other with neck and bill angled down about 45°, bodies drooped below the head and tail (which was slightly fanned), and the outer primaries slightly slotted. Ten minutes later, both birds perched on top of the nest-tree, 2 m above the nest while the female was still brooding.

The two birds then flew off together. The male was not seen to engage in mutual display with other Fish Crows or to tolerate them near the nest-site.

The next day at 16:27, the male and a second individual were observed together at a cache site on a horizontal dead limb 18 m above ground in a large deciduous tree 25 m from the nest where the female was brooding. The male chased the second bird from this cache site when the latter attempted to approach it again about 7–9 min later. This behavior was repeated several times. However, the male tolerated the second bird near the nest-site and they engaged only in low intensity chases as on the previous day. During the same period, the male vigorously chased several other intruding Fish Crows from the vicinity (<30 m) of the nest-site and cache site between 17:11 and 17:15 on 21 May. During these chases, the second bird fed the female at the nest once at 17:14.

The male and a crow other than his mate shared food at another cache site on 25 May. The cache was on a limb 20 m up in a tall pine 20 m from the nest. The male flew to this cache at 16:07 carrying an English muffin and called. A second crow left its perch 25 m away to perch beside the male and eat the proffered muffin. Prior and subsequent to this event the two birds engaged in calling bouts. The female was brooding at the time. At 17:30, the second crow again attempted to land at the pine cache site and gave a begging call, but did not receive any food from the male. On 11 June, when the nestlings were about to fledge, the male and female engaged in a calling bout when the latter was off the nest. At this time a third bird was within 2 m of the male. Also on 11 June, while the female was on the nest, the male and another crow returned to the nest. Although the observations described above indicate a third crow was tolerated by the pair, conflict occurred among these individuals as well. High intensity chases between the male and the third individual occurred frequently, particularly when the extra bird attempted to approach the nest, whether or not the female was on the nest. Although the extra crow was not marked, I have no evidence that more than one bird was involved as an auxiliary.

Brown (Am. Zool. 14:63–80, 1974) emphasized that retention of young in jays with social systems similar to Fish Crows may lead to communal breeding systems. The relatedness of the third individual to the nesting pair of Fish Crows is unknown. Fish Crows are short-distance migrants and are rare at Clemson during winter (H. E. LeGrand Jr., in litt.; pers. obs.). If the auxiliary was an offspring of the pair from the previous year, it must have returned from the wintering area (Good, Ph.D. diss., Ohio State Univ., Columbus, Ohio, 1952).

Food-caching behavior.—Interactions involving the auxiliary at two cache sites are described above. Most interactions at caches, however, were between the male and female. The male brought all the food to the cache sites. The food was always refuse, usually bread, and often in a bolus. Food was wedged into crevices of tree limbs or left lying exposed on limbs; many items were brought to the same cache. The pair fed at the cache site in a deciduous tree (see above) from 17:09 to 19:00 on 21 May. At that time, the male fed either alone or with the female. The female also fed at the cache after the male had left the area; the female occasionally flew to an adjacent tree to eat after first provisioning herself with food from the cache. Similar behavior was observed on 25 May from 15:30 to 16:45, when the mated pair fed at a cache site in a pine tree (see above). The male also left bread at other cache sites on other limbs of different pine trees, and the female fed at these, both when the male was present and absent.

Intraspecific defense of the cache sites, other than incidents involving the auxiliary, occurred at least six times. Two incidents of interspecific defense involving Blue Jays (*Cyanocitta cristata*) also occurred.

Food caching may allow the pair more flexibility in brood care, especially as a buffer against environmental variability such as short-term food shortages (cf. James and Verbeek

1982). In particular, the female benefits by feeding herself and her brood with cached food at the time of her choice, rather than being directly fed by the male. By providing food for the female at cache sites near the nest during the brooding period, the male probably reduces the time the nest is exposed and increases the time he spends near the nest feeding and is available for nest defense. The auxiliary I observed usually was barred from access to food caches.

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Clutch size increase and intraspecific brood parasitism in the Yellow-billed Cuckoo.—Two recent reports have documented an increased clutch-size in new world cuckoos (*Coccyzus*) as a probable response to a superabundant food resource (periodical cicadas in the Yellow-billed Cuckoo [*C. americanus*] Nolan and Thompson, Ibis 117:496–503, 1975; tent caterpillars in the Black-billed Cuckoo [*C. erythropthalmus*], Sealy, Condor 80:103–104, 1978). Additionally, Nolan and Thompson (1975) provided evidence of interspecific brood parasitism and other laying anomalies during these periods of abundant food. Previous observations suggest that behavior such as intra- and interspecific brood parasitism (Darwin, The Origin of Species, 6th ed., John Murray, London, England, 1872; Bent, Bull. U.S. Natl. Mus. 176:1–506, 1940; Nolan and Thompson 1975), varying clutch and egg-size (Bent 1940, Nolan and Thompson 1975), and asynchronous hatching and interrupted schedules of laying (Bent 1940; Hamilton and Hamilton, Proc. Cal. Acad. Sci. 32:405–432, 1965) are regular aspects of *Coccyzus* breeding biology. As these normally non-parasitic cuckoos are related to obligate brood parasitic species, such observations may provide important clues as to the factors responsible for the evolution of brood parasitism (Hamilton and Orians, Condor 67: 361–382, 1967; Payne, Ann. Rev. Ecol. Syst. 8:1–28, 1977).

Intraspecific brood parasitism may be documented by eggs appearing after a clutch appears to be complete (Nolan and Thompson 1975) by eggs within a clutch differing greatly in size, shape or coloration (Todd, Birds of Western Pennsylvania, Univ. Pittsburgh Press, Pittsburgh, Pennsylvania, 1940; Hamilton and Hamilton 1965; Nolan and Thompson 1975), or by examining egg proteins with electrophoresis (Manwell and Baker, Aust. J. Biol. Sci. 28: 545–557, 1975). Given cuckoos' unusual breeding habits, this latter method would seem to be the most reliable. Because proteins of undeveloped eggs are those of the mother alone, any protein polymorphism reflects (with high probability) the maternal genotype. If, therefore, different genotypes occur between eggs within a single nest it is very likely that two or more females contributed eggs to that nest (Manwell and Baker 1975; Yom-Tov, Biol. Rev. 55:93–108, 1980).

In this note we present observations made on the nesting of the Yellow-billed Cuckoo in eastern Kansas during spring and summer of 1981. The spring of 1981 was an emergence period for the 17-year periodical cicada (*Magicicada* spp., Brood XIV), and had abnormally high numbers of other insects (R. Holt, pers. comm.). Because of the prior report correlating cicada years with breeding anomalies in cuckoos, we attempted to determine whether 1981 clutch sizes were larger than those of previous non-cicada years, and whether intraspecific brood parasitism was occurring.

Methods.—We searched for nests in and around Lawrence, Douglas Co., Kansas, during the period 1 May–15 August 1981. After locating a nest, we revisited it if possible and recorded the order and dates of laying, the final clutch-size, and the fate of the nest. To