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## OBSERVATIONS ON COOPER'S HAWK NESTING IN SOUTH CENTRAL FLORIDA

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**Abstract.**—Four Cooper's Hawk nests in Highlands County, Florida, during 1983-85 constitute the southernmost known breeding records of the species in the state. Two nests in 1983 had three eggs each. One failed before or shortly after hatching, and at least two nestlings reached fledging age in the other. Single nests in 1984 and 1985 had four nestlings each. Laying in the three successful nests was estimated to have occurred during the first or second weeks of April. Observations on the nests, postfledging behavior of young, adult molt and behavior, and prey composition are presented. These nests together with a number of late spring-summer sightings in Charlotte, DeSoto, Glades, Hardee, Highlands, Lee, and Polk counties suggest that there is a substantial resident population in south central Florida and that the Cooper's Hawk may now be a more common breeder in southern Florida than during the 1930's-1950's.

The breeding range of the Cooper's Hawk (*Accipiter cooperii*) in eastern North America is generally regarded as extending southward in the Florida peninsula to about the level of Lake Okeechobee (Snyder 1978). However, there are few well-documented Florida breeding records for the Cooper's Hawk, and knowledge of its breeding biology in the state is limited to a few egg dates and clutch size records and brief descriptions of two nests observed in 1930 (Bent 1937, Hallman 1930, Howell 1932, Sprunt 1952). This paper presents observations on nesting Cooper's Hawks on the Archbold Biological Station, 12 km S of Lake Placid, Highlands County, during 1983-1985. Two nests were found at this locality in 1983 and one each in 1984 and 1985. Late spring-summer records of Cooper's Hawks at other localities in south central Florida are also reviewed.

### OBSERVATIONS

**Nesting Habitat.**—One of the 1983 nests was in a densely-wooded bayhead about 1.3 ha in extent surrounded by open scrubby flatwoods with scattered seasonal ponds. The predominant tree species was loblolly bay (*Gordonia lasianthus*), with scattered slash pines (*Pinus elliottii*) occurring in the drier peripheral areas. The understory consisted of

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Figure 1. Cooper's Hawk nest in sand pine in mature sand pine scrub, Archbold Biological Station, Highlands County, Florida, 2 June 1984.

dense clumps of saw palmetto (*Serenoa repens*) and ferns. The three remaining nests were in mature sand pine (*Pinus clausa*) scrub 50-170 m from the edge of more open southern ridge sandhill vegetation (Fig. 1). The sand pines were closely spaced, with 50-75 percent canopy coverage. The well-developed understory consisted of oaks (*Quercus myrtifolia*, *Q. chapmanii*, *Q. geminata*), palmettos (*Serenoa repens*, *Sabal etonia*), and other shrubs. More detailed descriptions of the vegetative associations are in Abrahamson et al. (1984). The scrub site in 1983 was approximately 2.5 km from the 1983 bayhead site. The three scrub nests were located in the same general area, suggesting that the same pair of adults was involved for the three years.

The bayhead nest was 10.4 m high in a slash pine with a diameter at breast height (DBH) of 27 cm. The nest tree was located near the edge of the bayhead about 15 m from the border of an open seasonal pond and about 70 m from a wide firelane. The sand pine scrub nests were in sand pines of 13, 29, and 30 cm DBH at heights of 13.0, 13.7, and 11.3 m, respectively. The 1983 nest was within 125 m of a wide, bare sand firelane and 56 m of a woods road. The 1984 nest tree was within 30 m of the same woods road and about 37 m from the firelane; while in 1985 the nest tree was about 18 m from the road and 110 m from the firelane. Distances between the nest trees in different years were: 1983-84, 280 m; 1984-85, 335 m; 1983-85, 76 m.

Description of Nests.—The bayhead nest (Fig. 2) appeared to have been built on top of an old gray squirrel (*Sciurus carolinensis*) nest and was poorly supported by two side branches of the pine and by vines (*Smilax* sp.) growing up the trunk. The nest was built of sticks ranging from about 3 to 10 mm in diameter and had the following dimensions: maximum diameter, 48 cm; minimum diameter, 36 cm; depth, 53 cm; diameter of cup, 20 cm; depth of cup, 9 cm. The three scrub nests were located near the tops of the trees in crotches formed by main branches and were constructed largely or entirely of sand pine twigs. The 1983 nest was in a slightly leaning tree, while the 1984 and 1985 nest trees were straight. Dimensions of the scrub nest in 1984 were: maximum diameter, 58 cm; minimum diameter, 33 cm; depth, 23 cm; diameter of cup, 23 cm; depth of cup, 5 cm. The bayhead nest and the two (1983, 1984) scrub nests examined were lined with thin flakes of pine bark. The cup of the bayhead nest also contained two slightly-dried green leaves when examined on 3 May.

Eggs and Young.—The bayhead nest in 1983 contained three eggs when examined on 3 May. On the following visit, 13 June, it was abandoned. Judging from the absence of droppings on the ground around the nest tree and lack of down adhering to the nest, either the eggs had not hatched or the young had been lost at an early age. The adult female of



Figure 2. Cooper's Hawk nest in slash pine, bayhead habitat, Archbold Biological Station, 4 May 1983.

the 1983 scrub nest was observed incubating during the last week of April, and the nest contained three eggs on 4 May. By the next visit, 26 May, the eggs had apparently hatched, as both adults came in and began to scold and there was more down clinging to the nest. On 17 June, the nest contained two young estimated to be 4-5 weeks of age (Schwabe 1940, Meng 1951). The 1984 nest was discovered on 10 April. The female was incubating when the nest was visited on 25 April. When examined on 2 June, the nest contained four young (two males, two females based on size) 3-4 weeks of age. One of the female nestlings was less developed than the others. On 11 June, the young were in the nest; but the following day three were perched in upper branches of the nest tree or nearby trees and one made a short flight from one tree to another. The less-developed individual was still in the nest. The 1985 nest was found on 21 March, incubation was in progress on 10 April, and heads of downy chicks were seen on 23 May. Four well-developed young (two males, two females) were observed on 11 June. Three were perched on branches near the nest and one was lying down in the nest. Based on an incubation period of 35-36 days (Meng 1951), estimated ages of nestlings, and normal age at fledging of 30 (males) to 34 (females) days (Meng 1951), the eggs of the 1983 scrub nest were laid during the first or second weeks of April and those of the 1984 and 1985 clutches about the first week of April.

**Postfledging Behavior of Young.**—The most detailed observations on the postfledging behavior of the young were made in 1985. When first out of the nest, the young were quiet and inconspicuous, but within a few days they became highly vocal and could usually be easily located by their calls. The vocalizations included a plaintive *weee-uur* resembling the initial phase of a Red-shouldered Hawk call; a more intense, higher-pitched, squeal-whistle *weee-tsear*, with the emphasis on the second note; and rapidly-repeated *cucks* resembling those of adults but with a mellow quality. The *weee-uur* calls were often given from a perch and would frequently phase into the *weee-tsear* vocalizations, particularly when the bird would take off and begin flying. *Cucks* would frequently follow *weee-tsear* calls. The *weee-uur*, *weee-tsear*, and *cucks* appeared to form a series reflecting an increasing level of excitement.

In 1983 the young remained in the vicinity of the nest and were fed by the adults from the latter part of June until at least mid-July. One of the young in 1985 disappeared, possibly killed by a Great Horned Owl (*Bubo virginianus*), about the time of fledging, as never more than three were seen after 11 June. A patch of feathers believed to be Cooper's Hawk juvenile breast feathers was found in the vicinity of the nest tree. The three surviving young were regularly observed until late July. They remained close to the nest at first, but by the fourth week (5 July) were ranging up to 150 m from the nest. Several days later (8 July) they were observed both in the vicinity of the nest and in an open grassy field with scattered pines and an old grove of ornamental trees about 300 m from the nest site. They spent much of their time in this open area and surrounding open woodland until 17 July, after which they were seen or heard there less regularly. The last time young (a male and female) were seen in the open area was 28 July. An immature male, assumed to be one of the young, was observed on 8 August, about 8 weeks postfledging, 6 km from the nest site. All of the observed movements of the young from the nest site were to the south in the direction of more open habitat.

When in the open field and surrounding woodlands, the young often perched conspicuously in live pines or dead snags and frequently allowed an observer to approach to within 25 m or so. In flapping flight, they appeared to be slower and more buoyant than adults. They often soared for brief periods, particularly during the warmer part of the day. I once observed a young female flying across the oldfield with unusually slow, deep wing beats accompanied by a slight rocking of the body. This may have been the type of flight termed "nighthawk flapping" by Berger (1957). Twice, young were encountered in dense cover close to the ground, and once a male was flushed from a patch of tall grass in the open field. Another time a young female flew toward me as I stood in the field and circled overhead giving *weee-tsear* calls and with her under-

tail coverts flared out, forming conspicuous patches on each side of the base of the tail.

Adults.—Both adults of the 1983 scrub nest and the females in 1984 and 1985 were seen at close range. All were in full adult plumage and had deep red eyes. The male in 1983 appeared to have a darker crown than the female, as is typical. The female of the 1983 scrub nest showed molt in the inner primary area on 25 April and appeared to have one or both central rectrices missing on 26 May. Molted secondary feathers were found in the vicinity of the nest tree on 12 and 15 July. The adult female in 1985 showed no sign of molt when seen at close range on several occasions in late May when the young were well grown.

Only the female was observed incubating. Adults were not aggressive around the nest during incubation, usually remaining out of sight and cackling when an observer approached. After the young had hatched, the adults became bolder in defense of the nest, the female being more aggressive than the male. Only on one occasion, in 1983, did both adults come in close when observers were at the nest; and in this instance the female remained nearer to the nest than the male. On other occasions the male was rarely seen or heard while the female was around the nest. The female would often swoop within 2 or 3 m of an observer on the ground near the nest. She frequently uttered rapid *cucks* when in flight and while perched nearby. Upon landing after a dive at an observer, she usually had her undertail coverts widely flared out. The coverts would return to their normal position within about 10 to 20 seconds if the bird remained perched and did not continue to attack. As noted above, similar fanning out of the undertail coverts was observed in a young female as she circled overhead. Although this display has previously been associated with courtship (Mockford 1951, Beebe 1974, Evans 1982), it appears to occur in other contexts and may be a generalized response reflecting a heightened emotional state. After the young fledged, the adults remained at a distance, occasionally calling. In 1985, neither adult was observed or heard after the young had been out of the nest several days.

Food Habits.—Prey items collected in the vicinity of the scrub nests in 1983 and 1985 after the young had fledged yielded identifiable remains of ten species of birds and two species of mammals. The species and minimum number of individuals included: Blue Jay (*Cyanocitta cristata*) 7, Mourning Dove (*Zenaida macroura*) 5, Northern Bobwhite (*Colinus virginianus*) 4, Northern Mockingbird (*Mimus polyglottos*) 2, Brown Thrasher (*Toxostoma rufum*) 2, Common Grackle (*Quiscalus quiscula*) 2, Chuck-will's-widow (*Caprimulgus carolinensis*) 1, Rufous-sided Towhee (*Pipilo erythrophthalmus*) 1, Common Ground-dove (*Columbina passerina*) 1, Northern Flicker (*Colaptes auratus*) 1, cottontail rabbit

(*Sylvilagus floridanus*) 1, black rat (*Rattus rattus*) 1. In addition, an adult was observed carrying a small mammal, probably a cotton rat (*Sigmodon hispidus*). One of two castings found, presumably from the young, contained numerous insect remains in addition to small feathers and hair. The abundance of insect parts seemed too great to be explainable as accidental or secondary ingestion, suggesting that the young had deliberately fed on insects. The young male that was flushed off the ground in the oldfield may have been foraging for insects. Fitch et al. (1946) reported a recently-fledged young chasing grasshoppers on a lawn.

#### ADDITIONAL EVIDENCE OF BREEDING

Sightings of Cooper's Hawks on the Archbold Biological Station during the summer months after the spring and before the fall migration periods suggest additional occurrences of breeding in this region. On 29 August 1968, an adult was observed in the vicinity of the main station buildings. An adult, probably a male, carrying a Northern Bobwhite was flushed from a dense oak thicket on 13 June 1969; and a recent fledgling was observed on 6 June 1982. On 28 August 1984, an individual, probably a female, was seen flying into a dense pine stand several kilometers from the known nest site that year. This suggests the possibility of a second nest in 1984, although by late August the adults or young of the known nest could easily have dispersed that far.

In the period 1971-85, I observed presumably summer resident Cooper's Hawks on 13 occasions in other sections of Highlands County and in Charlotte and Glades counties on the following dates: Highlands County—26 July 1971, 9 July 1979, 12 July 1979, 16 July 1979, 11 August 1979, 23 June 1981, 9 July 1981, 15 June 1983, 31 July 1984, 20 August 1984, 26 June 1985; Charlotte County—8 May 1975; Glades County—7 July 1974. The Glades County sighting was of an individual with tail molt in progress, further indicative of a resident adult. A rough index of the relative abundance of Cooper's Hawks in this three-county area in summer and winter is provided by the numbers of casual sightings in the two seasons recorded in my field notes from 1968 to 1985. Of a total of 92 sightings (not including those of known nesting individuals), 17 (18 percent) were in May (1), June (4), July (8), and August (4) and probably represent resident birds. These figures suggest the presence of a significant breeding population augmented by a marked influx of migrants in winter. The following published records further substantiate the regular occurrence of Cooper's Hawks in south central Florida in late spring and summer: DeSoto Co.—7 July 1981 (H. M. Stevenson in Paul 1981); Glades Co.—4 August 1981 (J. Cox in Paul 1982), 17 May 1982 (G. E. Woolfenden in Paul 1982); Hardee Co.—18 June (Stevenson 1966); Highlands Co.—19 June 1966 (J. C. Ogden in Stevenson 1966), 25 June 1967 (J. C. Ogden

in Stevenson 1967), 4 July 1971 (Ogden 1971); Lee Co.—27 July 1976 (D. B. Freeland in Ogden 1976); Polk Co.—3 June 1960 (Stevenson 1960), 24 May 1981 (Kale 1981).

#### DISCUSSION

The two previously described Florida Cooper's Hawk nests were located near Gainesville, Alachua County (Howell 1932), and on Anastasia Island, St. Johns County (Hallman 1930). The Alachua County nest was in an oak at a height of about 15 m. It was poorly-constructed and lined with "a quantity" of green pine needles and green oak leaves. The Anastasia Island nest was in a grove of hardwood trees adjacent to a salt marsh. It was about 5 m high in a small oak and was composed of small sticks and lined with small pieces of pine bark. J. C. Ogden (pers. comm.) observed a nest 50 ft. (15.2 m) high in a pine in Franklin County in 1964.

On the basis of presently fragmentary knowledge, the breeding biology of the Cooper's Hawk in Florida appears to be generally similar to that elsewhere in the range as described by Beebe (1974), Bent (1937), Evans (1982), Fitch et al. (1946), Hemphill (1966), Henny et al. (1985), and Meng (1951). One aspect of the behavior of the Florida young and adults apparently not previously reported is the flaring of the undertail coverts under conditions not associated with courtship. The available data also suggest that clutch size in Florida may average lower than elsewhere in the range. The mean of four clutches (Hallman 1930, 1945; present study) is 3.00 (3.33 if the two broods of four young recorded on the Archbold Station in 1984 and 1985 are included). Howell (1932) gave 3 or 4 as the usual clutch. In comparison, Henny and Wight (1972) reported 4.18 as the average clutch size over the U.S. as a whole. Nesting appears to begin earlier in Florida than farther north, although the difference in timing is not as great as might be expected. Estimated laying in the three scrub nests (27° N lat.) was the first or second weeks of April. Howell (1932) noted eggs found at Orlando on 4 April, 19 April, and 3 May. The nest on Anastasia Island recorded by Hallman (1931) had three eggs on 4 May, and another at Panama City, Bay County, had eggs on 12 May (Sprunt 1952). The Franklin County nest observed by J. C. Ogden (pers. comm.) on 11 April 1964 had an adult working on the lining but otherwise appeared to be complete. Bailey (1925) gave 1-20 May as the period of occurrence of fresh eggs, but it is questionable if this statement refers specifically to Florida nests. In comparison, dates of the first egg in upstate New York (43° N lat.) ranged from 22 April to 6 May (Meng 1951). Of egg dates given in Bent (1937), 50 percent of those for northern localities (New England, Ohio, Minnesota, Canada) fell between 29 April and 21 May; while 48 percent for Lower California and Florida ranged from 15 April to 17 May.



Howell's (1932) distribution map for the Cooper's Hawk in Florida showed ten breeding sites, the southernmost being Manatee, Manatee County. Bent (1937) listed St. Marks, Branford, Micanopy, Orlando, and Manatee as breeding localities. Baynard (1942) reported breeding at Hillsborough River State Park, Hillsborough County. Sprunt (1952) added an additional locality, Panama City, Bay County, and noted that he had never observed nor heard of any nesting in the vicinity of Okeechobee in south central Florida. More recent localities of reported nesting or circumstantial evidence of nesting in the state include: eastern Franklin County in 1964 (J. C. Ogden in Cunningham 1964); Gainesville area, Alachua County, in 1972 (C. H. Coleman et al. in Ogden 1972); and the vicinity of Lake Panasoffkee, Sumter County, in 1973 (G. E. Woolfenden in Ogden 1973). Thus, the Highlands County nests in 1983-85 constitute the southernmost known breeding record of the Cooper's Hawk in Florida. These documented cases of nesting together with the number of late spring and summer sightings of Cooper's Hawks in Charlotte, DeSoto, Glades, Hardee, Highlands, Lee, and Polk counties suggest that breeding has occurred regularly at the southern boundary of the range during the past 20-25 years.

Howell (1932) stated that the Cooper's Hawk was a rather uncommon resident in Florida and appeared to be most numerous in the northern part of the state. Sprunt (1952) did not alter this assessment. Some indication of the status of the Florida breeding population in more recent years is provided by records published in Audubon Field Notes/American Birds from 1960 to 1985. Of 29 sightings in the May-August period (excluding two from the Dry Tortugas in May 1978 and 1979), 13 were in six counties (DeSoto, Glades, Hardee, Highlands, Polk) in the southernmost part of the breeding range compared with 16 from the remainder of the state. Even allowing for a possibly higher probability of reporting of occurrences of Cooper's Hawks in summer in peninsular compared with north Florida, the distribution of these records suggests that there has been a relative or absolute increase in the resident population in the southern part of the state since the 1930's-1950's. The known or probable nest records and sightings of presumed residents from 1960 to the present cited above also indicate that there has been no significant change in the Florida breeding range from that given by Howell (1932) and Sprunt (1952).

The evidence that the Cooper's Hawk still maintains its historic breeding range in Florida and apparently has become a more common breeder in the southern part of the state during the past 25 years is encouraging in view of its severe decline elsewhere in eastern United

States during 1946-1967, presumably as a result of pesticide contamination (Henny and Wight 1972), and its continuing low population level (Arbib 1977). The potential importance of Florida both as a wintering and breeding area for the Cooper's Hawk in eastern United States points to the need for additional research on its distribution, numbers, habitat requirements, and other aspects of its life history and ecology in the state.

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