

## A PRELIMINARY COMPARISON OF TEXAS AND ARIZONA HARRIS' HAWK (*PARABUTEO UNICINCTUS*) POPULATIONS

by

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**ABSTRACT.** Nineteen Harris' Hawk nests found in west Texas were associated closely with Mesquite. Nest site characteristics were measured. Eight successful nests fledged 15 young, averaging 1.87 per nest. Only one nesting threesome was found. In a similar Harris' Hawk population in southern Arizona, approximately half the nests were attended by threesomes. The difference in the numbers of threesomes in the two populations may be a result of differential nest success and/or the effects of population shifts associated with an arid environment.

### *Introduction*

To a student of polyandrous breeding behavior, William Mader's (1976a, 1976b) work on Harris' Hawks is most intriguing. In a population of Harris' Hawks in the Lower Sonoran Desert of southern Arizona he found that approximately half of the nests under observation were attended by threesomes, with all three adults sharing duties in the care of young. Further, threesomes were more successful than twosomes. The purpose of my study was to describe the reproductive activity of the Harris' Hawk and, more specifically, to determine if segments of Harris' Hawk populations in west Texas exhibited the same unusual breeding behavior observed in populations of southern Arizona.

### *Study Area and Methods*

The present distribution of the Harris' Hawk within west Texas is patchy; it is completely absent in some districts while locally common in others. It frequents the rich mesquite (*Prosopis glandulosa*) savannah around Midland, Texas, near the periphery of its range, and the yucca-cactus-creosote bush deserts of the Trans-Pecos region (Kincaid 1974).

My study area lies mainly in Brewster and Pecos Counties in the Trans-Pecos region of the Chihuahuan Desert. I also found four nests in adjoining Crane County. The first Brewster County, Texas, record of the Harris' Hawk was in 1953 (Dixon and Walmo 1956). The nature of their observations suggest that the species had in fact been present for at least a short time before, but probably not in large numbers. The species has since increased and extended its range in the western part of the state.

Harris' Hawks were essentially limited to the desert brushlands, where mesquite appears in isolated woodlands often mixed with stands of hackberry (*Celtis reticulata*) and desert sumac (*Rhus microphylla*) along the lower drainage areas. The region is further characterized by Spanish-dagger (*Yucca torreyi*) usually with an understory of creosote bush (*Larrea divaricata*). Further north in Crane County the habitat of the Harris' Hawk is characterized by dense mesquite savannah.

The study area was rectangular measuring approximately 39 km by 22 km; however, some parts were not accessible for study.

The mean annual precipitation in the area of the largest hawks population is 38 cm; rain occurs primarily in the summer months. The average annual temperature is 17°C, ranging

between  $-17^{\circ}\text{C}$  in the winter and  $40^{\circ}\text{C}$ , in the spring and summer months (U.S. Department of Commerce 1968). The elevation is approximately 1126 m, with less than 30 m variation between areas.

This study was conducted between 30 March and 29 July 1975. I determined nesting success by searching for nests by car and on foot. The majority of the nests were found from the road.

Nest site preferences, clutch sizes, fledging success, and nest sizes were recorded. Thirteen nestlings were banded with Fish and Wildlife Service metal bands and with blue consecutively numbered plastic bands on the opposite leg. The long, bare tarsometatarsus of the Harris' Hawk facilitated the use of tall bands measuring 25 mm. No adults were banded.

### Results

**Territories.** Nesting pairs of Harris' Hawks appeared to maintain individual nesting territories. I found 19 territories. However, I saw no intraspecific competition between nesting groups. I found only one threesome consisting of two males and one female. These adults occupied a territory and maintained two nests but failed to lay eggs. The two closest nests of other pairs were approximately 1.2 km apart. I saw only one instance of interspecific aggression when a Harris' Hawk was in pursuit of a Marsh Hawk (*Circus cyaneus*). Even though the chase occurred in the general vicinity of a Harris' Hawk nest, I cannot be sure that it was territorial defense. Great Horned Owls (*Bubo virginianus*) commonly nested in the vicinity of Harris' Hawks, but I saw no encounters between the two species. Harris' Hawks were quite attentive to their nesting territories and hunted in the general vicinity of their nests. When a nest failed, the hawks quickly vacated the nesting territory.

**Nest Sites.** Harris' Hawk nests were usually in low-lying isolated woodlands. Of 19 nests, 5 were in Spanish-daggers and 14 were in trees: 7 in hackberry, 6 in mesquite, and 1 in desert sumac.

The nests were large, bulky platforms constructed of sticks and usually lined with grass. The lining of one nest consisted of lambs' wool. Nest measurements are shown in Table 1.

The Great Horned Owl was the only other common nesting raptor in the study area. The Swainson's Hawk (*Buteo swainsoni*) and Red-tailed Hawk (*Buteo jamaicensis*) nested only on the periphery of the study area, well outside the territory of active Harris' Hawk nests, and did not infiltrate the heart of the Harris' Hawk range.

In 1975 rodent populations were determined by trapping censuses to be very high (Pete Gobber pers. comm.), probably because of unusually heavy rainfall the previous summer and fall. Flowering plants appeared in great abundance, some that had not been seen for more than 50 years, according to local ranchers.

Nests of pack rats (*Neotoma* sp.) were abundant near Harris' Hawk nests, at the bases of nest trees or within a few meters of them. The farthest from a nesting tree was 18 m away. Pack rats collected essentially all the castings in the vicinity of hawk nests.

**Copulation.** Copulation was seen on five occasions. The earliest was on 2 March, the latest on 25 April. The average duration of copulation was 18 seconds, with a range extending from 6 to 30 seconds. I watched copulation by the only threesome twice on the same evening. The female was perched on a telephone pole and was joined by a male. He mounted her for 6 seconds, then perched next to her. Then the second male flew in and perched on an adjacent pole. Both males flushed together and perched in a small tree 45 m north of the pole. At 18:04, 32 minutes later, the female was again perched on the telephone pole and was joined by a male. He mounted her for 5 seconds, then jumped off and perched next to her. He mounted her again, and copulation lasted for 24 seconds. Both males were in the

immediate vicinity during copulations and displayed no aggression. I was unable to distinguish between the two males.

*Seasonal Timing.* There was little synchrony of egg laying among nesting pairs of Harris' Hawks. Eggs were found as early as 30 March and as late as 23 June. Mader (1976b) reported an average incubation period of 35 days in Arizona. A pipping egg that I found on 12 April was therefore presumably laid on 9 March, the earliest date for egg laying in my study area. The latest date for egg laying was estimated to be 1 June. Thus the earliest hatch date would be 13 April and the latest was estimated to be 28 June. However, if the late egg of 1 June had hatched, the latest hatch date would have been approximately 5 July. My earliest date for fledged young was 24 May, and the latest was approximately 29 July. With a longer study, later nesting dates might have been found.

*Productivity.* Eighteen of the 19 nests were active. They were checked two or more times to determine clutch size. Twenty clutches averaged 2.85 eggs. This average includes a second clutch of two eggs in one nest which had four nearly fledged young when the eggs were laid, and another which successfully re-nested with three replacement eggs after the first attempt apparently failed.

Nests in which at least one chick was reared to an age of approximately four weeks were considered successful (Mader 1976a). Eight nests (44 percent) were successful and fledged 15 young, averaging 1.87 per successful nest (range 1 to 4). The fledging success was 0.83 young per adult pair.

Causes of nest failure could be determined for only three nests. At one, two addled eggs were found, and within 70 m of the nest I found a female hawk dead from gunshot. At another, with two eggs, there was raccoon (*Procyon lotor*) sign. Even though one egg was left, the nest failed. The third, a yucca nest with four eggs, was knocked down when a pasture was "chained."

### *Discussion*

In southern Arizona Mader (1976a) found that of 50 nests, 23 consisted of threesomes; and of these, 18 (78 percent) were successful. Of 19 Harris' Hawk nests in west Texas, only one consisted of a polyandric trio. Copulations were observed within this threesome, but no eggs were laid.

Differential productivity may influence the number of threesomes in each population. Woolfenden (1975) found in a study on helpers at the nest of Florida Scrub Jays (*Aphelocoma coerulescens*) that a year with high fledging success produced more helpers the next year.

Clutch size was much the same in Arizona and in my Texas study. In Arizona, from 1969 through 1973, 50 nests averaged 2.96 eggs (Mader 1976a). In Texas, 20 clutches in 18 nests averaged 2.85 eggs in 1975.

Production per nest was slightly higher in Texas than in Arizona. Thirty-four successful Arizona nests from 1969-1973 averaged 1.60 chicks per nest (Mader 1976a). In 1975, 8 successful nests in Texas averaged 1.87 chicks per nest.

Total nest success (percentage of nests fledging at least one young) was higher in Arizona. From 1969 through the 1973 nesting seasons, nesting success was 68 percent (Mader 1976a), whereas in Texas for 1975 it was 44 percent. This low occurred in Texas despite the use of naphthalene crystals at the base of trees to repel predators, a technique not used in Arizona (Mader pers. comm.).

Shifts in Harris' Hawk populations are not well understood. However, there is growing speculation that the sporadic and unevenly distributed rainfall typical of the Trans-Pecos

region and its subsequent effect on rodent populations may regulate the patchy distribution and the nesting success of Harris' Hawks in the suitable habitats of west Texas. For example, after some 7 years of drought in my study area the unseasonable and large rainfall of the late summer and fall months of 1974 provided more food for rodents, whose numbers increased markedly, and, subsequently, predator populations increased. Harris' Hawks, not so numerous the previous year, (Grainger Hunt pers. comm.) invaded the area in large numbers.

A similar invasion was recorded in 1971 in Midland and Glasscock Counties, Texas, where 17 active nests were found (Tom Cade pers. comm.). In 1975, not one nesting was found there. This absence of hawks was attributed to decreased rainfall and low rodent populations (Frances Williams pers. comm.).

Such erratic shifts of Harris' Hawk nesting also occur in south Texas (Peter Cragg and F. and F. Hamerstrom pers. comm.) where drought conditions are local and irregular.

In Arizona, where rainfall is also irregular and unevenly distributed, nesting territories are nevertheless occupied regularly. Mader (1976a) suggests that the sporadic and uneven rainfall may result in the scattering of food resources throughout the year in varying localities. He believes that this irregularity, coupled with its effect on prey populations, may indirectly affect Harris' Hawk nesting success, but it seems not to cause the erratic shifts in populations reported for Texas.

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**Table 1**  
Harris' Hawk Nest Measurements (N=19).

	<b>Mean</b>	<b>Range</b>
Height	3.4 m	1.6-7.6 m
Diameter	46.6 cm	30.4-68.3 cm
Depth	23.3 cm	17.7-32.9 cm
Lining		
Diameter	23.8 cm	17.7-35.5 cm
Depth	5.3 cm	2.5-10.1 cm

*Literature Cited*

- Dixon, K. L., and O. C. Walmo. 1956. Some new bird records from Brewster County, Texas. *Condor* 58:166.
- Kincaid, E. B., Jr., (ed.). 1974. *The bird life of Texas*, Vol. I. by H. C. Oberholser. Austin: University of Texas Press.
- Mader, W. J. 1976a (In press). Extra adults at Harris' Hawk nests. *Condor*.
- Mader, W. J. 1976B (In press). Biology of the Harris' Hawk in southern Arizona. *Living Bird*.
- U.S. Department of Commerce-Environmental Science Services Administration. 1968. *Climatological summary, Alpine, Texas* (Revised May 1968). Climatography of the United States No. 20-41.
- Woolfenden, G. E. 1975. Florida Scrub Jay helpers at the nest. *Auk* 92:1-15.

**SNAKE RIVER BIRDS OF PREY  
RESEARCH PROJECT – 1975 ANNUAL REPORT**

The Snake River Birds of Prey Research Project--1975 Annual Report is available from the Bureau of Land Management, Boise District Office, 230 Collins Road, Boise, Idaho 83702. It is a 193-page compendium of the research projects being conducted in the Birds of Prey Natural Area and is recommended to anyone doing ecological studies on western raptors. The bureau would welcome any comments concerning this project. There is no better way to ensure future consideration of raptors in land-use planning than to let the decisionmakers know that ongoing efforts are worthwhile. If you order the annual report, for which there is no charge, why not follow up after you have read it with a letter to Curt Berklund, Director, Bureau of Land Management, 18th and C Streets, N.W., Washington, D.C. 20240

**CONFERENCE ON MANAGEMENT TECHNIQUES  
TO BE HELD AT OXFORD**

The British Falconers Club is organizing its second international scientific conference on the subject of "Birds of Prey Management Techniques." The meetings are planned for October 3-5, 1977, and will be held at the Department of Zoology and Wadham College, Oxford. Additional information can be obtained by contacting R. E. Kenward, Department of Zoology, Edward Grey Institute of Field Ornithology, South Parks Road, Oxford OX1 3PS, England.