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FLIGHT DISPLAYS IN TWO AMERICAN SPECIES OF *BUTEO*

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Flight displays occur widely among birds of prey (Brown and Amadon, Eagles, hawks, and falcons of the world, p. 95–101. McGraw-Hill, New York. 1968). A common type of courtship display is a circling flight in which the male (typically) stoops on the female, with actual or symbolic foot-touching occurring when she turns on her back to meet him at the moment of contact or near contact. Another version involves a prolonged grasping of the feet by the two birds, followed by a spectacular tumbling earthward. The latter behavior is known to occur in various eagles (especially *Haliaeetus*), some kites (*Haliastur, Milvus*), and in the Upland Buzzard (*Buteo hemilasius*) of Asia.

Several years ago I observed flight displays in two species of *Buteo* in New Mexico, one involving courting Red-tailed Hawks (*B. jamaicensis*) and the other, Zone-tailed Hawks (*B. albonotatus*). The display seen in *B. jamaicensis* involved the use of a snake and that in *B. albonotatus* a tumbling fall, features that do not seem to have been reported before in these species.

My observations of courtship flight in *B. jamaicensis* agree in most respects with those reported previously (e.g., Fitch et al., Condor 48:209, 1946; Austing, The world of the Red-tailed Hawk. J. B. Lippincott Co., Philadelphia and New York, p. 39–41, 1964). The birds seen by me near Silver City, Grant County, on 30 April 1961, were both adults of the pale *fuertesi*-like breeding population of southern New Mexico. The two birds differed notably in size, and I assume that the smaller was the male. I watched them for about 15 min as they circled overhead, the male ranging from about the same level to perhaps 20 ft above the female. Their flight was leisurely and flat-winged, with the male generally circling behind and above the female as they performed spirals of up to 100 ft in width. In his talons the male carried a limp snake, some 2 ft long and of an unidentified species. Perhaps 10 times during the period the male circled above the female and then with quickened wingbeats he swooped down at her, trailing the snake by her as she turned over to meet him. In no instance did she actually succeed in grasping the snake, although the male came within 3 ft of her on several occasions before turning to rise again. All through the performance at least one of the birds uttered a loud, low and raspy *hrrr, hrrr, hrrr*, quite unlike the ordinary scream of the species. This call apparently is the same as that described as *chwirk* by Fitch et al. (op. cit.), who also noted it during courtship flights. Eventually the two birds moved out of sight, still circling and displaying at about the same height.

Some indication of the function of this behavior is suggested in Brown and Amadon's discussion of sexual dimorphism and its significance in raptors (op. cit., p. 26–28). Among many species the female is notably larger than the male and, of all the theories put forward, these authors favor one that points to this as facilitating pairing. They explain that in species that are aggressive and usually solitary, what amounts to a conflict of drives may occur when birds come together to breed. These drives are predation and reproduction. The assumption is made that because the female is larger, the male is cowed in its predatory drive while remaining stimulated in its sexual drive.

Of course, the female must be receptive to the sexual advances of the male, or her predatory drive may end up inhibiting or preventing reproduction. Thus it would seem necessary that an interplay of signals takes place to insure pairing and breeding. In this regard, it may be that the larger female communicates a willingness to breed by allowing the male to dominate her in certain respects. For example, in the courtship flight of *B. jamaicensis* the male appears to be the aggressor, with the female covering up in response to his stooping. Brown and Amadon (op. cit.) also mention the courtship feeding of the female by the male in various raptors, an activity that they postulate may reduce or eliminate potential hostility. This behavior may also be another signal to the male of the female's receptiveness to breed, and it could also be a stimulus leading toward his later role of feeding the incubating female and then the young.

In certain respects the behavior of the female during the early breeding cycle recalls that of young birds—as is the case in many nonraptors, including being fed and wing-fluttering (associated with copulation). In *B. jamaicensis* the female has been known to elicit copulation while giving the begging call of the young (Fitch et al., op. cit.), and her non-domination of the courting male may be another "regressive" signal. Furthermore, I suggest that my observation of snake-carrying during courtship flight also fits this pattern, and in fact it may represent courtship feeding at some stage. One could even extend the argument by saying that, as with adults luring young with food, the male may have been manipulating the female—perhaps even toward the nesting area. The stage of breeding of the birds I

observed was not known, but from their casual attitude one suspects that they may not yet have had eggs or young, in spite of the late date.

The flight behavior observed in *B. albonotatus* occurred over the Gila Valley on 13 February 1960, just north of Redrock in Grant County. Three adults were involved, and when first seen they were circling about 200 yards to the north of me and perhaps 300 yards above the valley. My attention was attracted by several screams from the birds, but mainly they were silent. Initially, the three were soaring in large circles, with two birds somewhat higher than the third. Suddenly, one of the higher birds stooped at the lower one, which just at the moment of contact turned on its back and locked feet with the first. With wings over the back, the two then tumbled in somersault fashion for a distance of perhaps 100 yards, at which point they released and flapped back up to nearly their original positions. From there they gradually circled northward and disappeared together, in the same direction as the other bird, which had disappeared earlier and without becoming involved in the tumbling interaction.

The significance of the above behavior is unclear, as tumbling flights of this kind have been observed in aggressive as well as in courtship situations (Brown and Amadon, op. cit.). February is unusually early for this species to appear in New Mexico, so that activity associated with breeding would also seem premature. On the other hand, courtship flight is known to occur in *B. jamaicensis* throughout the year, and possibly was also involved here. Regardless of its exact function, this appears to be the first report of this type of behavior in *B. albonotatus*.

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A COURTSHIP FLIGHT OF THE SWAINSON'S HAWK

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Although the Swainson's Hawk (*Buteo swainsoni*) is a common breeding species on the prairies of the western United States, its courtship display has never, to my knowledge, been described. Swainson's Hawks are relatively tame and confiding and are not usually considered strong, aggressive fliers like some of its congenors. Nevertheless, their courtship display is vigorous and acrobatic.

On 24 April 1971, I observed a courtship flight of this species. Both birds of a pair soared separately for several minutes within a half-mile of a tree containing a nest. The paths of the birds roughly described quarter-mile circles at increasing altitudes to about 300 ft. The birds did not beat their wings for minutes at a time. Then one (I assume the male) soared to a position directly over the nest at that altitude, set its wings in a slightly bent attitude, and glided in a direct path away from the nest. It lost about 200 ft of altitude in about three-quarters of a mile and again began a leisurely circling soar as described above.

Once, when one of the birds, again presumably the male, was over the nest, it began a rapid, flapping flight, followed by closure of its wings and a 20–30-ft dive. After the dive, the bird continued the vigorous, flapping flight in a circular path (perhaps 25 ft in diameter), climbed sharply a few feet, stalled, and dove again. This occurred twice in rapid succession and led to a 15-ft nearly vertical climb to another stall. During this climb, even the axis of the bird's body was nearly vertical. The climb was launched from horizontal flight in a tight circle, not as the follow-through of a dive.

This rather acrobatic maneuver and stall was followed by a long dive which described a parabolic path, at the bottom of which the bird lit very gently on the edge of the nest. Between the beginning of the rapid, flapping flight and arrival at the nest, 55 sec elapsed. Within another 20 sec, the female lit about 5 ft from the nest. The display did not lead to copulation. To the contrary, no posturing, vocalization, or other courtship behavior followed. The male flew off shortly. The female hopped to the nest before she too flew off. They began soaring again and escorted a third *Buteo* (species unknown) across their territory and out of sight without direct conflict with it. A similar flight (which did not end at the nest) was observed on 3 May 1972, and John W. Stoddart (pers. comm.) and I have observed parts of the sequence as described on several other occasions.

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INCREASED MORTALITY OF COOPER'S HAWKS ACCUSTOMED TO MAN

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In the course of a 1969–72 study of the nesting biology of accipiters in the southwestern United States, we banded 235 nestling Cooper's Hawks (*Accipiter cooperii*), a total which does not include banded nestlings known to have died before independence. The banded nestlings have produced a pattern of recovery which strongly suggests that familiarity with man renders a hawk more likely to die from predation by man, especially shooting.

Of the 235 Cooper's Hawks, 33 from 12 nests had frequent exposure to man either in the form of handling for weighing and measuring every 2 or 3 days (25 birds), in the form of intensive study from blinds (26 birds), or both (18 birds). The nests that did not have frequent exposure to man were generally visited only once or twice to check contents, and again on banding day. A few were visited on banding day only. Of the 33 birds with frequent exposure to man, 4 (all from different nests) were recovered as a result of predation by man within a year of banding (3 cases of shooting, 1 of a bird killed in a building). Two were recovered at 2 months of age, 50 km from the sites of banding; one aged 7 months, 1130 km away; and one aged 10 months, 1050 km away. Only one of the 202 birds from 70 nests with little exposure to man was recovered within a year of banding; it was found dead from unknown