

Vaux's Swift. *Chaetura vauxi*. A male (JSW no. 943) collected on 14 September 1969 was very fat, with a few pinfeathers, a large skull window (7×10 mm), and the testes $1\frac{1}{2} \times 2$ mm. It was taken from a flock of seven Vaux's Swifts and is the first specimen from central Arizona (Phillips et al., loc. cit.:59).

Mountain Chickadee. *Parus gambeli*. A female (JSW no. 974) collected 24 October 1970 is our only known specimen from the south-central Arizona lowlands. This individual with skull fully ossified, no fat, and ovaries 4×15 mm, was one of four seen that day.

Rufous-backed Robin. *Turdus rufopalliatus*. Our specimen (JSW no. 927), collected on 30 November 1969, is an adult male, testes minute. It showed little fat and a few pinfeathers in the capital tract only. It was feeding alone on the grassy margin of a marsh even though there was a small flock of Robins (*Turdus migratorius*) in the area. This is approximately 175 mi. N of the specimen collected by Harrison (Auk 79:271, 1962). It is also apparently the second verifiable record for the United States, and the species, like the Groove-billed Ani, remains unrecorded in northern Sonora.

Northern Water-thrush. *Seiurus noveboracensis*. A female? (JSW no. 969) taken on 30 August 1970 is the first collected from the lowlands of south-central Arizona since one taken at Phoenix by Breninger on

16 September 1897 (Phillips, pers. corr.). The specimen had heavy fat beneath the feather tracts, skull fully ossified, and no molt.

American Redstart. *Setophaga ruticilla*. A young female (JSW no. 971) collected 30 August 1970 is the first record for central Arizona and one of few specimens for the state. The specimens showed skull windows, no molt, and moderate fat.

Golden-crowned Sparrow. *Zonotrichia atricapilla*. A female (JSW no. 923) taken on 15 November 1969 is the first record from central Arizona (Phillips et al., loc. cit.:207) and one of the few specimens from the state. It had a few pinfeathers in the spinal tract, moderate fat, and ovary not enlarged ($1\frac{1}{2} \times 3$ mm).

Swamp Sparrow. *Melospiza georgiana*. A female (JSW no. 924), collected on 15 November 1969, was the first specimen from central Arizona, although there are others from the southern and western parts of the state (Phillips et al., loc. cit.:208-209). It had little fat, no molt, a large skull window (8×10 mm), and ovary not enlarged ($2 \times 3\frac{1}{2}$ mm).

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SPRUCE GROUSE COPULATION

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During field work on Spruce Grouse (*Canachites canadensis*) in northern Michigan in May 1968, I witnessed copulation of a pair of Spruce Grouse. Although descriptions of males attempting copulation with study skins have been published in the literature (Lumsden, Can. Field-Nat. 75(3):152-160, 1961; MacDonald, Living Bird 7:5-25, 1968), I know of no description of a completed copulation. The copulatory behavior I observed was very similar to copulatory behavior described for other members of the family Tetraonidae by Lumsden (Ontario Dept. Lands Forests Res. Rpt. 83, 1-94, 1968). In the interest of clarity, a full description of the copulatory behavior will be presented here, though portions of the display pattern may be found described elsewhere (Lumsden, 1961, op. cit.; MacDonald, op. cit.).

Strutting was one of the preliminaries to copulation. In the strutting posture the male erected his neck and breast feathers, lowered his undertail coverts downward and straight out from the body, elevated his rectrices to an angle of 70° , enlarged his bright red eye combs, and lowered his chin feathers so that he appeared to have a short beard. The bird's wings were held slightly out from the body and downward. Erection of the breast feathers produced a white band across the chest, and lowering the undertail coverts exposed their white tips.

When strutting, the male walked toward the female in the posture described above. The outer rectrices were alternately opened and closed as the leg on the opposite side went forward and backward in strutting.

This is known as tail-swishing, and is an integral part of the strutting display. The faster the bird went, the louder and more continuous the tail-swishing became. Strutting was alternated with the tail-flick and "challenge call" (Harju, unpubl. MA thesis, Northern Michigan Univ., 1969) as the male approached the female. As the tail-flick began, the male lowered his head, extended it forward slightly, and took several steps forward. Then he raised his tail feathers to 90° , lowered the front of his body near the ground, and suddenly fanned his tail out to a three-quarter open position and then quickly closed it again. The bird snapped his head back up to the strutting position as the tail was closed, and as the head reached the vertical position the tail was simultaneously spread fully open. The challenge call, in two parts, was produced partially when the head was down and partially when the head was snapped up. Each part of the call was precisely coordinated with one of the parts of the tail-flick. A scraping sound was produced as the tail was flicked closed and then open again.

Immediately prior to copulation the male approached the female very slowly and deliberately in the strutting posture with his head cocked to one side, probably to expose the brilliant red eye combs. The approach was made indirectly, in a series of short, sidling struts at an angle to the side of the female, from the front toward her rear. The male slowed considerably as he neared the female, and seemed to be assessing her response to his display. As he drew near the female (within 6 ft) he suddenly made stamping movements with his feet, lowering the front of his body slightly as he did. His head was then snapped from side to side, one or two times at first, followed by a pause, then several times in succession, exactly as described by Lumsden (1961, op. cit.) for Spruce Grouse in Ontario. The rectrices were swished open and closed while this "head-jerk" was being performed, and the wings were flicked out to the side, perhaps to provide balance. The hen during all this display appeared very little interested, and did not move a great deal,

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nor did she make any apparent movements to attract the male.

Immediately after giving the last of several head-jerk displays, the male strutted from the front of the female around to a position just behind her. The female then responded by crouching low on the ground with her back to the male. Her wings were outstretched and held slightly above the level of the back, with the primaries spread widely apart. The body feathers of the hen were somewhat ruffled in appearance and the tail was closed and shifted over to one side to expose the cloaca. This response is very much like the receptive posture of female Sage Grouse (*Centrocercus urophasianus*).

The male, once the female had assumed the receptive posture, stepped on her back and grasped the feathers of the back of her head in his beak. The wings of the male were extended to the ground on either side of the female, probably to maintain balance. His tail was lowered in an attempt to make cloacal contact. The male then made pushing movements with his feet against the upper back region of the female, with his neck bent forward and pulled down

so that his throat was nearly on his breast. Once cloacal contact was established, the treading movements on the female's back continued for approximately 10 sec, after which the male dismounted. He then strutted away in the same vigorous manner displayed in precopulatory behavior.

The female after copulation exhibited postcopulatory behavior similar to that displayed by many hens of the Galliformes (Lumsden, 1968, op. cit.). Once the male had stepped off her back, the female moved forward several feet with most of her feathers ruffled, shaking them vigorously as if she had taken a dust bath. Her tail was alternately spread and closed, and her head was in a more vertical position than it was in the receptive posture. The feather-shaking lasted about 15 sec, after which the female spent a short time preening.

The male continued to show a high degree of response to sexual stimuli after copulation; i.e., he strutted vigorously, gave several challenge calls, and twice performed display-flights in response to recorded female calls. The female showed no further response.

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POST-BREEDING NEST CAVITY DEFENSE IN PURPLE MARTINS

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During studies of Purple Martin (*Progne subis*) activity, I noted that behavior similar to that of nest cavity defense in the spring (Allen and Nice 1952; Johnston and Hardy 1962) appeared to be repeated in late summer. This activity, which I called "post-breeding," I first observed at Edmonton in 1963. That season several subadults participated in intense activity in and around a nest box for about a week in early fall. The same procedure was noted in this colony the next season. In 1965 and 1966 this activity of entrances and departures at nest boxes was recorded with electronic equipment. In 1966 a new phase was noted: at least three subadult males each attracted females that assisted in defending their cavities for several days.

Based on data for 14 males, this final stage in the breeding cycle lasted 5.9 ± 4.6 days with a range of 1-19 days. Activity during the post-breeding stage was quite intense (fig. 1). There appeared to be two daily peaks of activity, morning and afternoon; the former was generally greater. A comparison between the activity when martins first arrived in the spring and during the post-breeding stage of late summer showed that entrance-departure activity of both stages was of the same intensity.

As two earlier workers on Purple Martins made only brief mention of post-breeding activity (Olmstead 1955; Johnston and Hardy 1962), I submit a summary of my notes. Post-breeding activity began in the early morning with males, usually subadults, arriving at the nest boxes, either singly or in small flocks. Some individuals entered the nest cavities without hesitation; others, which I presumed were newcomers, hesitated before entering. The occupant of a cavity defended it by making sudden outward lunges from the entrance,

or by resting in front of the nest entrance in a manner similar to that described in Johnston and Hardy's (1962) comments on first arrival and my own observations. Birds were continually flying from cavity to cavity. If a new bird arrived, all established males produced a piercing cry and attempted to discourage the newcomer from landing nearby. Few fights and no gathering of nest material were observed during the post-breeding stage. Observation of color-banded birds indicated that previous nest tenants that had fledged young that year did not participate in this stage.

Post-breeding defense activity commenced about mid-July and increased as the season progressed. By the time the last young fledged near the end of July in 1966, 30-40 martins were competing for possession of future nest cavities at one colony. This competition continued for a few days and then ceased by 2 August in both years.

Researchers have reported fall activity for other bird species. Brewster (1925) and Bump et al. (1947) mention fall drumming of Ruffed Grouse (*Bonasa umbellus*). Nice (1937) mentions young resident Song Sparrows (*Melospiza melodia*) taking up territory in their first fall. Morley (1943) summarized the European literature on bird territorial activity in the fall. Peterson (1955) observed recently fledged Bank Swallows (*Riparia riparia*) examining old holes and digging at new ones.

I suggest as a tentative explanation for the post-breeding defense activity in Purple Martins, that it may help to imprint upon participating birds the location of future nest sites. A territory to which they will return the following spring could be learned. Martins have a fairly good homing instinct. Southern (1968) found that 79.8 per cent of the 96 birds used in homing experiments returned over distances of 1-594 miles. Data from birds banded in my studies indicate that martins return each year to nest in the same area. My returns of birds banded as nestlings indicate that they nested 3-10 miles from the colony where they were raised. However, one female I banded as a nestling later nested 85 miles SW of the place where she had fledged.

My observations and others suggest that martins