TABLE 2. Weights (in grams) of male Western Tanagers.

	n	Range	Mean
14 May (first capture)	27	25.6–37.6	27.70
15 May (recaptures)	4	23.1–27.3	25.05
15 May (first capture)[a]	5	30.0–38.1	32.18

[a] That most of the tanagers captured on 15 May were recent arrivals is suggested by the relative commonness of females on that date. Four were captured on 15 May (weights, 31.1–32.9 g). On the previous day only one female was seen or captured (her weight was 26.1 g).

History, which is located in Cave Creek Canyon of the Chiricahuas. Here Western Tanagers (*Piranga ludoviciana*) and Black-headed Grosbeaks (*Pheucticus melanocephalus*) were crowded around the hummingbird feeders in large numbers, as were lesser numbers of several other species.

On 14 May mist nets were set up near the feeders and one female and 27 male tanagers were captured. These were weighed, banded, and released. Four of the male tanagers were recaptured on the following day. All showed a weight reduction from the previous day (table 2). One recaptured individual, noted as weak on 14 May, appeared to be even more so on the following day (wt. 23.1 g) and probably did not survive. Another recaptured male died in my hands. His weight (23.6 g) was 6.1 g below the mean weight of the 27 males captured on the previous day and 2.4 g below the lightest male not recaptured. Only three of the 23 male tanagers not recaptured were lighter than the heaviest individual recaptured. It appears that the tanagers remaining near the feeders were those approaching starvation.

At 09:40 on 15 May, while I was attending the nets, I observed a Flammulated Owl (*Otus flammeolus*) perched in an oak near the feeders. I approached the owl, which flew only about 20 meters before it dropped to the ground, apparently exhausted. At capture, this bird, a female, weighed 39.8 g, less than either of two starved individuals reported by Johnson (Condor 67:93–124, 1965). It died the following day in spite of my efforts to feed it. A few days earlier Charles Sisler, then of the research station, chased and captured a male Wilson's Warbler (*Wilsonia pusilla*) that was capable of flight, but presumably was weakened by hunger.

These three species (Flammulated Owl, Wilson's Warbler, Western Tanager) are primarily insectivorous, feeding on active insects. The eight other species for which one or more weights were obtained are also insectivorous in part, but they are able to forage either under bark or leaf litter where their insect prey was probably less affected by the freeze. There was no indication that these species had suffered severe food deprivation.

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THE SURVIVAL RATE OF JUVENILE CACTUS WRENS

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Relatively little is known about survival rates of young birds from the time they leave the nest until they are independent of parental care. Several authors have speculated that this is a period of greatly increased and perhaps even maximum mortality. It would seem reasonable to assume that inexperienced and only partially matured birds are extremely vulnerable to predators and the vagaries of climate which might lead to starvation. However, it may also be postulated that nestlings should not fledge until they are sufficiently developed that their survival rates out of the rest are equal to or higher than as nestlings. To whatever extent experience out of the nest contributes to survival out of the nest, one would expect a comparable increase in mortality immediately following fledging. This is to say that the young must "pay" for a period of gaining experience by increased mortality rates.

It is important that data on the survival of fledglings are gathered to enhance our understanding of the development of survival capabilities in birds and their relation to population phenomena.

While making a study of growth and temperature regulation in the Cactus Wren (*Campylorhynchus brunneicapillus*) near Tucson, Arizona, I was able to collect some incidental data on the survival of young.

TABLE 1. Survival of juvenile Cactus Wrens.

Nest	Number of young fledged	Interval before collection (days)	Number of young alive	Number of young lost
X	3	3	2	1
E'	3	3	3	
FF	2	6	1	1
S	3	15	2	1
Q	2	15	2	
E	4	20	4	
DD	3	21	3	
N	2	25	2	
Z	2	26	2	
I	3	26	2	1
BB	3	27	3	
B	3	29	3	
A	4	38	3	1
D	2	40	2	
Total	39	(ave. 21)	34	5

The Cactus Wren is well suited for this type of study because the young remain in family groups for several months and sleep in readily accessible roosting nests. Fourteen broods of juvenile Cactus Wrens were collected at night from roosting nests 3 to 40 days after fledging (23–60 days of age). The number of young surviving in each brood is presented in table 1. Brood size in this species is normally three or four, but many young were collected as nestlings, and thus family groups in this sample were smaller than usual. Of 39 young which fledged, 5 were not

found again when the broods were collected. The daily survival rates of juveniles may be calculated with a method described by Mayfield (Wilson Bull. 73:255–261, 1961), but since the exact dates of death of the young are not known it is possible to calculate only the range of values for this statistic.

The daily survival rate of the sample presented in table 1 lies between 99.33 and 99.40 per cent. The survival of 49 nests observed during the same season and calculated in the same manner was 99.35 per cent per day. Nine of these nestings were terminated before fledging. Anderson and Anderson (Condor 62:351–369, 1960) followed the outcome of 55 Cactus Wren nests which had an overall survival rate of 99.03 per cent per day. Thus, it appears that in the Cactus Wren the survival rates of juveniles are comparable to those of nestlings and that the period of life closely following fledging does not represent a time of maximum mortality.

Hann (Wilson Bull. 49:145–237, 1937) noted that of 70 fledgling Ovenbirds (*Seiurus aurocapillus*), 39 left the forest in which they were raised at an estimated age of 30 to 35 days after leaving the nest. This would indicate an overall daily survival rate of between 98.07 and 98.34 per cent. From Hann's data on the survival of these birds as eggs and nestlings one can calculate survival rates of 97.53 and 95.40 per cent per day, respectively. Again, juvenile survival rates are higher than those during the nest period.

It should be emphasized that these rates are averages for periods of three or four weeks, and it is likely that losses of young are much higher immediately following fledging. Two of the five Cactus Wren fledglings lost were known to have died within six days after leaving the nest. As the young gain experience and mature physically, their survival rates must increase until they approach adult levels. For comparison, if adults were to suffer 50 per cent mortality per year, their daily survival rate would average 99.81 per cent.

Snow (Ibis 100:1–30, 1958) followed the fates of 140 fledgling English Blackbirds (*Turdus merula*). He found that 113 were alive five days after leaving the nest and that 92 survived the period between five days and 15 to 20 days. The survival rate calculated for the first five days out of the nest (95.82 per cent per day) is much lower than during the next 10 to 15 days (98.36 per cent per day).

The analyses presented here do not resolve changes in survival rates at the time young leave the nest and become free-living juveniles. It is demonstrated, however, that overall survival rates of Cactus Wrens and Ovenbirds are higher during the period after fledging than during the nest period, although data for English Blackbirds suggest that survival rates may decrease briefly immediately following fledging.

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MIXED WOOD DUCK—TREE DUCK CLUTCH IN TEXAS

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A second instance of Wood Duck (*Aix sponsa*) nesting in south Texas substantiates an earlier observation (Bolen and Cottam, Southwestern Naturalist 12:198–199, 1967) of range expansion for this species in Texas. In the present case, the nest was discovered 16 June 1967, in Live Oak County when nesting boxes erected for Black-bellied Tree Ducks (*Dendrocygna autumnalis*) were inspected.

The clutch, complete when the nest was found, contained a mixture of six Wood Duck and nine Black-bellied Tree Duck eggs. All the eggs were cushioned with profuse Wood Duck down. The Wood Duck hen was caught and banded (USF&WS No. 515-00301) on 19 June 1967. The hen continued incubation until the clutch hatched on about 3 July 1967. It was not possible to determine which species began the clutch.

Several points of interest arise from this observation. First, the comparatively low number of eggs making up the Wood Duck clutch suggests that the addition of the Tree Duck eggs effected a reduction in the Wood Duck's clutch size. Wood Ducks normally lay 12 eggs (McLaughlin and Grice, Trans. N.A. Wildl. Conf. 17:242–250, 1952), although intraspecific egg parasitism has perhaps led to overestimation of the clutch size considered normal for a single hen (Fuller and Bolen, Wilson Bull. 75:94–95, 1963). Weller (Ecol. Monogr. 29:333–365, 1959) has amply demonstrated the reduction in clutch size that occurs when a second species adds its eggs to the nest of another. This reduction can only occur when the host is still laying, suggesting that the Wood Duck and Tree Duck hens indeed laid simultaneously.

Secondly, four Wood Duck and eight Black-bellied Tree Duck eggs hatched with all 12 ducklings successfully leaving the nesting box. The balance contained a dead, early embryo (Wood Duck) or no visible evidence of development (1 Wood Duck, 1 Black-bellied Tree Duck). In any event, the incubation period of these birds seems approximately the same (or, at least enough alike to allow successful incubation of the Tree Duck eggs by a hen of another species). The incubation period for Wood Ducks is commonly reported as 28–30 days with this, or greater, variation dependent on the frequency and duration of periods the female spends off the nest (Breckenridge, J. Wildl. Mgmt. 20:16–21, 1956). Twenty-eight days also seems to characterize the incubation period for the Black-bellied Tree Duck, but the point has not been adequately confirmed with nest-recording apparatus (Bolen, unpublished Ph.D. thesis).

Thirdly, Black-bellied Tree Ducks pluck no down for nest lining. Johnsgard (Ibis 103:71–85, 1961) postulated that, because both male and female tree ducks share incubation, the incubation period is essentially uninterrupted, thus negating any requirement of down for egg insulation. If so, the eight Black-bellied Tree Duck eggs that hatched did so under a regime of interrupted incubation but with the benefit of abundant Wood Duck down. The nest under our observation was visited on two occasions (07:00 21 June and 14:00 1 July) when the Wood Duck hen was absent. All eggs had been well covered with