

# BIRD-BANDING

A JOURNAL OF ORNITHOLOGICAL INVESTIGATION

VOL. XXXIII

January, 1962

No. 1

## TEN YEARS AND 10,000 BIRDS

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Between April 1946 and April 1950 a concentrated and continuous effort was made to band as many individuals and species of birds within a 20 mile radius of Bakersfield, California, as could be trapped or found as nestlings. The study was designed to determine the dispersal of local birds within Kern County and to points extralimital to Kern Co., and to establish at least the ranges of longevity in local species. It is now ten years since this project was closed and except for a few species such as Mourning Doves and Black-crowned Night Herons the life span of most of the birds has elapsed.

This report attempts to bring together the pertinent data resulting from this study involving more than 10,000 individuals and 75 species. Grinnell and Miller (1944) list subspecies that occur in Kern County, but in the present study no attempt to identify subspecies was made.

As banding records accumulate each bander finds himself asking questions of his data. The obvious questions of how old does a bird live and how far does it go usually head the list, for these are the first ones capturing a worker's imagination. Later other questions arise: what plumage changes take place in different species? What sibling relationships exist after fledging? How tenaciously do individuals cling to territories winter or summer? What happens to siblings from one nest? Is migration of certain winter residents a continuous thing, come in waves, or one fell swoop? What is the survival of injured birds? Is there differential survival between sexes or ages? Suggested answers to these and other questions are touched upon in those species where the records are pertinent.

### LOCALITIES

Nesting studies were made at many localities in and around Bakersfield which lies near the center of Kern County (large as the state of Massachusetts), and trapping was carried on mainly at Hart Memorial Park, the Hunn Olive Grove, and farmyards west of Shafter. Hart Park, on the Kern River 7 miles east of Bakersfield, covered an area of about 300 acres planted in box elder, maple, elm, ash, willow, and conifers. It was watered by irrigation daily and was very attractive to birds, of which more than 243,000 individuals of 167 species were tallied over the four years.

Adjacent to and across the river from the park was a 3 acre flood-plain study area (known as the Cabin) covered with low shrubs, and with an open overhead of sycamore, cottonwood, and willow. Species

similar to those seen at the Park were tallied here, 20,400 individuals of 111 species.

Five miles north of Bakersfield was the Hunn Olive Grove, 100 acres including more than 3,000 sixty-year-old trees. This was especially attractive to House Finches, thousands of which nested here each year, along with Mourning Doves, Black-crowned Night Herons, Robins, Brewer's Blackbirds, Bullock's Orioles and others. The tally was 46,700 individuals of 50 species.

Along the northeast edge of the olive grove was an irrigation canal bordered with marshy areas of tule beds known as Lerdo Slough, and a mile further east was the S.A. Camp Cattle feed yards. Fifty-two species and 29,000 individuals were recorded at the Slough.

West of Shafter six farmyards were studied for different periods, the most intensive of which was the observations of English Sparrows at the Froese place a mile out of town. These farmyards each had a small tule filled reservoir and the lawns and gardens were shaded by walnuts, ash, elm, maple, Casurina, and fruit trees. Each farmyard was distinctive and attractive to certain birds, but the aggregate was an average of farmyards over the floor of the valley. English Sparrows made up more than 44,000 of the 77,000 birds tallied here, the remainder including 102 species.

#### METHODS

Most extensive trapping was at Hart Park where traps were in operation three days a week in the summers of 1946 and '47 and at weekly intervals for the rest of 1946 and 1947 and all during 1948 and 1949. Early in the study simple bottomless funnel traps of  $\frac{1}{2}$ " hardware cloth were constructed (18" wide, 36" long, with 6" to 8" funnel at either end) and baited with grain or watermelon. At times fifteen or twenty of these were in operation scattered over the park.

In 1948 they were replaced by 12 circular traps with eight cells (Rogers' 8-celled traps) each operated by a modified figure-4 drop trip. Baited with grain, fruit, or water these were highly effective and superseded other types of traps in use. Put to use in Bakersfield and at other localities, these traps were subject to damage and theft so that a uniform number could not be kept in operation.

In 1948 large permanent walk-in traps 18' x 3' x 6' with a funnel at each end were built, one at the olive grove and at the Froese farmyard. Baited with grain or fruit and operated once a week, these were effective in taking English Sparrows, House Finches, and White-crowned Sparrows.

Hand nets and an Italian birdnet were occasionally used for such species as Mountain Bluebirds and Cliff Swallows.

At every nest that was found the young were banded when approximately half grown.

#### DISCUSSION BY SPECIES

More than 12,300 individuals of 75 species were handled nearly 20,000 times during this study. Thousands repeated in the traps, hundreds returned each year to be caught again, and 53 were recovered at distances from the study areas.

Black-crowned Night Heron, *Nycticorax nycticorax*. A small colony nested in the olive grove each year, and 47 young were marked in 26 nests. Three of 21 nestlings in 1946 were found dead before they fledged and two of 24 in 1947. A nestling banded June 5, 1946, was shot when 288 days old, 29 miles north, about 4 miles east of Earlimart, California.

American Bittern, *Botaurus lentiginosus*. One young banded in Lerdo Marsh, 6 December 1946, was found dead about 80 miles southeast near Lancaster, California, on March 25, 1947.

Sharp-shinned Hawk, *Accipiter striatus*. Four males and 13 females or immatures were trapped at the Cabin or Hart Park, all between Nov. 5 and Mar. 5. Eleven of these were captured in 8-cell traps at the Cabin between Nov. 5 and Dec. 20, 1946, including one male and 10 females or immature plumaged birds. They were probably migrants for only one returned when released 5 miles down the Kern River. This was a female which repeated twice, but was not seen after Nov. 18. Although Sharp-shins are winter residents in Kern County, individuals must rove considerably for those taken at Hart Park did not repeat and only one, a male, was shot there in November, 20 days after it was banded.

Cooper's Hawk, *Accipiter cooperii*. During the trapping at the Cabin a male and three females were taken between Nov. and Dec. 1946. They were captured in each instance by setting a figure-4 drop-trap and baiting it with White-crowned Sparrows which they had killed in the Rogers' 8-celled traps. They were released 5 miles down the Kern River and none repeated nor were the bands recovered.

Sparrow Hawk (Kestrel), *Falco sparverius*. Kestrels were small enough to enter Rogers' 8-cell traps after other captured birds. It is a resident species in Kern County, but adults were captured only in fall or winter months. A male taken at the Cabin on Sept. 2, 1946 was retaken there on Dec. 16, 1946, apparently a winter resident. Another winter resident, a female, was captured at Hart Park on Dec. 9, 1949 and repeated 3 times up to Jan. 13, 1950. In each instance captured birds were released 5 miles down the river from the park. There were no recoveries from four adults, or from a family of 5 banded as nestlings in Hart Park, May 1, 1947.

California Quail, *Lophortyx californicus*. One hundred and two were banded, 39 males, 48 females, and 15 unsexed chicks. Of these, 43 or nearly 40 percent were retrapped 138 times, at intervals up to more than two years (829 days). Those that were recaptured averaged 1.6 repeats in 1946, 2.8 in 1947, 4.4 in 1948, and 1.3 in 1949. In both 1947 and 1948 half of the newly banded birds repeated. The average number of days between the date of capture and the first repeat was 86 in 1947 and 24 in 1948.

In most instances these birds originated as escapees from a game farm at Hart Park, but they probably bred with local birds as well as among themselves. The ratio of adults to juveniles was 25 males, 27 females and 39 juveniles.

The known survival among these birds is shown in Table 1.

TABLE 1  
SURVIVAL OF CALIFORNIA QUAILS BANDED AT HART PARK

Year	Number Banded	X† + 6 Months	X + 1 yr.	X + 2 yrs.	X + 3 yrs.
1946	14	10	2	1	
1947	35	14	5		
1948	30	16	7	2	1
1949	22	12	1	1	
TOTAL	101	52	15	4	1

†X = Unknown age.

Mourning Dove, *Zenaidura macroura*. No success was had in trapping adult doves, for of the 371 banded, only 12 were adults or juveniles; the remainder were nestlings. Ten of these were found dead soon after they were banded. Other bands were returned by hunters. Only one was taken outside the boundaries of California, but many had dispersed widely from their points of origin. Two birds were taken as adults within a mile of their hatching site and had apparently returned there to breed. Within the state, the average distance from origin at which adults were collected was about 107 miles. The average age of shot birds was 22 months. The oldest bird, 5.5 years, was recovered in the state of Jalisco, Mexico, about 1,400 miles south, where several of my Iowa banded birds were also recovered. Table 2 gives the band return data.

Ringed-turtle Dove, *Streptopelia risoria*. Thirteen young from eight nests in a colony of released birds at Hart Park were banded in 1948. Parents and young dispersed and did not return, and there were no recoveries. A captive reared juvenile was released at the park in June 1949 and was shot 15 miles north, three months later.

Barn Owl, *Tyto alba*. In an open field more than a hundred yards from the nearest building, four miles west of Shafter, was an old well 20 feet deep which had gone dry when deep well pumping for irrigation had lowered the water table. A family of Barn Owls was known to have nested there for several years. On June 3, 1946, three well-feathered young were banded. Two were fledged and one was found dead on the floor of the pit.

In March 1947 the male and female nesting there were caught and banded. It was a simple matter to descend into the pit by ladder and capture the birds by hand as they tried to fly past.

On May 13, 1947, six young from a clutch of nine eggs had reached the age of several weeks and were banded. One was found dead in the pit on June 20. Three of the remaining five were also recovered; in a nearby cottonfield on June 13, 1947, at Wasco six miles north of the pit on July 8, 1947, and at Minter Airfield 10 miles east of the pit on July 4, 1947. All were reported and verified as being found dead. Since they hatched on or about April 15 (usually a day or so apart) the longest lived had reached a little over 100 days. In 1948 two males were banded in the pit.

TABLE 2  
RECOVERY OF MOURNING DOVES BANDED IN KERN COUNTY

Place Banded	Age	Date Banded	Date Recovered	Location Recovered	Approx. Distance in Miles	Direction	Days Since Banded
Kern River floodplain	7 days	5-18-46	9-1-46	19 mi. S. Bakersfield	20	S	106
Kern River floodplain	Adult-F	6-24-46	9-15-46	Kern River at Junction	8	E	1178
Hart Park	8 days	7-25-46	9-3-46	Cottonwood Creek	7	E	47
Hart Park	8 days	7-9-48	9-2-49	Isabella, Calif.	45	NE	420
Hart Park	7 days	9-2-49	9-5-49	Hart Park	0	O	3
Hart Park	7 days	5-27-49	9-5-51	Shell Park	1	N	831
Hart Park	10 days	7-2-48	9-15-50	Kern County	10	SE	805
Hart Park	9 days	6-18-48	10-2-49	El Centro, Imperial Co., Calif.	300	SE	371
Olive Grove	6 days	6-12-46	9-2-46	3 mi. NE of Wasco, Calif.	18	NW	82
Olive Grove	7 days	7-29-46	9-20-46	Near Wasco, Calif.	15	NW	53
Olive Grove	7 days	8-9-46	9-2-46	Near Bakersfield, Calif.	7	S	24
Olive Grove	7 days	8-28-46	9-11-46	Marsh by Olive Grove	0	E	14
Olive Grove	8 days	7-2-47	4-26-49	NE corner San Bernardino, Calif.	190	E	662
Olive Grove	25 days	8-30-47	9-1-47	1 mi. W. of Olive Grove	1	W	2
Olive Grove	7 days	7-31-46	9-10-49	Rocklin, Placer Co., Calif.	250	N	1137
Olive Grove	7 days	7-31-46	9-1-50	Ukiah, Mendocino Co., Calif.	330	NW	2050
Olive Grove	7 days	6-4-47	1-4-53	Ocotlan, Jalisco, Mexico	1400	SE	1494
Olive Grove	10 days	6-25-47	9-1-52	1 mi. E. Lindsay, Tulare Co., Calif.	40	N	1894
Stones Place, Shafter	7 days	7-6-48	9-1-50	Shafter, Calif.	5	W	792

Black Phoebe, *Sayornis nigricans*. This two-brooded summer resident built readily accessible nests under bridges. Only one of 12 nests was destroyed during the five seasons of observation and 43 young were fledged from the remainder. A nestling banded on April 30, 1948 at Hart Park when approximately 10 days old was collected September 21, 1948 by A. R. Phillips for a museum specimen in a canyon of Big Sandy River about two miles southeast of Wickieup, Mohave Co., Arizona. Structurally it looked to be an adult, but was only 154 days old and had moved over 360 miles east of its birthplace.

Mountain Bluebird, *Sialia currucoides*. Wooden frame temporary class rooms at the East Bakersfield High School were so constructed that ledges beneath overhanging eaves provided roosting places for over wintering Mountain Bluebirds. When the site was discovered on January 24, 1947, 54 birds were present. Half were caught in a square hand net. On seven subsequent attempts, 40 more were taken, Table 3. Since the birds were caught at night and artificial light made it difficult to distinguish color they were retained in a cage until morning. The blue of the males is a light phenomenon rather than wholly pigment and only in sunlight were they readily distinguishable from females. This amount of handling may have discouraged the birds from returning to this same roosting site, or they may habitually change sites, for the numbers seen steadily decreased the rest of the winter. Only seven were caught again, and 40 of the 90 counted after the first night were known to be new birds not previously seen.

Fewer birds made use of the site the winter of 1947-48, but eleven of eighteen were caught and one of these was a male from the previous winter, now 341 days since banding.

Two birds were seen on November 22, 1948 of the 1948-49 season and one was new while the other, a male, had been banded on February 1, 1947, 659 days before.

TABLE 3  
MOUNTAIN BLUEBIRDS IN ROOST  
AT EAST BAKERSFIELD HIGH SCHOOL

Date	Number of Birds Present	Number Banded	Number Recaptured	
			Banded Same Year	Banded Previous Year
Jan. 24, 1947	54	27		
Feb. 1	35	22	1	
Feb. 6	27	7	5	
Feb. 12	10	3		
Feb. 14	7	3		
Feb. 18	5	2		
Feb. 22	3	0	1	
Mar. 7	3	3		
Dec. 17	16			
Dec. 30	25			
Jan. 8, 1948	14	6		1
Jan. 22	4	4		
Feb. 3	0			
Nov. 22	2	1		1
TOTAL	205	78	7	2

The sex ratio in 1946-47 was 54 males to 13 females (4 to 1) and in 1947-48 it was eight males to two females (also 4 to 1). This suggests that the sexes may segregate during the winter.

Cedar Waxwing, *Bombycilla cedrorum*. Cedar Waxwings appeared in Bakersfield almost every spring and fed on berries of *Pyrocantha*, mountain ash, mulberry, and California fan palm. During the two weeks from April 16 to 30, 1948, there was a heavy mortality of unknown cause among those feeding on the berries of California fan palm in one locality of Bakersfield. At 1330 on April 19, I checked the square block area finding four crushed in the street, four mauled by dogs, the feather remains of two eaten by cats, three freshly succumbed birds, and one that died as I watched the flock. Several were feeding in a mulberry and one dropped to the ground, flopped over, spun around and died in about 30 seconds. It was female, in good flesh with much fat under the skin. The stomach was full of mulberries, the intestine immediately behind the stomach for a distance of two to three inches was inflamed and the blood vessels enlarged, the liver was blotchy. Four additional females and four males were examined. Those dead beneath palm trees were filled with palm nuts, those beneath mulberries contained that fruit. All were fat and when the specimens were fresh the intestine was inflamed. Eight more were found in the next few days.

One female had a sublethal dose of the poison (or toxin) and recovered after 24 hours. It was bloated, breathing rapidly, and in partial paralysis when found. Four days later it was well enough to be released. However, its reflexes must have still been slow for it was caught by a cat the following day.

Loggerhead Shrike, *Lanius ludovicianus*. This shrike is a permanent resident of Kern County, nesting in isolated shrubs and trees in the open country. During the four years 33 nestlings were banded, of which six were known to have died before they left the nest, one entire family of four when the parents were probably shot by local farm boys.

Adults could readily enter Rogers' eight-cell or walk-in traps after birds already captured. The ranges of these adults appeared not to be large, for two trapped at Hart Park were taken there again 27 and 14 days later. One banded at the Olive Grove on August 14, 1946 was taken four months later, December 7, 1946, by a hunter at Minter Airfield, three miles northwest of the Grove. None of the remaining 40 birds has been reported.

English Sparrow, *Passer domesticus*. During the four years 2,703 sparrows were handled 3,868 times. There were 15 trapping stations in operation at different times and places and for variable duration, but most extensive work was done at Hart Park and the Froese farm.

English sparrows as a general rule did not retrap readily as adults, but juvenile birds were less wary (Dexter, 1949). The large walk-in trap devised in 1947 and put into operation at the Froese farm worked effectively in trapping and retrapping fledglings from nearby nests.

In 1946, 391 birds were banded; 181 nestlings, 171 fledglings, and 39 adults, but only four of these were retaken in 1947. In 1947, 318 were banded; 200 nestlings, 321 adults, 297 fledglings, and only 12 were retaken in 1948. In 1948, 905 were ringed; 185 nestlings, 97 adults,





Date	Total Birds Trapped	New Birds Banded	Weeks Since Banded																
			1	2	3	4	5	6	7	8	9	10	11	12	13				
May 4	16/0	16/0																	
11	35/0	26/0	9/0																
18	29/14	6/14	14/0	9/0															
25	24/7	3/0	1/7	13/0	7/0														
Jun 1	26/21	5/14	1/0	1/7	12/0	7/0													
8	38/16	19/1	0/11	1/0	1/4	11/0	6/0												
15	76/22	44/7	16/0	0/11	1/0	1/4	8/0	6/0											
22	51/28	9/19	20/1	10/0	0/8	1/0	0/0	6/0	5/0										
29	39/25	2/17	6/4	16/0	7/0	0/4	1/0	-	3/0	4/0									
Jul 6	37/17	2/5	1/5	6/3	15/0	5/0	0/4	1/0	-	3/0	4/0								
13	47/26	15/16	2/1	1/4	3/3	14/0	5/0	0/2	1/0	-	2/0	4/0							
20	60/38	19/22	12/7	2/1	1/3	3/3	12/0	4/0	0/2	1/0	-	2/0	4/0						
27	51/39	6/18	13/10	11/4	0/1	0/2	1/2	11/0	3/0	0/2	1/0	-	2/0	1/0					
Aug 3	47/51	2/29	1/6	13/8	11/3	0/0	0/1	1/2	10/0	3/0	0/2	1/0	-	2/0	1/0				
10	38/74	2/50	0/7	0/5	12/6	8/3	-	0/0	1/2	8/0	3/0	0/1	0/0	-	2/0	1/0			
17	32/65	3/29	1/15	0/6	0/4	10/6	6/3	-	-	1/2	4/0	2/0	0/0	-	2/0	0/0			
24	26/73	2/30	1/10	1/1	0/5	0/4	6/5	6/3	-	-	1/2	4/0	2/0	-	2/0	0/0			
31	19/70	0/25	1/7	1/7	1/12	0/5	0/4	3/4	5/3	-	-	1/1	3/0	1/0	-	2/0			
Sep 7	11/65	0/17	0/7	1/7	0/6	0/11	0/5	0/4	2/4	4/3	-	-	0/2	1/0	-	0/0			
14	9/62	0/14	0/6	0/7	0/6	0/3	0/11	0/4	0/3	2/4	4/3	-	-	0/1	-	0/0			
21	5/27	0/0	0/1	0/1	0/4	0/1	0/1	0/6	0/4	0/1	1/4	2/3	-	-	-	0/1			
28	3/24	0/5	0/0	0/1	0/1	0/3	0/1	0/0	0/4	0/4	0/0	1/2	0/2	-	-	-			
Oct 5	3/20	0/1	0/0	-	0/1	0/1	0/3	0/1	-	0/4	0/4	-	1/2	0/2	-	-			
12	3/17	0/3	0/0	-	-	0/1	0/3	0/0	-	0/3	0/4	-	-	1/1	0/0	-			
19	3/13	0/1	0/0	-	-	-	0/0	0/1	0/3	-	-	0/2	0/4	-	1/1	-			
26	3/11	0/1	0/0	-	-	-	-	-	0/1	0/3	-	-	0/2	0/4	-	1/1	-		
Nov 2	3/9	0/1	0/0	-	-	-	-	-	-	0/3	-	-	0/1	0/3	-	-			
9	3/13	0/6	0/0	-	-	-	-	-	-	-	0/1	0/2	-	-	0/3	-			
16	2/9	0/2	0/0	-	-	-	-	-	-	-	-	0/1	0/2	-	-	0/1			
23	2/6	0/1	0/0	-	-	-	-	-	-	-	-	-	0/1	0/2	-	-			
30	2/3	0/0	0/0	-	-	-	-	-	-	-	-	-	-	0/0	-	-			
Dec 7	2/0	0/0	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total		181/34899	10586/86	71/67	60/51	45/41	38/30	30/28	26/24	15/21	17/16	12/12	8/10	6/7					



565 fledglings; and 35 of these were recaptured or recovered in 1949, and one lived until 1954. In 1949, 589 were banded; 217 as nestlings, 317 fledglings, 55 adults. One was recaptured in 1950 and another shot in 1951. The data are too meager to determine age ratios, but it is of interest that one bird was known to survive for six years.

Sex ratios were equally difficult to determine. In 1946 only 22 males and 10 females were recorded. In 1947 the figures were 160 males to 153 females, an apparent sex ratio of 1:1. In 1948, the ratio was 58 males to 39 females.

At the Froese farm in 1947, 112 young were banded on the nest. Twenty-one or 18.7 percent were retaken during the summer and fall months. Table 4 gives the number of banded nestlings and juveniles known to be in the local population over a 31 week period. Nesting began about the tenth of March and young began leaving the nests after April 20. Peak production of first and second broods came at May 15 and June 15. The large trap was operated weekly from June 20 on. It was open and baited six days and set one day a week. In 1948 only four of the 1947 birds, 3 percent, banded as nestlings were known to be in the area. In 1948, 181 young were banded as nestlings and 99 or 55 percent were trapped after leaving the nest.

From the nestlings handled in 1948 something was learned of the ages of juveniles in a localized area. Trapping from week to week showed a normal dispersal, mortality, or as Dexter (1949) suggests, the rate at which juveniles learn to avoid traps, Table 5. The rate of recession was as follows: 99 birds were present one week after being banded, 88 at two weeks, 71 at three weeks, 60 at four weeks, 26 at eight weeks, nine at twelve weeks, 4 at sixteen weeks, and 2 at twenty weeks. During any given week of the summer the composition of the flocks depended upon the number of active nests from which young were leaving or had left. For example: the week of June 18 was the peak for young leaving the nests. At this time 76 birds were handled: 44 nestlings, 16 that had been fledged a week, 0 two weeks, 1 three weeks, 1 four weeks, 8 five weeks, and 6 six weeks, but a month later the ages of 60 young were 19 nestlings, 12 fledged one week, 2 two weeks, 1 three weeks, 3 four weeks, 12 five weeks, 4 six weeks, 1 eight weeks, 2 ten weeks, and 4 eleven weeks. The 12 five-week-olds were from the June 18 brood, Table 5.

In 1949, trapping operations were closed the end of July so data as extensive as those of 1948 were not obtained. As shown in Table 6 the pattern was much the same. Peak fledgling of young came the first weeks of June. Even though the trap was in operation for only 12 weeks after the appearance of the first young, 37 percent of 217 nestlings were trapped.

The nesting studies at Froese in 1947 included only a sample of the total nests present. Also trapping was intermittent, therefore the total nestlings and juveniles banded were added together in the construction of Table 4. This table shows the regular depletion of the population or its trapability as the summer progressed.

The 1948 data, Table 5, compares the population dispersal of local nestlings, and juveniles from nearby breeding areas. This year almost every nest in the farmyard was under observation and the young banded. The young from those not reached would have made up but a



small percentage of the population. Peak number of nestlings was banded the week of June 15. Juveniles from outside the farmyard began arriving in numbers early in June, but reached greatest numbers in the week of August 10. Dispersal in August and September rapidly depleted the take from each week's newly banded birds. The total figures for this table suggest that those individuals which remain at their nativity site do so for a longer period than the restless juveniles which have moved into the location.

The 1949 data, Table 6, show similar trends. Local nestlings were most abundant in the nests during the week of May 31, but the peak infiltration of juveniles had not yet occurred when the study was closed.

Very little is known concerning sibling relationships after birds leave the nest. In 1947 trapping methods at Froese's were not conducive to the recapture of nestlings. Young from one nest were captured together two weeks later, and a pair from another nest was taken 29 weeks later.

Of 42 nests under observation in 1948, young were trapped from 22 at varying times after leaving the nest, in association with their nest mates. Whether any filial ties existed is not known, but at least these birds were in the same flocks and were associated when trapped. The maximum period at which siblings were trapped was as follows: from 4 nests two weeks, 5 nests three weeks, 5 nests four weeks, 4 nests five weeks, 2 nests eight weeks, 1 nest nine weeks, and 1 nest thirteen weeks. In 1949 young from 16 of 43 nests were retrapped in association. These were as follows: from 1 nest at one week, 6 nests two weeks, 5 nests three weeks, 2 nests four weeks, 1 nest five weeks, and 1 nest six weeks. These data suggest that families may remain together at least until fall dispersal.

A total of 32 banded Sparrows have been reported as shot, found dead, etc. The distribution of these birds is shown in Table 7. Nearly half were found within a short distance of where they were banded. This suggests that only about half of the local population shifts during the dispersal season. However at Froese the number retrapped when a year older made up only 5.8 percent of the total banded, which indicated a much greater rate of dispersal. Since adults are wary, the actual resident population probably lies somewhere in between these two figures.

TABLE 7

DISTRIBUTION OF THOSE ENGLISH SPARROWS FOUND DEAD OR SHOT  
AFTER HAVING REACHED AN AGE GREAT ENOUGH TO HAVE  
PASSED AT LEAST ONE SEASON OF DISPERSAL.

Distance from Banding Site	Direction				Total	Percentage
	North	East	South	West		
1/8 to 1/2 mi.			1	1	2	6
1/2 to 1 mi.		2			2	6
1 to 2 mi.	1	3		7	11	35
2 to 3 mi.	1				1	3
3 to 4 mi.				1	1	3
10 + mi.	1				1	3
20 + mi.				1	1	3
At point of origin*					13	41
Total	3	5	1	10	32	100

\* Birds retrapped one year older made up 5.8% of the original population. This would indicate a much greater dispersal than the mortality records show.

TABLE 8

THE NUMBER OF REDWING BANDED IN KERN COUNTY STUDY AREAS  
1946 THROUGH 1949 AND THEIR RELATIONSHIP  
TO THE MONTHS OF THE YEAR.

	Nestling	Juvenile	ADULT		Total
			Male	Female	
March	0	0	4	0	4
April	8	0	18	11	37
May	30	3	10	20	63
June	31	3	8	3	45
July	2	0	26	7	35
August	0	0	7	2	9
September	0	0	1	0	1
TOTAL	71	6	74	43	194

Thirty-one percent of the recoveries were from west of their banding site, but this is an artifact resulting from the distribution of farmyards along the road west of Froese, which would naturally attract the birds that way. Also 35 percent of the recoveries were from one to two miles distance, but this too was an artifact since one farmer at this distance west through constant shooting in his barnyard picked up seven of the Froese birds.

Yellow-headed Blackbird, *Xanthocephalus xanthocephalus*. In 1946, 226 nestlings were banded in 121 nests among bulrushes in a farm reservoir four miles west of Shafter. Twenty-two were later found dead in the nests or drowned in the water beneath. A female nestling banded on May 24, 1946 was found when 772 days old dead in a potato field a mile away (on June 28, 1949). In the following three years 76 additional nestlings were banded in 34 nests, with only three known dead, and no further recoveries.

Redwinged Blackbird, *Agelaius phoeniceus*. Redwings were difficult to trap except during the summer when a mixture of grain was attractive to them. Males were caught in Hart Park when first setting up territories in March, but females were not taken until April. Between September and March none was captured at baited traps even though hundreds came to the Park each evening to roost. Table 8 lists the numbers banded and their relationship to season.

Twelve of 149 banded at Hart Park were recaptured, 9 at least one year old, 5 at least two years old, and 1 at least three years old. The fact that four juveniles were later captured as adults indicated that at least a portion of the population was made up of birds fledged in the habitat and returned to it to take up breeding territories.

A juvenile male banded in 1947 grew until the band was injuring his leg when recaptured in 1948. The leg was badly swollen above the band which was removed and replaced by a larger size on the opposite leg. In 1949 he was again taken and there was no evidence of the old injury. Another male taken in 1948 had the lower mandible injured so that it did not mesh with the upper mandible which had grown over it in a large sickle. It was kept in captivity more than a year and fed

by picking food up with its bill held sideways. A third injury was seen, that of a male with his head severely scalped. The injury was healing from the edges.

Twelve Redwings were found dead in the vicinity of where they were banded but none was recovered at a distance.

Tricolored Blackbird, *Agelaius tricolor*. Neff (1942) was impressed by the erratic movements of this species and stated that they change their areas of activity without apparent cause. Similar population shifting was noted in Kern County, but some colonies showed considerable stability. Nesting colonies in the Sacramento valley varied in size from a few to an estimated 100,000 nests. Only 736 tricolors had been banded prior to 1930 when Neff began his study. Between 1931 and 1940 19,000 nestlings were banded, 600 of these by C. D. Duff of Los Angeles in a colony near Lake Buena Vista. Italian market hunters during the years 1931 to 1936 shipped nearly 400,000 blackbirds from one Sacramento valley shipping point, and 88,000 were shipped in the winter of 1935-36. Because of these wholesale killings Neff had better recoveries of bands than usual and received 93 or 0.47 percent of the total banded. From these band returns he found that, "There is little southward movement after nesting is completed. Instead, the movement is northwestward toward the Sacramento-San Joaquin delta, thence either westward in the area contiguous to the bays and into the coastal farming areas or on northward into the center of the rice growing counties of the Sacramento valley."

We banded both nestlings and adults in Kern County. During the breeding season when the diet was mainly insectivorous the adults were not attracted to grain bait and none was trapped. During the winter, at the Camp stockfarm an abundance of food was available and the adults showed no desire to enter traps, however, during the "shading up" or rest period between 1000 and 1300 they were attracted to baited traps placed near them in the shade. On cloudy or partly cloudy days they did not indulge in "shading," and trapping was unsuccessful.

The number of nestlings banded at the Lerdo Marsh Colony was 23 in 1946, 79 in 1947, 59 in 1948, and 67 in 1949. Ten of these were later found dead in their nests. In the winter of 1947-48 during ten hours of trapping at the stockfarm adjacent to Lerdo Slough, 70 male and 19 female birds were banded, while in 1948-49 during twelve hours 23 males and 13 females were banded. One of the birds banded by Mr. Duff near Lake Buena Vista in 1939 was shot in a field near Los Palos, Merced County, 140 miles northwest in 1940. Of the birds banded at the Camp stockfarm on March 11, 1948, a male was found dead two months later, May 5, two miles east of Pixley, California. This bird may have been nesting in the Pixley area which is 33 miles north of the stockfarm. In April 1950 another was killed near Delano, 20 miles north. None of the birds banded as nestlings was recovered, but the data suggest that the winter group at the stockfarm was unrelated to that at Lerdo.

Bullock Oriole, *Icterus bullocki*. Bullock Orioles were readily trapped in this dry climate with simple walk-in traps baited with watermelon or fruit. A total of 615 were taken at Hart Park and vicinity, the Olive Grove, and at some of the farms. Since this was a summer resident the

earliest dates when they were trapped were May 21, 1946, June 6, 1947, April 30, 1948, and April 29, 1949. Latest trapping dates were August 8, 1946, July 24, 1947, August 20, 1948, and the close of trapping on July 20, 1949.

The males were bold and easily recaptured, but females and juveniles may also repeat. Seventy-four birds repeated the summer they were banded at an average interval of 19 days. The time interval at which they were retaken on subsequent years was as follows: 61 birds returned at an average time of 350 days, 39 returned when 708 days older, 7 when 1,065 days older, and two when 1,802 days older.

Since we cannot know what percentage of the birds caught were migrants, local residents or wanderers it is not possible to use the entire banding data for population survival estimates. Nestlings cannot be included, because they disperse rapidly, and of the 19 banded in seven nests at Hart Park only one was taken in following years at the same location.

The recoveries of orioles banded at Hart Park are listed in Table 9. This is arranged to present several kinds of information. The number of birds recaptured among the new ones banded each year (not including nestlings) are shown in successive years. For example, 240 were banded in 1946 and 17 of these were recaptured in 1947. Of the 17 six were taken in 1948 and of the six two were taken in 1949, etc. If these data are viewed in retrospect it would appear that about 65 percent are lost each year. This is in line with other survival studies as discussed by Hickey (1952) and Farner (1955) and would suggest that if two orioles were alive in 1949, six in 1948, 17 in 1947, then the original residents of the 240 banded were around 55. But if all the birds of the original 240 known to be alive are totaled then the ratio is 1947—32, 1948—10 and 1949—6. This would suggest that possibly 100 of the original ones were local birds.

If the assumption is made that birds which repeat through the summer are local residents then returns among those should suggest rate of mortality. Of 30 that repeated in 1946 only three were known to be alive in 1947 and two in 1948.

Using all of the data from recaptured birds at Hart Park the following survival table seems reasonable:

Birds one year $\pm$	160	(by extrapolation from two-
Birds two years $\pm$	65	and three-year-old birds)
Birds three years $\pm$	31	
Birds four years $\pm$	7	

Two orioles were recaptured when five years old, at the Olive Grove and Hart Park, but none has been recovered at a distance from its point of banding.

It became evident early in the study that plumage characters for male and female were not uniform nor consistent. Juvenile birds were fairly easily identified. They were yellow and gray, lacking the black of adults. The yellow was lighter and not as intense as that of the female. The bill was slender, fragile and less heavily pigmented than that of

TABLE 9  
SURVIVAL IN BULLOCK ORIOLES BANDED AT HART PARK  
1946

<p>240 New Birds</p> <p style="margin-left: 40px;">1947      1948      1949</p> <p style="margin-left: 40px;">17      14      1</p> <p style="margin-left: 40px;">1948      1949      1949</p> <p style="margin-left: 40px;">6      1      2</p> <p style="margin-left: 40px;">1949</p> <p style="margin-left: 40px;">2</p>	<p>30 of which Repeated</p> <p style="margin-left: 40px;">1947      1948</p> <p style="margin-left: 40px;">2      1</p> <p style="margin-left: 40px;">1948</p> <p style="margin-left: 40px;">1</p>
1947	
<p>132 New Birds</p> <p style="margin-left: 40px;">1948      1949</p> <p style="margin-left: 40px;">20      8</p> <p style="margin-left: 40px;">1949 — 1950</p> <p style="margin-left: 40px;">7      1</p>	<p>14 of which Repeated</p> <p style="margin-left: 40px;">1948</p> <p style="margin-left: 40px;">2</p>
1948	
<p>80 New Birds</p> <p style="margin-left: 40px;">1949</p> <p style="margin-left: 40px;">19</p> <p style="margin-left: 40px;">1950      1953</p> <p style="margin-left: 40px;">3      1</p>	<p>17 of which Repeated</p> <p style="margin-left: 40px;">1949</p> <p style="margin-left: 40px;">4</p> <p style="margin-left: 40px;">1950      1953</p> <p style="margin-left: 40px;">1      1</p>
1949	
<p>74 New Birds</p>	<p>7 of which Repeated</p>

the adult. In July and August of 1948 six birds with these characters were examined for stippling in the cranial bones. All had some stippling along the occipital sutures, but the rest of the cranium was that of a juvenile. The color varied, but the delicate structure of the bill was evidenced in each.

In August 1949, 227 specimens in the Museum of Vertebrate Zoology, University of California, were examined for color characters and sex determination. Full-plumaged males made up 121 of these. They had the black tail triangle on the inner retrices, black cap on the cranium, black lores and stripe through the eye, and black throat. Birds of female plumage, lacking the black as listed above, included 55 individuals. The remaining 51 specimens lacked the black inner retrices, the black cap, and the black lores, but retained the black throat patch. This throat patch varied from a few dark feathers to a dense black area. Most of the specimens had been collected by Jos. Grinnell and the sex determination was probably accurate. He sexed these as 36 males and 15 females.

In order to determine the period of time during which these color patterns develop as well as to learn what sex was related to the various colors, the plumage of each specimen captured was recorded. Eighty-six individuals were taken 195 times.

At an age of one year, 10 birds previously banded as juveniles were as follows: 5 females, 2 full-plumaged males, and 3 of intermediate plumage (with a black throat patch). Ten birds known to be two years old included 3 females, 3 males, and 4 intermediates. From these it was evident that the full plumage of a male can develop in a year. Eleven birds with intermediate plumage when first banded were found the following year to include six intermediates and five males. Seven of these at the end of the second year included six intermediates and one male, and at the end of the third year two were still in intermediate plumage. This indicated that in some individuals at least the intermediate plumage can develop into that of the male in at least one year. Birds with male plumage retained that plumage one, two and three years except for one individual which reverted to intermediate by the end of the first year following its first capture and retained that coloration during the following year. At the end of the first year after banding, two of 19 birds classed as females had taken on the intermediate plumage. These might have been birds that were juveniles when captured and were thought to be females. However, four of 11 at the end of the second year had developed intermediate plumage.

It was evident from these observations that the intermediate plumage may develop the first year after hatching, may be retained for life, and may develop from female plumages. Rarely did the full-plumaged male revert to intermediate coloration, but the full-plumaged condition develops readily from the intermediate. Since either sex may develop this plumage, an accurate sex ratio based upon coloration is not practicable for this species.

The sex ratio based upon trapped birds in 1946 was 43 ♂, 48 ♀, 40 intermediates; in 1947 it was 47 ♂, 57 ♀, and 18 intermediates; in 1948 it was 46 ♂ 54 ♀, and 22 intermediates; and in 1949 it was 22 ♂, 23 ♀, and 24 intermediates. This indicated a total of 158 ♂, 182 ♀, and 104 intermediates. Nesting habits of the species would suggest that the sex ratio was approximately 1:1. If this were true, then 64 of the intermediates would have been males and 40 of them females.

Brewer's Blackbird, *Euphagus cyanocephalus*. Brewers entered traps readily during the nesting season, but not when nuptial activities had ceased. The birds' diet should have made trapping easy in the winter, as it swings from predominately insectivorous in the summer to predominately granivorous in the winter. Techniques for capturing blackbirds in post-nuptial flocks were not developed. During the four summers 362 Brewers were caught as follows: April 16, May 105, June 36, July 54, August 108, September 43. An additional 83 birds were banded as nestlings and of these 12 repeated in the traps as juveniles, and one, a male, was taken the following year. One bird banded as a nestling in June 1948 was found dead in May 1949, about ten miles west of its point of origin. Juvenile birds were prone to repeat more often than adults, for 12 of 71 juvenile males repeated while only seven of 106

adult males were recaptured during the same season. Of 175 birds in female plumage, 25 were retaken. These may have included some juveniles, but 11 were taken the following year, all adult females, indicating that juvenile males had not been misjudged as females. Of 178 birds caught in 1949, 56 were known to be less than one year old, 16 at least one year old, 3 at least two years and 1 at least three years. These figures suggest that the population was made up of 31 percent birds less than one year old, 49 percent a year or more old, 15 percent two years or more, and 5 percent three years or more.

In May 1948 the sex ratio of trapped birds was 13 male to 24 female. In April of 1949 it was almost 1 to 1 (29 male to 33 female). Juvenile males were readily identified as they developed their glossy feathers of maturity. Without cranial inspection juvenile females were more difficult to distinguish. The sum of birds banded in 1947-1948 equalled 32 juvenile males, 22 adult males, and 54 birds in female plumage. The four-year total was 71 juvenile males, 106 adult males and 179 birds in female plumage.

A nestling banded in 1948 was found dead 10 miles north a year later. A male banded at Hart Park in 1948 was found dead there two years later; while a female banded at Hart Park in 1949 was shot nine miles west in 1950. During July and August 1949, 102 juvenile males, 28 juvenile females, 15 adult males and 4 adult females were banded at Eschbach Park, Yakima, Washington. One of the juvenile males was found dead in 1951, 10 miles away, another was shot a year later 30 miles north, a third was killed by spray in an orchard two years later 15 miles northwest and a fourth, one of the juvenile females, was killed by a cat the following year 75 miles south. Both groups of recoveries indicate that dispersal from the point of origin was in all directions.

Brown-headed Cowbird, *Molothrus ater*. Cowbirds were permanent residents of the valley with high concentrations in the winter when thousands roosted with other icterids in reed-filled marshes such as those at Hart Park. During the summer months they were readily attracted to grain and watermelon baits. Four were banded in April, 15 in May, 14 in June, 82 in July, and 3 in August. The July take made up 70 percent of both males and females for the entire season, suggesting that there was mass movement at this time, following the breeding season.

TABLE 10

## THE AGE OF COWBIRDS BANDED AT HART PARK, 1946 THROUGH 1949.

Year	Age, Greater than			
	1st year	2nd year	3rd year	4th year
1946	22	9	4	3
1947	50	13	9	
1948	11	4		
1949	11			
Percent Survival		31	60	75

The Cowbirds of Hart Park were readily retrapped and appeared to have a high survival. Since not all birds captured were residents of the area only 31 percent repeated the year following their banding date. However 60 percent of these returned the second year and 75 percent of the 3+ year olds were still alive when 4+ years. Table 10 lists these data.

(to be concluded)

## A STUDY OF BOREAL SHOREBIRDS SUMMERING ON APALACHEE BAY, FLORIDA

BY HORACE LOFTIN

### INTRODUCTION

At least 30 species of shorebirds (Charadriidae and Scolopacidae) are found regularly on the beaches and mud flats of Florida at one time or another during the year. A limited number of these species breed in Florida. Others are seen as winter residents only or as transients during migrations to and from their northern breeding grounds. Of these 30 species, 19 are known to breed only far to the north, into Canada and Alaska, and even above the Arctic Circle in several instances.

Such boreal-breeding shorebirds typically leave or pass through Florida in spring in the northward migration. In the north they mate, lay eggs, incubate, and rear the young in summer. Southward departure from the breeding grounds may begin for some of them as early as July (or earlier?), but the height of southward migration is typically early in autumn. Thus one might expect these boreal-breeding species to be virtually absent from the southern coasts of the United States and farther south during the breeding season. But of the 19 northern breeders that occur in Florida, individuals of 16 of these species may be found with some regularity in summer months along the coasts of that state. Such individuals constitute the so-called *summering shorebirds*.

As used here, the term *summering* does not necessarily denote a bird which is a *summer resident* in Florida, but rather any boreal-breeding bird there during the breeding season of its species for whatever reason. For the purposes of this study, the term is further restricted to apply to boreal-breeding shorebirds in Florida during the month of *June*.

Both frequency of records and size of flocks seen indicate that summering is far more than a casual occurrence among most of the species in question. The phenomenon apparently involves a significant portion of the total populations in many cases and therefore warrants greater consideration than it has heretofore received in the study of shorebird life histories.

\* This is a contribution from the Florida State University Department of Biological Sciences, and from the F.S.U. Oceanographic Institute, No. 175.