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SOME INFERENCES FROM SEVEN YEARS' BANDING RECORDS

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Our banding station is the 100 by 317 foot lot upon which we live at 418 North Hudson Avenue (previously 418 Elm Avenue), Pasadena, California, within one-half mile of the main business street of that city. When banding was begun in the fall of 1924, the front, to a depth of 165 feet, was occupied by the house, twenty fruit and shade trees of moderate size, a considerable profusion of shrubs from three to five years old and a small lawn in front of the house entirely surrounded by shrubbery and the house. Back of this was a chicken yard about forty feet deep extending approximately the full width of the lot and in which two large eucalyptus trees grew. The next 65 feet of depth was open ground except for vegetables during part of the year; and the rear 55 feet was occupied by fourteen three-year-old fruit trees.

By the end of 1931 the shrubbery on the front half of the lot had grown in thickness and height until parts of it formed an almost impenetrable tangle ten to fifteen feet high, with paths and small open places here and there through it. Shrubby had also extended along both sides and the back of the rear half of the lot and occupied most of the ground which had been used for vegetables in 1924. Soon after banding was begun we started the practice of disposing of the leaves from the street and pathways by profusely distributing them on the ground beneath the shrubbery, thus, in the course of one or two years, providing a bed of leaves and leaf mold several inches deep.

This change in the station grounds has been described in some detail because of the effect it has had on the bird population. This is most strikingly illustrated by the San Diego Spotted Towhee (*Pipilo maculatus megalonyx*).

During the six years' residence at this address previous to starting banding, we would occasionally see a San Diego Towhee and would think of it each time as the same individual or as a member of a small group that lived in our neighborhood. Then when we began to band we were surprised to find that we seldom caught the same bird twice. During the first year 27 were banded and only 4 of those repeated soon after banding, and two others returned about four months after banding. Four of those banded were immature. Although there were 27 banded and a total number of captures of 37 made from January to early October, these birds were rather uncommonly seen about the yard. They were apparently just drifting through. The next year (1926) their performance was of much the same character: 17 banded, 2

returns from the previous year, 3 individuals repeated a total of 6 times, and 5 of those banded were immature.

In 1927, the number of individuals trapped remained low, 19, of which 3 were returns from the previous year. Unlike the previous year, 15 of these repeated a total of 67 times and 13 of them were immature, one being recorded as recently out of the nest. The records of this year extend from January 17 to September 27, and immature birds were banded from May 31 to September 4. It seems evident that there were nests on or near our station grounds, but no nests or nesting activities were observed, probably because of lack of time for such observations.

If our banding records had only stopped with the year 1927 they would have shown conclusively what we knew to be taking place, namely, that the San Diego Towhee had become a resident of our yard in the sense that some of them were present much of the time and that they nested in or near the yard. Presumably this was because of the increase in the shrubbery and of the dead leaves on the ground in which to scratch. There was no doubt in our minds that this change was taking place and that these birds were making themselves more at home in our yard year after year. We first observed nest building activities in 1928 and have known that they had nests in the yard each year since then. We expected an analysis of our trapping records to show this change. This the records do show but not without disappointment to our expectations.

The analysis shown in table 1 gives the actual figures for the seven years. If one chooses the total number of individuals trapped each year as showing the relative abundance of these birds during the seven year period, the figures are 27, 19, 19, 24, 39, 42, and 38. It might be thought that the total number of captures (this includes repeats), would be a better measure of abundance. Then the figures are 37, 25, 86, 47, 64, 131, and 64. But why the high peaks in 1927 and 1930? These are due to the unusually large number of repeats for those two years. It might seem reasonable to think that the large number of repeats would result from a large number of immature birds; but this is not the case for the numbers of immature birds banded run 4, 5, 13, 13, 21, 25 and 20; no peak in 1927 and only a slight one in 1930. Another set of figures that might throw some light on the annual abundance of this species is the number of days in each year on which these birds were trapped. These figures are 32, 23, 50, 40, 52, 87 and 50, although the traps were open practically all of the time.

TABLE 1. ANALYSIS OF TRAPPING RECORDS OF SAN DIEGO TOWHEES

	1925	1926	1927	1928	1929	1930	1931	Totals
Individuals banded.....	27	17	16	21	34	36	33	184
Returns from previous years.....	.....	2	3	3	5	6	5	24
Total individuals trapped.....	27	19	19	24	39	42	38	208
Repeat captures.....	10	6	67	23	25	89	26	246
Total captures.....	37	25	86	47	64	131	64	454
Individuals that repeated.....	4	3	14	5	12	22	8	68
Adult males banded.....	14	1	0	1	6	5	8	35
Adult females banded.....	9	8	2	6	7	6	4	42
Immature birds banded.....	4	5	13	13	21	25	20	101
Age and sex not recorded banded....	0	3	1	1	0	0	1	6
Days on which captured.....	32	23	50	40	52	87	50	.....

None of these rows of figures show the increases in population that we expected them to show. We are willing to say that during the last four years a San Diego Towhee could have been found on or near our lot nearly any day of the year and now that we are ready to admit that the trapping records do not closely approximate the relative abundance of this species, as measured by the annual summation of the num-

ber of individuals present each day, we will try to point out some of the reasons why this should be so. The factor of perhaps the greatest influence is the intelligence of the bird. Those that live here with us learn to go in and out of some types of traps as they please. They also learn to gather the food that other birds have knocked outside of the traps. It seems probable that the transients which visited us in the earlier years did not develop this wariness about the traps. Our experience with Fox Sparrows verifies this conclusion that the trapping records reflect quite closely the visits of transient birds of this general type. We have banded only 16 of them during the seven years in question. Nearly all of them have been seen first in the traps. A few have been seen before they were trapped, but never has one been seen without there being one in a trap shortly afterward.

Perhaps the appropriation of territory by a nesting pair has diverted transient San Diego Towhees from our traps during the nesting seasons of the later years.

Then there are numerous other causes that might have affected the trapping records one year more than another. Such things as building activities in neighboring yards, our own activities in the yard, cats, conditions that affect the continuity of our trapping operations, the condition of the traps themselves and many other things are variables that have not been closely controlled nor carefully recorded.

On taking a broad view of the records by averaging the results of several years, thus smoothing out the irregularities due to the causes mentioned above, we find that a comparison of the average of the last three years with the average of the first three years gives an increase in the number of birds banded of 70%; in the number of individuals trapped, 82%; in the total number of captures, 75%; in the number of individuals that repeated, 100%; in the number of immature birds banded, 200%; and in the number of days in the year on which these towhees were caught in our traps, 80%. These figures do, in a large measure, show the increased abundance of this species due to improved ecological conditions.

Now as to the orioles: The abundance of the orioles apparently has not been changed appreciably by the changes in our yard.

The Bullock Orioles (*Icterus bullockii*) have not been sufficiently numerous to justify much comment. Beginning with 1927 the annual catch has been 1, 9, 5, 3, and 3. Classified by sex and age they were 2 adult males, 1 one-year-old male, 4 females, 13 immature birds, and 1 with age and sex not recorded.

The Arizona Hooded Orioles (*Icterus cucullatus nelsoni*) have been more plentiful. Table 2 gives an analysis of the trapping records of the 205 banded during

TABLE 2. ANALYSIS OF TRAPPING RECORDS OF ARIZONA HOODED ORIOLES

	1925	1926	1927	1928	1929	1930	1931	Totals
Individuals banded.....	4	20	57	46	16	51	11	205
Returns from previous years.....	..	1	1	2	1	2	0	7
Total individuals trapped.....	4	21	58	48	17	53	11	212
Repeat captures.....	0	2	10	14	0	3	0	29
Total captures.....	4	23	68	62	17	56	11	241
Individuals that repeated.....	0	2	8	9	0	3	0	22
Adult males banded.....	0	2	4	3	3	4	0	16
Adult females banded.....	2	7	7	7	3	8	3	37
One-year-old males banded.....	0	0	5	2	2	5	6	20
Immature birds banded.....	2	12	42	33	9	32	21	151
Age and sex not recorded banded....	0	0	0	3	0	4	0	7
Days on which captured.....	4	20	48	39	15	35	9	....

these seven years. The annual average of the number of individuals trapped during the first three years is within one of the same as that for the last three years. However, the ease of observing these birds has increased with the size and number of

abutilon (flowering maple) bushes. These give an abundance of flowers attractive to the orioles. The records show that about half as many adult males as females were trapped (16 to 37) and almost four times as many immatures as females (137 to 37). We know no reason for fewer males than females coming to our traps, but the ratio of immatures to females seems a reasonable ratio of the immature to female populations.

Perhaps the most interesting information our records show in regard to this bird is the time of year it may be expected in Pasadena and vicinity. In general our occurrence records lie between late March and the first part of September, as given by Willett (*Birds of the Pacific Slope of Southern California, Pacific Coast Avifauna No. 7, 1912, p. 71*); but we have a sufficient number of records of trapped birds and observed birds to lead to the conclusion that the Arizona Hooded Oriole may be expected here any month of the year. Beginning with the month of September and arranging the occurrences consecutively according to the days of the month, we have on September 4, 1927, one female that was banded; on September 8, 1925, two banded and recorded as female or immature; and on September 12, 1927, one female or immature banded. For the month of October there was one female banded October 4, 1928; one heard in abutilon October 8, 1927; one female seen October 19, 1927; and one seen in abutilon October 28, 1928. In November there was one female trapped on November 5, 1928, and one female seen in abutilon on November 27, 1928. One banded on December 11, 1927, was recorded as a female or immature after comparing it with skins from the collection of J. Eugene Law and studying it with Mr. Law. This bird is the prize of all our orioles; banded on December 11, 1927, it was in our traps again on November 5, 1928 (the one mentioned above on that date), and on May 21, 1929. It was a female. On January 1, 1929, a female or immature was banded, and on February 5, 1927, one member of the family heard an oriole and another member saw it to be a female or immature Arizona Hooded. On March 13, 1932, one was heard by two members of the family; on March 15, 1927, a male was seen and heard, and on March 28, 1927, a male which had been banded on June 8, 1926, returned to our traps. This gives us an actually trapped Arizona Hooded Oriole for every month of the year except February in which month one was both seen and heard.

Of the whole 205 banded only five returned to our traps in a succeeding year. One of these returned a second time as mentioned above. Another return record, making seven in all, was that of an immature banded on June 27, 1929, and found dead on April 17, 1930, in Alhambra, about three and one-half miles south of our station.

In searching *The Condor* for notices which might extend the range of time for this bird in this vicinity beyond that given by Willett (*loc. cit.*), the following by Roland Case Ross (*Condor*, xxvi, 1924, p. 226) was found. "Mr. and Mrs. Charles Francis Saunders tell me that Arizona Hooded Orioles . . . in their yard are fond of the flowers of the flowering maple (so-called) and probe the pendent bells by reaching down with the foot and pulling the face of the flower up". That day at the lunch table we were saying that we had not seen that performance when we heard the chatter of an oriole in a flowering maple outside an open door. There was one of the first males of the season, and as we looked he reached for a flower that was hanging a few inches to one side and slightly lower than his perch, grasped it with his beak, swung it near his perch, caught it with one foot, keeping only the other foot on his perch, and held it there in an approximately horizontal position while he probed

with his beak between the calyx and corolla. This is the place they always probe, in so far as we have observed.

We must not fail to mention the Troupial (*Icterus icterus*) which caused so much excitement when found in a trap on June 16, 1928. Its golden iris, bright plumage (in general much like the male Baltimore Oriole), its large size, strong feet and inclination to bite and to grasp with the feet were all calculated to make deep impressions. We were fortunate in having both Mr. Law and Dr. Storer at hand to help us identify this bird and the specimen is now in Mr. Law's collection. It probably had escaped from some aviary.

In conclusion the main inferences which seem justified by the facts recited are:

That the population of San Diego Spotted Towhees probably was increased in number and surely was increased in permanence because of the greater abundance of shrubbery and leafy ground cover;

That our trapping records are influenced by so many difficultly controlled variables that they do not reflect truly the abundance of resident San Diego Towhees although they do show the general trend;

That our trapping records show quite closely the visits of transient San Diego Towhees and Fox Sparrows and probably of other birds of similar habits;

That the abundance of Arizona Hooded Orioles has not been affected by the changes in our yard;

That Arizona Hooded Orioles may be expected in Pasadena and vicinity any month of the year, but that their occurrences between early September and late March are unusual.

Pasadena, California, April 21, 1932.