

State of California
The Resources Agency
Department of Fish and Game
Wildlife Management Division

CALIFORNIA LEAST TERN FLEDGLING STUDY
VENICE, CALIFORNIA, 1989

by

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Nongame Bird and Mammal Section Report

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ABSTRACT

A study was done at the California Least Tern (Sterna antillarum browni) colony at Venice Beach to devise a more accurate method of assessing fledgling production than has been available in the past. One week after the first fledgling was seen, a count was made of adults and fledglings in the evening roosting flock. Thereafter counts were done weekly for 9 weeks. The flock increased in number until it peaked on 13 July, then dropped sharply as migration got underway.

Chicks were banded by age, using a different color weekly so their ages could be determined post-fledging. Fledglings from the first two hatching weeks were mostly gone by the 4th post-fledging week. Color bands on fledglings proved difficult to see, however, and the kind of detailed information sought on length of time the fledglings stayed in the area was not obtained.

By counting the fledglings at 2-3 weeks post-fledging, and then again 3 weeks later, overlap was avoided. However, migration has usually begun by mid-July, and the presence of fledglings from other colonies could become a factor. The greater the knowledge of the colony, the more accurate the interpretation of the counts.

Two evening counts can be made by the monitors without difficulty at most colonies, and the method is recommended for future seasons.

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INTRODUCTION

One of the more problematical aspects of Least Tern monitoring is estimating the number of fledglings produced in a season at a given colony. Accurate figures for each colony are needed to arrive at a reasonable estimate of productivity for the whole population. Modeling and prediction of population changes are based on the number of breeding pairs and number of fledglings produced each year.

It is possible to document accurately the number of nests, clutch size, and hatching success, with semi-weekly, or even weekly visits to a colony; but the several methods used to determine fledgling numbers have not been very satisfactory. Early research showed that chicks that survived the first week had a good chance of fledging (Massey 1974), and at colonies where chicks are banded at hatching and recaptured regularly, this method has been verified and used, e.g. Camp Pendleton (Minsky et al 1983, 1984). It is, however, very labor intensive and cannot be done at many colonies. A less demanding method is to find the roosting site of a colony and count adults and fledglings at dusk when they settle down for the night (Atwood 1986). The problem that has always flawed this type of count is not knowing how long fledglings stay in the breeding area and return to the roost. If the juveniles stay throughout the season, then the peak count would be the most accurate; if, however, they leave at regular intervals as they become mature enough to undertake migration with their parents, then at those (undetermined) intervals one would be seeing an entirely new group. A study in Texas using patagial tags to identify fledglings concluded that 45% left the area by 2 weeks post-fledging, and 86% by 3 weeks (Thompson and Slack, 1984). However, patagial tags have been known to have adverse effects on Least Terns (Massey, field notes) and gulls (Southern and Southern 1985), and their study may have been compromised by the use of this method.

The terns at Venice Beach in Los Angeles County have regularly roosted at night either inside the enclosure or between the enclosure and the marina channel, about 100 m southwest of the fence (Atwood 1986). During the period of incubation and chick raising, most of the terns roost at night inside the enclosure; pre- and post-season they roost outside. Evening fledgling counts have been done on the beach for many years. Many adult color-band codes have been read through a spotting scope as the birds settle down for the night.

In 1989 a study was done at Venice Beach using color-bands on chicks, to try to identify fledglings by age during the evening counts.

METHODS

Nesting activity was monitored approximately weekly. After hatching began on 24 May, banding of chicks was initiated. The first group of chicks was banded on 1 June, and once a week thereafter, using a different color-band each week for 5 weeks. Chicks that were missed in their first week of life but caught later were aged according to wing length and weight (C.T. Collins, pers comm) and banded the appropriate color. The colors chosen were not used elsewhere in the state. Three were split bands (two colors), two were solid colors. Table I shows the color codes and number of chicks banded.

An estimated 300 chicks hatched in the colony; thus about 50% were banded.

Table I. Chick banding scheme at Venice in 1989.

<u>Date</u>	<u>Color code</u>	<u># of chicks</u>
1st week (to 1 June)	pink/blue (p/b)	67
2nd week (to 8 June)	red/yellow (r/y)	22
3rd week (to 15 June)	black/violet (k/v)	12
4th week (to 21 June)	green (g)	37
5th week (to 30 June)	black (k)	10
Total		148

The first fledgling was seen in the colony on 14 June; evening counts began one week later on 21 June. Nine counts were done: 21, 28 June; 5, 9, 13, 19, 26 July; and 3, 10 Aug. The counts began about an hour before sunset and lasted till it was too dark to see, about 30 min after sunset. Birds continued to arrive after dark, vocalizing as they came, so all counts are considered conservative.

Multiple counts were made during the evening as the terns continued to arrive, and the highest one was used. The procedure was to count the entire flock, keeping track of the number of adults and fledglings; then look for bands on the fledglings.

RESULTS

The first egg was laid at Venice on 2 May, and by 24 May there were 97 nests. There were 137 nests in the 1st wave, 21 in the 2nd. Hatching began 24 May, and by 21 June 90 nests had hatched. Fig. 1 shows the chronology of nesting and hatching.

The first two fledgling counts were not very satisfactory. Both evenings all of the terns roosted inside the fenced enclosure, making it difficult to see those in the dunes and vegetation around the edges. In addition, a strong, chill wind on 28 June precluded the use of binoculars and drove me from the beach before sunset. At all subsequent counts the weather was cooperative and the terns roosted on the beach.

The number of terns in the roosting flock ranged from 16 to 260. The peak number was 260 on 13 July (Fig. 1, Table II). There was a sharp drop in the next two weeks, indicating that migration had begun. On 19 July the greatest number of fledglings was seen (74), even though the size of the flock was down to 173. By the last count on 10 Aug, the flock was down to 16 birds.

Table II. Adults and fledglings in the night roosting flocks at Venice, 1989.

Date	Number of adults	Number of fledglings	No. of banded fledglings	Total
6/21	- 1	34	nc ²	
6/28	- 1	55	nc ²	
7/05	140	60	24	200
7/09	116	51	13	167
7/13	196	64	33	260
7/19	99	74	7	173
7/26	45	55	9	100
8/03	34	41	4	75
8/10	10	6	6	16

¹ All terns were inside enclosure and many adults were still incubating, making a count of non-incubating roosting adults impossible.

² nc=not counted

Table III shows the number of color-banded fledglings seen at each count. Seeing color-bands on fledglings proved more difficult than anticipated, due to the birds' habit of standing in small depressions, or hunching down so that their legs could not be seen. It was never possible to see the legs on more than half the juveniles in an evening. In addition, there were regular fly-ups of the whole flock when people wandered too close, or a dog ran on the beach, and I would have to begin the count again.

Nevertheless, a trend could be detected, with a drop-off of the first wave of fledglings after 13 July. Before that date the flock was mostly comprised of juveniles that were

banded the 1st two weeks in June (p/b, r/y). On 13 July a group of newly fledged terns (g) joined the flock, but the older juveniles were still present. A drop in the number of p/b and r/y fledglings on 19 July, coupled with a sharp decrease in the total roosting flock, indicated that migration was then underway and the 'older' fledglings had begun to leave. A few of the earliest fledged birds stayed at the site for 7 weeks, but most left after about 4 weeks.

Only 10 chicks were banded in the 5th week (k); no fledglings with this color-band were ever seen.

Table III. Color-banded fledglings

Date of count	# fledglings seen	# hatched by				
		6/01 (p/b)	6/08 (r/y)	6/15 (k/v)	6/21 (g)	6/30 (k)
7/05	60	14	10	0	0	0
7/09	51	6	3	2	2	0
7/13	64	13	7	1	12	0
7/19	74	4	2	0	1	0
7/26	55	1	0	1	7	0
8/03	41	1	1	1	1	0
8/10	10	0	0	2	4	0

Juvenile plumage changes rapidly and dramatically after fledgling and by the time of migration most juveniles have molted and are approaching the first basic plumage (Massey and Atwood 1978). In addition, the bill, initially stubby and brownish, lengthens and darkens until it is indistinguishable from the adult. As the season progressed, I found it more profitable to look at the bill and plumage than to look for color-bands. I would find a color-banded fledgling of known age and examine its plumage for identifying characteristics, then look for others that were similar. This method was not as precise as color-banding, but did enable me to distinguish two classes of fledglings on the last 3 counts. Newly fledged Least Terns have short bills, and their plumage is shades of brown and buff. The back feathers and wing coverts have pale, scalloped edges. By 4 weeks post-fledging, the bills have lengthened and molt has begun, brown feathers with scalloped edges are replaced and the juveniles begin to acquire the grey, black, and white appearance of the first basic (winter) plumage (Massey and Atwood 1978). On the late counts I was able to sort grey-black-white 'older' fledglings from brown-buff 'new' ones less than 4 weeks post-fledging.

On 10 Aug the roosting flock was very small; most of the terns had left the area. There were 6 fledglings, all banded; they had been airborne for 4-5 weeks (k/v, g).

DISCUSSION

The results of this study were not as clear-cut as hoped for the following reasons:

1) The chronology of the breeding season at Venice in 1989 differed somewhat from 'normal', apparently because of a food shortage (Massey 1989). Egg laying began on schedule (2 May) and was tightly synchronized for the first two weeks. Breeding pairs were ≥ 4 yrs of age. Thereafter the pattern deviated from the usual. In normal years, 3-yr old terns lay eggs 7-10 days after the older birds (many terns age 3 are breeding for the 1st time) but most have nested by 1 June; there is then a lag period before the 2-yr olds lay eggs - from the 2nd week in June to about 1 July. In 1989 nesting of both 2- and 3-yr olds was delayed and strung out through June. Thus there was no clear demarcation between the 1st and 2nd waves. In a normal season there would be a lag before the appearance of 2nd wave fledglings, and many of the older fledglings would have left on migration before the next batch fledged. At Venice this year there were not two peaks of fledglings, but one more-or-less bell-shaped curve. It was therefore difficult to find a point at which I could feel confident that the fledgling group had changed completely and the count reflected an entirely new crop of fledglings.

2) Seeing color-bands on fledglings proved more difficult than anticipated, and one or two persons were not enough when there were 50+ fledglings. I therefore had to rely on differentiating age groups of fledglings by plumage, a less exact method.

By combining information on the chronology of nesting and the number and composition of the roosting flocks, I concluded that:

1) On 28 June, by chronology, all fledglings seen on this date must have been from eggs laid in the 1st two weeks of the season and banded by 8 June; by 5 July the 3rd week's chicks (banded by 15 June) could also have been present, but none were seen (and very few of this group were ever seen).

2) On 13 July the roosting flock was at its peak number, and included juveniles banded in the 4th post hatching week.

3) On 19 July the size of the flock had decreased sharply, and most of the oldest fledglings had left.

4) On 26 July the flock was almost entirely a different group from the one present on 5 July.

5) 10 Aug. The flock was tiny, but 6/10 fledglings were color-banded and identifiable as 4-5 weeks post fledging. There were no 'older' fledglings present.

In a normal tern breeding season when most nests in the 1st wave are laid the first 2-3 weeks in May, an evening

fledgling count taken approximately 8-9 weeks after the first egg is laid (2-3 weeks after the first fledgling is seen) would document the number of fledglings produced from this 1st group. Another count taken approximately 3 weeks later would insure that most of the older fledglings had left on migration, and the fledglings present could be considered previously uncounted. If the season is prolonged and second-wave nests have succeeded, another count 3 weeks later should yield yet another batch of fledglings. (At Venice this year it was apparent from the bands that the 6 fledglings on the final count in August had been counted already, so were not added. The better knowledge one has of a colony, the more accurate will be the estimates.)

However, counts taken after the initial one could be subject to a complication that did not occur at Venice Beach but has been seen at other colonies - the addition of adults and fledglings from other colonies to an evening roost, particularly after migration has begun. Such observations have been made at Huntington Beach (J. Fancher, pers. comm.). The Belmont Shore (Long Beach) roosting flock has long been known to attract terns from the several colonies in the vicinity. Thus it is important for the monitor to know how many pairs, active nests, hatched nests, etc. are in the colony under observation, in order to interpret with some accuracy the numbers seen in the evening roosting flocks.

Using the above criteria, and taking into account the abnormalities in chronology that occurred this season, two fledgling counts at Venice in 1989 taken at 3 week intervals gave a total of 129 fledglings (55 on 28 June, 74 on 19 July). There were no late fledglings from nests laid in late June (all 6 fledglings seen on 10 Aug had been banded by 30 June) so a 3rd count was not applicable. The number of nesting pairs was 137; thus the ratio of productivity was 0.94/pair.

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Fig. 1. Chronology of egg laying, hatching and fledgling counts at Venice, 1989.

1989 - Venice Beach

California Least Tern Nests & Fledglings

CHRONOLOGY

