

CENSUS OF A COLONY OF CASPIAN TERNS

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Students of birds in the San Francisco Bay region have derived satisfaction and pleasure in the success of a nesting colony of Caspian Terns (*Hydroprogne caspia*) situated in the marshes of the south arm of the Bay, not far from Dumbarton Bridge. This ternery was discovered in 1922 when it consisted of but 7 pairs (De Groot, Condor, 33, 1931:188-192); by 1930 it had grown to 296. Since De Groot's last count in 1931, no published record of the colony's later progress seems to have been offered, although a number of people have visited it and ascertained that it was in thriving condition.



Fig. 56. Caspian Terns standing near nests at colony near Dumbarton Bridge, Alameda County, California, May 21, 1943; photo by the author.

On May 21, 1943, I had opportunity to go to the ternery and to make a census. Part of a census-taker's business is to pose questions so that he may embellish his general count with subsidiary figures and better interpret the lives of his subjects. At once I saw certain variables in the population of which I might keep track, but as is often true, subsequently I thought of still other data that should have been accumulated.

Mrs. T. Eric Reynolds, who accompanied me to take motion pictures, had ample time to photograph, for it took from 11 a.m. to 5 p.m. to "do" the colony. Two hundred yards away, as we walked along the levee toward the site, the terns came out to meet us, bowling along with powerful wing strokes and then diving shallowly over our heads. When under full speed in the approach, they uttered a staccato *ca, ca, ca, ca* of moderate intensity which burst into the full raucous *crau-au* as they swung over us. Accenting this intimidation note, so it seemed, was the simultaneous wide opening of the

gullet, vertically and laterally. This great red opening and the massive red bill seemed to capture all one's attention as he watched the on-plunging bird. As it veered off, the prevailing white plumage was patterned by the black crown, eye and under wing tip and by the small black feet held back and pressed together to form a neat "V."

Hatching had begun, especially in two sections of the continuous nesting area that were the highest parts of the levee in this region. Perhaps the colony had been divided earlier and only more recently had the low intervening sections been settled. But eleva-



Fig. 57. Adult and juvenal Caspian Terns at nest, June 2, 1943; photo by Kathleen Dougan.

tion was not the only factor in choice of site, for clustered about the high points (6 feet) at levels scarcely 2 feet above the bordering salt ponds, were equally advanced nests. Desire for propinquity, so prominent in this and other nesting terns, must have induced birds early to cluster about the favored high spots even though this meant that some had to take low positions, lower actually than in the new districts of the colony. Spacing in these two centers was closer, sometimes being only 2 feet, whereas generally nests were 6 to 10 feet apart.

Some young were seen that were about one-third grown and must have been at least a week old. These ran easily along the levee between the nests and often took to the water. Young apparently but two days old would venture a yard or two before toppling over and crouching down. Usually unless touched or closely inspected they remained flattened in their original nest hollows and newly hatched young lay seemingly exhausted, outstretched on the ground.

We were at once impressed by the variable appearance of the downy young. They were essentially of two color phases as mentioned by De Groot (*op. cit.*: 190). The dark type (as in Mus. Vert. Zool. no. 88382) is a light wood brown, the light type (no. 88381) an extremely pale creamy white with a few wisps of black on the backs and wings. So distinctive are these types that one may with few doubts classify young seen even at some distance on the water. The dark birds have a sooty throat patch, dark skin and dusky olive feet; the light birds are essentially as white on the throat as on the belly, the skin is light yellowish and the feet are dull orange. Careful search disclosed a few birds of intermediate aspect which fell into two categories: one (no. 88383) had no brown pigment but was liberally flecked with black above and had a dark throat and

dark feet and skin; the other (no. 88380) was pale yellowish above with no more black flecks than in the completely pale type and it possessed a faintly gray throat, orange feet and light skin. The fully dark type seems to combine the black and yellowish pigments of these two intermediates.

The two principal phases were found represented among newly hatched young in the same nest (see fig. 58). Young examined closely enough that they could be classified as to phase totaled 110. Of these 62 were of the dark type, 40 of the light type, and 8 of some sort of intermediate coloration. Nests with two or more recently hatched young showed the following combinations: 1 light and 1 dark, 6; 2 light, 1; 2 dark, 3; 3 dark, 1; 2 intermediate, 1; 1 dark and 1 intermediate, 1. These young all were too feeble to have strayed from their home nest.

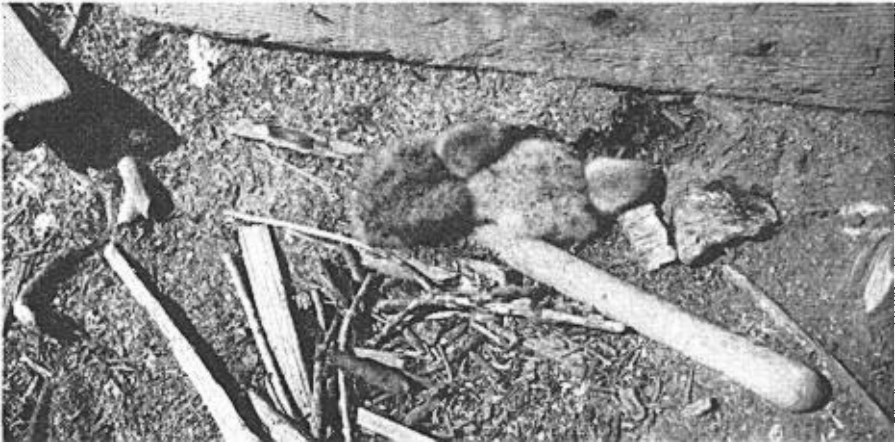


Fig. 58. Newly hatched terns in "nest," showing dark and light phases of downy plumage, May 21, 1943; photo by the author.

This situation with respect to phases suggests that there is a small number of hereditary factors controlling down color and that they freely segregate. The genes for the two main types seem both to be of high frequency in the population. It would be worthwhile to make subsequent counts of the phases in this colony and similarly to check other colonies to obtain some evidence of possible fluctuations in gene frequencies. One might expect them to fluctuate toward one extreme or the other, although the breeding population is large and closely knit and if there are no selective factors, the variability of the population may persist in its present state more or less indefinitely according to Hardy's principle (see Dobzhansky, *Genetics and the Origin of Species*, 1937:123).

At this particular colony I could not see that one color type was better adapted for concealment than the other. The dark birds may have been a little less conspicuous than the light ones, but they were definitely darker than the silt of the levee and the light birds were lighter than the substrate. There may not be much selection of color types in a compact colony of this kind of bird whose young, unlike those of grouse or quail, are rather well protected from terrestrial predators by their aggressive and formidable parents if not by the isolated situation of the colony. The number of dead young which I counted was only 8 and included all color types; such a sample obviously is too small to yield conclusions on differential mortality. It is to be noted that



Fig. 59. Nest of Caspian Tern, showing maximum amount of nest material. Two light objects on lower left margin of nest are pellets of fish scales.



Fig. 60. Two light-phase young with egg about to hatch. Nest rim composed chiefly of shells.

these distinct phases of the downy young have no counterparts in the plumages or foot color of the adults which at any one season are uniform in appearance.

The colony, when we visited it, was apparently close to the former locations upon which De Groot reported. The section of levee occupied was 175 yards long; the maximum width was 14 yards but most of the nests were in a 9-yard strip along the crown of the levee. Much driftwood and debris was scattered about and frequently was used in the nests. These varied from mere spots scraped down to hard dirt, to rims of little clods or oyster shells and to piled up masses of wood and stick debris (fig. 59). Often

one could find pellets of fish scales and bones deposited on the rims of nests by incubating birds (see fig. 59). These were friable to an extreme, having no binding material as in owl pellets. Many eggs were muddy, perhaps the result of wet feet or blown spray coupled with normal turning and moving of them by the parent birds, but we saw no sure sign of damage due to wind and high water as reported by De Groot. Seemingly the levee is somewhat higher now than it was formerly. Eggs commonly were found scattered about the colony out of the nests, but they did not give evidence of having been blown or washed about.

Tabulation of nest contents and of totals of eggs and young is as follows:

No. in nest	Nature of contents	No. of nests
1	eggs, 99; young 12	111
2	2 eggs, 193; 1 egg, 1 young, 15; 2 young, 11	219
3	3 eggs, 29; 2 eggs, 1 young, 8; 1 egg, 2 young, 2; 3 young, 1	40
4	4 eggs, 2; 3 eggs, 1 young, 3; 1 egg, 3 young, 1	6
5	5 eggs	2
Totals		
	Occupied nests	378
	Estimated empty nests	22
	Estimated nesting pairs	400
	Eggs in nests (some at least fresh).....	633
	Eggs out of nests	51
	Eggs in and out of nests.....	684
	Young in nests	70
	Young out of nests (includes 8 dead; probably about 20 not here included were overlooked)	62
	Young in and out of nests.....	132
	Grand total of eggs and young.....	816
	Total eggs and young with chance of survival on May 21.....	757

To review the progressive increase in the colony we may best use De Groot's figures for maximum number of occupied nests known for each season. There is of course a source of error in the fact that the number may not have been checked each year at the peak of the season; the peak seemingly does not coincide in date in different years. Nevertheless the approximate growth rate of the colony is shown.

Year	Occupied nests	Date
1922	7	
1923	2	
1924	12	
1925	35-50 (estimate)	
1926	164	July 4
1927	212	June 11
1928	242	June 14
1930	296	June 8
1931	287	June 3
1943	378	May 21

About the colony in 1943 we found occasional fishes left by the side of nests with newly hatched young (see fig. 61). These consisted of three species (identifications by Garth Murphy): bullhead (*Leptocottus armatus armatus*); bay smelt (*Atherinops affinis affinis*); viviparous perch (*Cymatogaster aggregatus*). The perch were by far the most commonly represented. These rather spiny fish, 2 to 3 inches long, were fed

with only the head removed to young no more than two days old. Pieces of smelt 2 inches long were spit up by similarly small young. Juveniles at hatching weigh about 40 grams, but after their first fish meal of such proportion they jump to almost 60 grams.

All fishing by the adults was done at some distance, for we saw no diving in the adjoining salt ponds. The old birds flew in with apparently just a single fish held cross-ways in the beak. We had no opportunity to watch feeding of the young and it is possible therefore that more fish were carried concealed in the throat, as De Groot implies.



Fig. 61. Tern nests, showing viviparous perch (on board) brought for newly hatched young.

As we left the colony, older young were paddling back to the levee and seeking refuge among the clods along the shoreline. A breeze had whipped up small waves and they had become waterlogged. In the downy stage the terns certainly are not well equipped to swim far in rough water. Old birds, seemingly recognizing their own young, flew over them as they swam and settled by them on the shoreline as they sluggishly climbed out to dry off. Such young could not be induced to try the water again.

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