

# THE CONDOR

A BI-MONTHLY MAGAZINE OF  
WESTERN ORNITHOLOGY

Published by the  
COOPER ORNITHOLOGICAL CLUB

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VOLUME XXXIII

MAY-JUNE, 1931

NUMBER 3

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## NOTES ON THE HABITS AND DEVELOPMENT OF YOUNG QUAIL

By FRANK F. GANDER

By chance, during the summer of 1930, I had an excellent opportunity to study young Valley California Quail (*Lophortyx californica californica*), but due to pressure of other duties was unable to take full advantage of it. However, some of my notes seem worthy of record, since I find almost nothing in the literature which deals with the development of these birds.

On June 15, while burning grass in my yard, which is on a cañon side and adjacent to thick chaparral, a quail's nest was discovered which contained 20 eggs. The bird flew from the nest only when the fire had burned to its very edge; while I immediately put out the flames, some of her protecting cover had already been burned. The nest was typical, being a shallow depression in the ground, very lightly lined with dry grass and roofed over with dry grass and golden tarweed. One of the eggs was so finely and evenly speckled with dark brown as to appear solidly colored. The quail returned to her nest and was observed on it numerous times, even when children were playing quite near, or when big-footed Muscovy ducks waddled haphazardly past her.

On July 2, at about 6:30 p. m., the quail's nest was inspected and found to be deserted and the eggs cold. Many of the eggs were pipped and in some I could see that the chick was still alive, although ants had been feeding on them. Two eggs were smashed, including the brown one. The remainder were taken to the house and placed in a pan of warm water where they at once began to bob around and I could hear a faint peeping sound. When to this was added the cracking of shells, the eggs were hurriedly removed from the water and placed in a nest of warm flannel. The chicks quieted down and there was no more cracking of the shells after about 7:30. About 8 they were given another warm bath and, as before, they bobbed around, but there was no cracking of the shell and much less peeping. They were left in the bath this time only long enough to permit of arranging their nest on a hot water bottle before returning them to it. Twice during the night, fresh hot water was put in the water bottle, but the little birds remained quiet.

Between 6 and 6:30 a. m. the water was again changed and in a short time activity began. By 7 o'clock five had hatched, three were almost out and others

were busily chipping the shells. Hatching was a rapid process. Most of the eggs had been pipped the night before and remained in this condition until morning. With the resumption of activity at dawn, with much peeping, the chick would turn in the shell, breaking a ring about the larger end as it did so. When this had progressed about three-fourths of the way around there would be a short rest period of a few seconds. Then, accompanied by a loud cheep, the top would fly open like a lid. The little bird would draw its head forth from under its wing and, with much kicking, squirming and peeping, would succeed in extricating itself from the remainder of the shell. By noon, 13 had hatched and there were no more after this, although all of the eggs were fertile.

Since there was no change in the method of caring for the eggs, the long rest period from 7:30 p. m. to 6:30 a. m. was seemingly due to the fact that this is the natural rest time of quail and the little birds were presumably sleeping. This is in keeping with observations that have been made on domestic pigeons. (See Whitman, Charles Otis: *The Behavior of Pigeons*, Publ. Carnegie Inst. Wash., no. 257, vol. 3, 1919.) It is interesting to note within how short a time the hatching of the brood was completed.

Female quail feathers discovered in the yard of a neighbor on the morning of July 1 were presumably from the missing owner of the nest, which had perhaps furnished a meal for someone's pet cat. This would indicate that the eggs had been exposed from some time previous to the finding of the feathers on the morning of July 1 until the evening of the second. It seems remarkable that any of the chicks were alive after the two days exposure to the July sun. Some of them were noticeably weakened.

On the morning of the 4th the little quail were given finely chopped yolk of hard-boiled egg, which they picked at rather casually after I had aroused their interest in it by tapping with my forefinger. In mid-morning they were placed in a cage out-of-doors in the sunshine. Live insects were dropped in their cage and they caught and eagerly devoured them. Anything that moved was looked upon as food and they ate flies, bugs, ants, tree hoppers, a wasp, small caterpillars, spiders, grasshoppers, etc., without discrimination except as to size and hardness. Large specimens were torn into small fragments which the quail seized eagerly. Whenever one secured a morsel too large to be swallowed readily, it ran wildly about the cage to prevent others from snatching the food from its beak. One little bird was seen to scratch in the sand of the cage floor, but rather awkwardly and ineffectually. Ants invaded the cage during the day and distressed the baby quail greatly by biting them on the toes. The cage was moved to a clean spot, but the birds had learned to fear the tiny biting insects and made no attempts to eat them from this time on.

Due to lack of time and of equipment for properly caring for the little orphans the mortality rate was high. By July 13, there were but 8 left. One of these was conspicuously larger than the others and a second was very long-legged. Wing feathers reached clear to the tail on the larger birds and pinfeathers were showing in tail and on shoulders. They were turned loose in the yard and followed me as I searched for food for them. They soon responded to my call of "chick, chick", with which I attracted their attention to insects I had found. Not only all insects offered were eagerly eaten, but also spiders and even the little isopods known as sow-bugs. They also found much food for themselves, and their crops were well filled when I returned them to their cage. For the next 10 days they were taken out for walks about the yard two or three times daily by either my small son or

myself. It was noted that they usually started the morning by eating much sand or earth, and whenever during the day they came to freshly turned clay or other inorganic soil they ate it quite greedily. They were now finding most of their food by themselves, but they continued to eat some of the chopped egg; and during this period they began to show a fondness for bread crumbs and chick mash.

After about July 24 the little quail were given the run of the place and wandered widely over the yard and through the neighboring chaparral. They always returned to their cage at dusk and, as their wings developed, soon came flying whenever called. On the evening of July 31 one was heard to attempt the three-note call of the adult male. On the following morning they were heard giving the "conversational" notes of feeding adult birds, instead of the peeping which they had used theretofore. They were seen feeding extensively on sand spurry and moss at this time, even though the latter was dry and crisp.

By August 8, they were becoming quite well feathered, but the head was still largely down-covered. Some feathers were showing over the ears, in front of the topknot and on the neck. The long-legged bird was much more richly colored than most of the others, although one other approached it in shade. The largest bird was lighter in color, as were the two smaller ones. The two darker birds proved to be males, the largest light one a female; but the two little ones never reached a stage of development where I was sure of their sex. It was not until about August 20 that the sex of the larger birds could be definitely and readily determined, through their resemblance to adults.

After August 21, they roosted in shrubbery near the house. Due to depredations by predators, by the 24th of the month but 3 were left, the large female and the two males. It had been noted for some time that they were feeding less and less on insects and more and more on plant food, being especially fond of the clover in our lawn and also of the dry moss which grows under the greasewood. Some experiments were made with insect food. A small measuring worm was offered the female, but while she pecked at it she did not eat it. She looked at a robber fly but did not move towards it; she ate one small grasshopper and ignored another. A month earlier, any of these insects would have been fought over. All 3 were seen eating chinch bugs, and they also eagerly devoured flies which were swatted for them about the house.

The quail were now becoming of good size and were growing fond of grain which was supplied to them on top of a barrel near the chicken run. Whenever called, they would come flying to this barrel to be fed. During the latter part of August two more disappeared, so that only the largest and darkest-colored male remained. He developed a very interesting plumage which, apparently, was a true post-juvinal plumage and was worn all during the month of September. The back, wings and neck were gray; the facial mask was a darker gray and was distinctly bounded by a narrow band of grayish white; the breast and belly were gray with a median stripe of chestnut on the lower part; the sides and flanks were marked as in the adult bird. The top-knot worn with this plumage was like that of the adult female. A few scattered feathers of the adult plumage appeared, but their number did not increase during the month. About October 1 the top-knot was shed and at the same time a plumage resembling that of the adult began to appear. A new top-knot was grown and the bird was in good feather by the middle of the month.

With the disappearance of its companions, this last bird became more and more attached to its human associates and would follow any member of the family who

appeared in the yard. As time went on, he began to spend more and more time in the chaparral and soon was running with the wild birds. He would come daily to feed from our hands until about the end of the month, when he began to grow more timid and would not come near. By the beginning of the open season we had lost contact with our former pet, but often a fine male quail would come out of the chaparral at the foot of the yard and call to us. If we attempted to come near, however, he would retreat into the brush.

Summary: Thirteen little quail were successfully hatched from 18 eggs after these had been exposed in an open nest for a period probably exceeding 36 hours.

None of the little chicks hatched out between 7:30 p. m. and 6:30 a. m., although several had pipped the shell some little time previous to this, and others were active and chipping the shell about 7:00 p. m.

The newly hatched quail showed a decided preference for insect food and it was not until after about three weeks that this taste began to wane; by August 24, when 52 days old, they were feeding largely on plant food and one bird refused to eat some kinds of insects previously taken.

Sexual characteristics of the plumage, resembling adults, were not distinguishable until August 20, when the birds were about seven weeks old.

The sole surviving male bird developed a distinct post-juvinal plumage at the age of about two months and wore same for about one month. This was followed by a plumage practically like that of the adult.

*San Diego Society of Natural History, San Diego, California, February 12, 1931.*