

## THE SEX OF THE INCUBATING KILLDEER.

BY GAYLE PICKWELL.

*Plates XXIII-XXIV.*

It became necessary, as a part of some experimental work the writer is doing with nest-protective and young-protective reactions of the Killdeer, to collect birds, the more accurately to assign to the proper sex the various reactions. To this end a beginning was made the summer of 1929 and two incubating Killdeers were collected. Both of these proved to be males.

One of these was taken from a nest in the vicinity of a peculiar sink hole, which still contained some water, on a lava-boulder strewn plain some thirty miles west of Mt. Lassen and fourteen miles east of Red Bluff, California. The other was taken from a nest on a slight elevation above the general heavily grass-covered and marshy land some two or three miles west of Ft. Klamath, Oregon. The former was taken on June 21, and the latter on June 27, 1929.

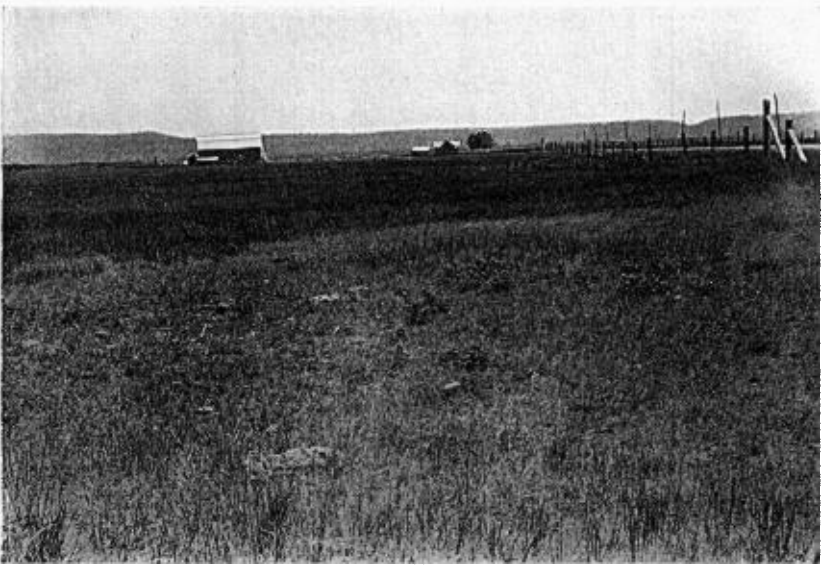
It is significant, in this connection, to go into some detail with regard to the conditions under which the birds were taken and their reactions prior to collection. The first bird was one of scores of Killdeers that had been attracted to the isolated pond in that otherwise very dry and inhospitable country. Water is at a premium here and this particular body seemed to be the result of drainage of winter rains from the hundreds of acres of barren lava fields that slope gently into it from nearly all sides. Since the water, now only a few acres in extent, was so shallow, even this drainage seemed scarcely sufficient to account for its continued existence into June after weeks of the blistering hot weather that is a feature of the upper Sacramento Valley region. Perhaps a spring from beneath, contributed by the snows of the nearby Lassen and Sierra mountains, may have accounted for its persistence. In any case it had no outlet that was visible and its evaporating water had left white alkaline rings for hundreds of yards out from its present level. The boulders that covered the plains as

thickly as sheep on all sides encroached also up to and into the water.

We had gone into the region to make observations of the Ruddy Horned Larks which inhabit these peculiarly uninviting lava fields by the hundreds. The Killdeers attracted our attention only incidentally at this time. But, it should be noted, though there was an amazingly large number of species and individuals of other birds in the trees that bordered the stream beds of the region, on this torrid plain there were Larks and Killdeers only. Dr. Jean Linsdale tells me that men from the Museum of Vertebrate Zoölogy of the University of California have found as many as five nests of Killdeers here in one day but at the time of our visit, though Killdeers were numerous and solicitous, probably only a few were incubating.

The reactions, of the bird here collected, were in most respects typical of the incubating Killdeer (quite radically different it is to be noted from those of the parent with young). The first indications of a nest were noted the day prior to its discovery. These were faint "dee" calls heard from the same locality (some two or three hundred yards from the pond), two or three successive times. This is always indicative of a Killdeer nest: repeated presence of a bird in the same locality and a solicitude milder than that when there are young. On June 21, when passing by this locality, we located the calling bird with our glasses and seated ourselves some fifty yards distant. The Killdeer shortly ran up to a certain spot and stood there bobbing. Here was a nest, rather elaborately made for a Killdeer, in a considerable depression formed by a collection of lava gravel and wooly heads of a small composite that dominated the region.

The bird seemed much more concerned with shading the eggs than with incubating them for, throughout the entire period that we observed, not once were the eggs settled upon. The temperature that day reached 110 degrees Fahrenheit at Red Bluff and in the exposed glare where the Killdeer nest was located certainly the temperature was well above this. Embryos, in eggs exposed to this sun, could not have withstood its heat for more than a few minutes certainly. The rocks became so hot that they were burning to the touch and even those children of the shimmering heated places,



UPPER: HABITAT OF KILLDEER'S NEST, FORT KLAMATH, OREGON.

LOWER: MALE KILLDEER SHIELDING EGGS FROM THE SUN, MT. LASSEN, CALIF. IN THE DISTANCE.

the Ruddy Horned Larks, would not alight on them but rather spent the middle portions of the day in their shade, panting. One located nest of the Ruddy Horned Lark had been built well under the shade of the north side of a boulder. But the Killdeer nest had no protection whatsoever from the sun and the parent bird suffered intensely, with all feathers relaxed and ruffled up and with constant vigorous panting, while he protected the eggs with the shadow of his body.

The Killdeer had left the nest this day and the previous with the typical furtive abandonment that the bird always uses to conceal a nest on first or widely spaced visits of an intruder. The call, as noted, was given after the bird had reached a position thirty yards from the nest. After returning to the nest and while we were in the vicinity the bird continued to call from the nest and at no interval of less than fifteen minutes did we get any other reaction. In this case, then, an interval longer than fifteen minutes would have been necessary for a repetition of concealment by furtive abandonment. We walked up to the bird repeatedly from various distances. The bird cried from over the nest as we approached, left it only after we had come within thirty or forty feet and ran only a few yards. The bird was back over the eggs in less than a minute each time as we retreated to a position some seventy-five feet distant.

The writer has had too much experience with the automatic responses of birds to attribute to them any pronounced facultative intelligence or even prescience but there may have been some relationship between the danger of the intense heat of the sun and the solicitude of the Killdeer in shading these eggs.

This remarkably solicitous bird was finally (and reluctantly on our part), collected on the nest. Dissection proved it to be a male. Equally important, in this case, is the fact that no other Killdeer was ever noted nearer than the margins of the pond (two-hundred plus yards away) and, of course, no other expressing solicitude in the vicinity.

The situation at Fort Klamath was radically different but of great interest, nevertheless. It should be noted that this is the location of many of the important and interesting observations of Dr. J. C. Merrill of more than forty years ago during the days of

the old army post here. Now the fort is gone and but a lonely store or two still clings to the old encampment. Likewise Dr. Merrill's marshes, that extended for so many miles up from the head of Upper Klamath to the south, have been converted largely into pasture lands and his birds have gone with them.

But the pastures are luxuriant and wet. Roads dissect the lowlands here and there and their side ditches fill with water. Water-filled canals run this way and that across the pasture lands. As one would expect this condition exerts a powerful appeal to the Killdeers. But since they must have bare ground to run upon and to nest upon they are restricted largely to the roadsides and the occasional dryer hummock.

While driving over these roads Killdeers would start up every few hundred yards and one group of three downy young was noted. *Two* adults were with them expressing solicitude but one only gave the typical distress simulation.

We stopped at another point where several (at least three), Killdeers were in evidence along the roadside and from this point we noted a Killdeer go on to a nest about thirty feet from the road and about fifty feet from our car. This return was within five minutes of our arrival but since we remained partially concealed in the car this may have accounted for the rapid return after the initial furtive abandonment. To a companion, Mr. Alton Alderman, goes the credit for locating this nest. It was in a small depression surrounded by fine pebbles and on a little area about thirty by fifty feet that stood a few inches higher than the surrounding very flat region. As a consequence of its slight elevation its grasses were shorter and sparser than the others of the vicinity but were still somewhat heavier than the conditions ordinarily selected by the Killdeer.

The bird returned within five minutes of its second flushing and an attempt was made to collect it on the nest but the charge missed. In spite of the alarm this must have caused the bird it was shortly back, returning with its typical run and pause method. Mr. Alderman stepped up to it and, as it left the eggs in abandonment concealment (without calling), it was collected about six feet from the nest. This bird, a male, had the breast feathers well worn and the brood spot very large. This was also the case with the Red Bluff bird.

Though other Killdeers were in the vicinity expressing solicitude there was none which could with certainty be ascribed as the mate of this collected Fort Klamath bird. We returned to the eggs after an absence of more than an hour but no incubating bird was over them and they were very hot from the sun indicating that none had been. A Killdeer in the vicinity called.

Two incubating males do not in themselves make a full case for reversal of parental instincts but, in connection with many other observations, they point forcibly in that direction. Thus, though I have spent many hours in close observation at many nests,<sup>1</sup> I have never seen exchange of incubating birds. Likewise, while performing many experiments with the young, though there have been two adult birds in the vicinity, one always expressed much more solicitude. I am constrained to believe that this incubating and more solicitous bird is the male. The female of course must lay the eggs. Does the male, however, make the nest as do male Phalaropes? What are his reactions during egg laying? Since the young hatch almost simultaneously he does not incubate until the set is complete; but does the female initiate incubation? These and several other questions are as yet unanswered.

Since we are, with regard to shore birds where sex markings do not exist, in a state of transition from that period where the more solicitous bird has always been assumed unquestioningly to be the female, to a state where the reverse position may someday be assumed for many, it may be well to summarize our present knowledge of the situation. In looking over the literature it is very hard to sort away the statements where the knowledge regarding the sex of shore birds is only inferred from that where definite knowledge is present due to collecting and sexing. One is especially impressed with this fact in seeking for precise information on the subject in the many sources which Bent<sup>2</sup> has used in compiling his "Life Histories of North American Shore Birds." However, using these two bulletins as a basis, and concerning ourselves only with the incubating sex, the following categories can be made provisionally:

---

<sup>1</sup> Pickwell, Gayle, "Nesting of the Killdeer," *Auk*, Vol. XVII, 1925, pp. 485-496.

<sup>2</sup> Bent, A. C., "Life Histories of North American Shore Birds," *Bulletins* 142 and 146, 1927 and 1929, U. S. Nat. Mus.

1. Species where female alone incubates; European Woodcock; Pectoral Sandpiper.

2. Species where the male alone incubates: Red, Northern and Wilson Phalaropes; Killdeer (probably);<sup>1</sup> Surf Bird (probably); Spoon-bill Sandpiper (probably).

3. Species where both male and female incubate: Black-necked Stilt; American Woodcock; Wilson Snipe (probably male chiefly); Long-billed Dowitcher (male chiefly); American Knot; Purple Sandpiper; Pribilof Sandpiper; Aleutian Sandpiper (male chiefly); Least Sandpiper (male chiefly, probably entirely); Dunlin; Red-backed Sandpiper; Curlew Sandpiper; Semipalmated Sandpiper; Western Sandpiper; Pacific Godwit; Black-tailed Godwit; Green-shank; Eastern Willet; Upland Plover; Spotted Sandpiper (male chiefly); Long-billed Plover; European Golden Plover; Pacific Golden Plover; Black-bellied Plover; Semipalmated Plover (difference of opinion as to most solicitous sex); Ringed Plover; Turnstone; Black Turnstone; European Oyster Catcher.

4. Questionable, insufficient or no data as to sex incubating: American Avocet; Snipe (European); Great Snipe; Jack Snipe; Sharp-tailed Sandpiper; White-rumped Sandpiper; Long-toed Stint; Marbled Godwit; Sanderling; Rufous-necked Sandpiper; Redshank; Greater Yellowlegs; Solitary Sandpiper; Western Willet; Wandering Tattler; Buff-breasted Sandpiper; Hudsonian Curlew (male most demonstrative); Eskimo Curlew; Dotterel; American Golden Plover; Little Ringed Plover; Piping Plover; Snowy Plover; Wilson Plover; Mountain Plover (an incubating male has been taken); American Oyster Catcher; Mexican Jacana.

Many of the species in the first three categories require more careful collecting before they can be definitely assigned. And the number in the fourth category is quite astonishingly large. Especially in this true of the Plovers and this is the more interesting

<sup>1</sup> Bent (*loc. cit.*, Bull. 146, p. 207), states that both sexes of the Killdeer incubate. He gives, as the authority for this statement, F. L. Burns ("Comparative Periods in Deposition and Incubation of Some North American Birds," *Wilson Bulletin*, Vol. 27, pp. 275-286). Reference to this article discloses that Burns, collecting a mass of material from manuscript notes of various individuals and "statements of authors," writes that, "according to present information both sexes take regular turns at incubation" (p. 277), and includes the Killdeer in a long list of others. Since he gives no specific evidence his record is open to question with regard to this species.



UPPER: KILLDEER'S NEST ON A LAVA-BOULDER PLAIN BETWEEN RED BLUFF AND  
MT. LASSEN, CALIF.

LOWER: KILLDEER'S NEST, FORT KLAMATH, OREGON.

INCUBATING MALE BIRDS WERE COLLECTED FROM BOTH NESTS.



since many of them nest within the boundaries of the United States (excepting of course the casual visitants which Bent includes), and not far to the north as is the case with the majority of the Sandpipers.

One or two recent writers have contributed information to this question of considerable interest and, though their records have been reviewed by Bent and so included in the above summary, a word or two should be said about them in addition. Thus Van Rossem,<sup>1</sup> with assistance from the notes of Dr. Loye Miller and Alden Miller, first disclosed the family scandal of that well-known bird the Spotted Sandpiper. He shows that the courting bird, in one instance at least, was the female; in two cases the only parent with the young was the male; and in a fourth case the incubating bird was a male. But the same article quotes Dr. Joseph Grinnell as reporting three specific instances where the female was with eggs or young.

Dixon has done more than most ornithologists to uncover this interesting problem and his reports of Baird's, Spoon-bill and other Sandpipers are included in the preceding summary taken from Bent. In his magnificent report<sup>2</sup> of the discovery of the Surf Bird at home he writes that an incubating bird collected was a male and that of eight birds taken five were males with bare incubation patches or egg pockets on their lower breasts whereas none of the females (two specimens), had these.

As may be supposed, wherever the male incubates largely or entirely, he assumes chief care of the young, shows more solicitude in their behalf and is retiring or unaggressive in courtship. In fact he takes over all the usual duties and attitudes of the female except egg laying. This is most pronounced in the Phalaropes but also has been shown for the Spotted Sandpiper. Careful observation may show it for many others.

This problem undoubtedly has some deep-seated physiological and cytological implications but it is interesting too because of its partial or complete reversal of the so-called "maternal" instincts which have always been presumed to dwell exclusively or largely

---

<sup>1</sup> Van Rossem, A. J., "Observations on the Spotted Sandpiper," *Auk*, Vol. XLII, 1925, pp. 230-232.

<sup>2</sup> Dixon, Joseph, "The Surf-bird's Secret," *Condor*, Vol. XXIX, 1927, pp. 2-16.

in the female. It requires, properly to comprehend it, thorough study not only of incubation but of courtship, nest building and care of young. The writer plans to carry the matter farther with the Killdeer though, unfortunately, considerable collecting must be done to clarify it.

*Department of Natural Science, State College,  
San Jose, California.*