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THE NESTING OF THE KILLDEER.

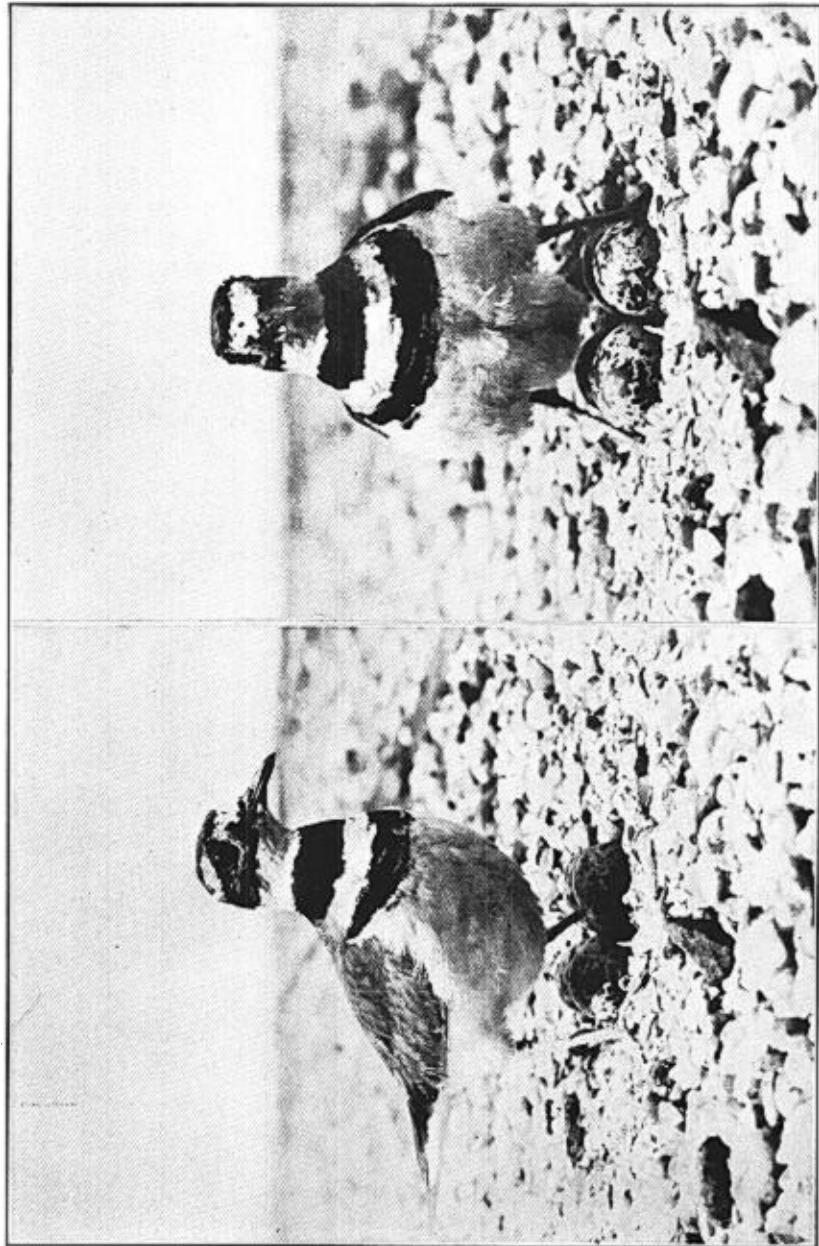
BY GAYLE PICKWELL.

Plates XXI-XXIII.

DURING the spring of 1922, Killdeer nests found in the vicinity of Lincoln, Nebraska, presented such a variety of interesting data that considerable observations were made of them. Three nests, in all, were located in as many different environments and conditions.

On April 15, the first nest was observed south of Capitol Beach Lake just west of Lincoln. The nest was in an old rubbish heap along a road travelled by workmen who were busy near the shore of the lake. It was one of the latter who first observed the nest and it was he who directed our attention to it. The chief point of interest concerning this nest was the location. The eggs were in the usual depression in the ground closely surrounded by broken bits of glass, old bottles and other debris. In spite of their position, the eggs, with their dark mottling, harmonized so closely with their variegated surroundings that they were invisible until they were closely approached.

On May 20, another Killdeer's nest was found at the same lake but on a gravel beach. This nest had nothing but sand and gravel for a background and the little, flat stones that had settled down into the bottom of the nest made a pleasing mosaic pattern for the eggs to rest upon. The mottled eggs, against the intermingling hues of the tiny pebbles, made a combination in which nature showed beautiful handiwork. The eggs harmonized into that



KILLDEER AUK ON ROOF OF BUILDING.

background of sand and stones more closely than human hands could have accomplished by careful arrangement. This nest is interesting mainly because the writer was fortunate enough to see, and to secure photographs of, the four young birds before they left the nest.

On April 14, a party of engineers, who were surveying the State Fair Grounds just north of Lincoln, reported a Killdeer's nest on the race track grandstand. Dr. R. H. Wolcott of the Department of Zoology, of the University of Nebraska, to whom the report had been made, hastened to the Fair Grounds the following morning, but the nest had been destroyed and the eggs scattered for some distance over the roof. One egg was, he states, fully seventy-five feet from the site of the nest. The reason for this destruction is not known unless the wind can be held accountable.

While on the roof, Dr. Wolcott noted that a number of depressions had been made in the coarse gravel covering. This indicated that the bird had either nested there in previous seasons or had experimented considerably before the final nesting site had been chosen.

The roof was not visited again for several weeks, but on May 4, while in the vicinity, Dr. Wolcott and I climbed upon the roof to see if the Killdeers had renested. No bird was seen nor were any eggs located although the evidences of previous nesting sites were observed. Thinking that the bird had abandoned the location we clambered down and were just leaving when the Killdeer was noted coming onto the roof. We crept back very cautiously and saw the bird just as she was slipping off the nest. She flew off over the edge of the roof as soon as we had pulled ourselves up through the trap.

The nest was located in the portion of the roof which we had looked over only casually before, since it was on the opposite end from that occupied by the previous nest. That explains, perhaps, why we did not see it upon our first examination though, considering the wonderful blending of the eggs with the coloration of the roof, our oversight could easily be excused.

The grandstand is a very large structure, approximately 400 feet long by 80 feet wide. The roof is about fifty feet above the foundation and has a very gentle slope. The covering of the roof is

composed of a tarred paper heavily weighted with crushed stone. It was in a depression worked out in this rock covering that the nest was located. The trap that gives access to the roof is about in the center of the lower edge and therefore about 150 feet from the Killdeer's nest. The position of the trap is important for from this many observations and calculations were made.

The following day, May 5, the nest was visited. The eggs had been moved slightly in the intervening time and one of them was lying with its point away from the center. Subsequent observations and sketches showed not only that the eggs were moved every twenty-four hours between 11:30 A. M. and 3:00 P. M. but that it was not at all unusual to find them with their points to one side or away from the center of the nest. (see p. 495)

This day the trap in the roof had been approached very carefully and the bird was discovered just as she was leaving the nest. She slipped off and ran to the northeast corner of the roof and disappeared over the edge just as we came up through the trap. While we were photographing the nest the bird returned to the opposite end of the roof and teetered softly. She allowed my friend and myself to approach within a few feet this time before flying. After she was flushed she described a large semicircle back to the end of the roof where the nest was located. We returned to the nest to sketch the position of the eggs and the bird retreated to the end of the roof without flying.

After sketching we took up a position about fifty feet distant. With extreme care and caution the Killdeer maneuvered toward the nest. She would zig-zag back and forth, now advancing, now retreating. At the slightest motion on our part she would crouch down and remain motionless.

While we were in that position the bird did not come entirely to the nest but when we doubled the distance between us and the eggs the bird came rapidly to the nest and after a little cautious teetering up and down settled over it, still facing in our direction. In all we watched her for about fifteen minutes from the two positions before she finally reached the nest.

The trap cover, which had been used as a tripod for the camera, was left within a few feet of the nest. Since this did not disturb the bird greatly I hoped to substitute a camera, or box which

would contain the camera, in order to obtain pictures of the bird herself. We left the roof about four o'clock.

It was not possible to visit the nest on May 6, but on May 7 I went prepared to stay throughout the day, if need be, to secure pictures of the Killdeer herself. Upon coming through the trap the Killdeer was observed sitting upon the nest. She vacated immediately and slipped off over the corner as before when I approached.

The trap cover, which had been left near the eggs, was utilized to brace the camera and a burlap sack was placed over the machine and liberally sprinkled with pebbles from the roof. (Later experiences showed, however, that this caution and elaborate preparation were entirely unnecessary.) A thread was then stretched from the shutter release to the trap, a distance of about 150 feet.

After having stationed myself near the trap the Killdeer was noted upon the roof (the bird had not been seen returning), some fifty or sixty feet away from the nest. This bird, judging from later actions, was determined to be the male. He immediately began to go toward the nest, advancing rapidly until within a few feet. The bird seemed suspicious of the arrangement near the nest and stood teetering anxiously a rod or so away. He then described a large semicircle about the nest, investigating.

While watching this bird inspect the new arrangement I saw the mate also come and alight upon the roof near the position where the former bird had been observed. It was this second bird which finally reached the nest and covered the eggs. The Killdeer carefully faced the camera throughout. In the meantime the male had disappeared but was observed a few moments later near the end of the roof.

After the female bird had reached the nest I attempted to snap the shutter but in the operation the string broke and I was not sure that the shutter had been released. The string was repaired, the film wound and I stationed myself about midway between the nest and the trap, this time within seventy-five feet. The bird during this time had vacated the nest but had not left the roof.

To my surprise the bird came back rapidly to the nest, though I was much nearer, and covered the eggs within a very few minutes. At no time during all the observations upon the roof was any

attempt at concealment made. The roof was practically bare, excepting a few racks for light wires, and consequently one was in full view of the bird on any portion of it. Lying prone, however, did much to allay the fear of the bird.

Upon resetting the camera a second time I noticed that the bird was simulating distress. This it had not done before. It would run up within fifty or sixty feet, crouch down, spread out the tail feathers and display the rufous coloring of the rump. The wings would be drooped to one side and the whole appearance was one of helplessness and distress. This simulation was not accompanied by any fluttering or limping. The bird would teeter occasionally and wind up with a sharp "k-k-k-k-deer." This cry almost always preceded the distress simulation as well.

After having arranged the camera I stationed myself within twenty-five feet of the nest. While this close the bird would not come quite within range of the machine but ran back and forth very near, now and then crouching down, rocking back and forth, teetering.

At this time my attention was drawn to the male bird who was going through the same distress performance as that of the female though at no time did he approach so closely.

Finally I increased the distance between the nest and myself to about forty feet. Almost at once the bird came to the nest and just before she covered the eggs I snapped the camera. The bird started a little at the click but did not leave.

Six exposures were taken, in all, with the camera, at one time, within two feet of the eggs. During the last exposure I was within twenty-five feet. I left about 2:00 P. M. having spent three hours upon the roof.

May 8, 9, 10 and 11 added but little to my observations for only sufficient time to run out and sketch the nest could be spared. Each time the brooding bird would slip off, as soon as I came up through the roof, and retreat to the corner. She flew, generally, before I reached the eggs but occasionally she would run back and forth along the edge before taking flight. Once or twice on these days she returned to the roof before I left. She alighted usually about the central part of the roof and if I then came toward her she would retreat to the end opposite the nest.

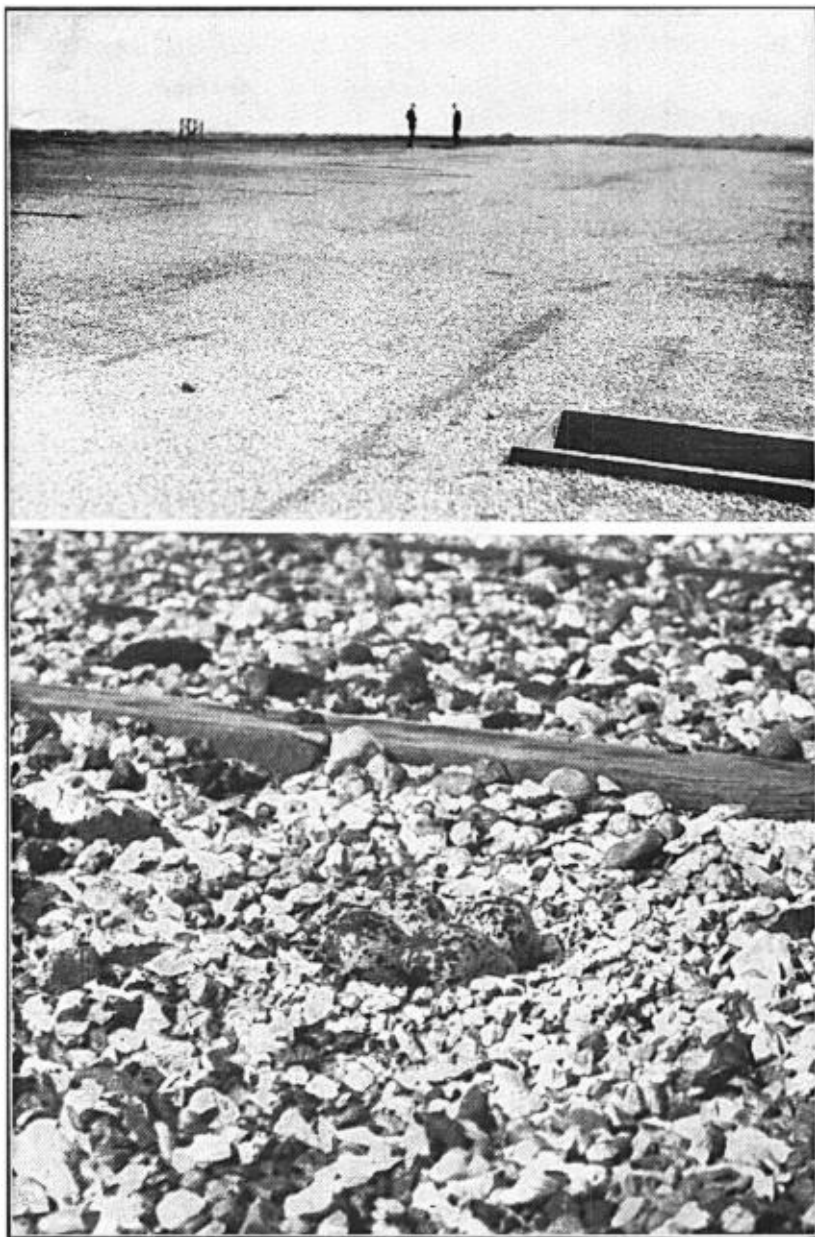
The bird returned very quickly to the nest after the observer had left the roof. On May 12, after making the usual notes, I let myself down through the trap to jot down some observations. This required less than two minutes and when I looked up again the bird was on the nest although she had not returned to the roof before I had descended.

On May 13 the roof was not visited but on the 14th extended observations were made. The Killdeer did not leave the nest this time when I looked up through the trap and she was watched for some time before she was aware of my presence. The male was on the roof too (I presume it was the male), and he ran back and forth along the east side occasionally coming close to the nest. Although the two were watched thus for over half an hour the male did not relieve the female from her duties. At no later date was I able to determine, definitely, whether the male aided the female in the business of incubation though much evidence pointed that way.

When I finally came up through the roof the female slipped off the nest as before and retreated to the northeast corner. The male remained motionless for some time near the nest. During this time he preened himself apparently oblivious to my presence. The female, in the meantime, was watching me closely. The male presently flew off to the north, for no apparent reason, but the female remained motionless upon the roof. When I approached the nest she ran nervously back and forth along the eastern edge several times and finally left just as I finished sketching.

On May 15 the results were similar to those obtained upon previous occasions. This time a possible explanation for the peculiar change in attitude of the bird during each visit came to me. Each time as we had looked up through the roof the bird had quickly slipped off the nest while the observer was still at a considerable distance, at least 150 feet. Yet if one stayed for any length of time the Killdeer would return to the nest though the observer be within twenty or thirty feet. This was a great inconsistency.

The instinct of nest concealment by furtive abandonment is exhibited by many shore birds for the eggs are all protectively colored and the nests are best hidden when uncovered. This



1. ROOF OF GRAND STAND ON WHICH KILLDEERS NESTED.
2. NEST WITH EGGS.

instinct was exhibited by the Killdeer in the most inconsistent of circumstances. The bird always, without any exception, slipped away upon our first approach. The concealing instinct (which is a secondary development of parental instinct following the acquisition, undoubtedly, of camouflaged eggs), is inhibited by that of solicitude if the bird is kept away from the eggs too long and she then returns even in the face of the first instinct and the most terrifying of circumstances. Thus, though she always left at first approach when one was over 150 feet away she would sometimes return when one was within twenty feet. Definite experiments were not made to determine how far an observer must remove himself or how long he must be concealed before a normal exhibition of these two instincts could be reobtained, but certainly the minimum time for the reassertion of the concealing instinct was not more than ten or fifteen minutes and probably much less than this.

In company with two others I visited the nest early the morning of May 16. When first observed the bird was facing toward the west, the direction of the wind and not toward the sun. (She usually faced into the wind which came very powerfully across the roof.) The bird arose from the nest while one of the party was observing it but immediately covered the eggs again when he withdrew his head within the trap. We all then climbed up and the bird slipped off as before and soon left the corner of the roof.

In keeping with that first secretive departure from the nest the Killdeer would make no sound but when forced to fly after a return she would protest with a sharp "kill-deer." The instinct first exhibited would succumb to that of solicitude for the safety of the nest in about five minutes; sometimes more, often less. When this occurred the bird would make no effort at concealment.

The nest was not visited on May 17 and, accordingly, when I set out on the afternoon of the 18th I had a strong premonition that something might have happened during my absence, for the eggs had been incubated for two weeks within our knowledge. When I looked up through the trap, therefore, I was not surprised to find that the Killdeer was not on the nest. And when I approached I found that the eggs were gone and the nest cavity partly filled with pebbles. Though the roof was searched carefully no trace of

eggs, egg shells, young birds or adults was to be found. This was a great disappointment for one of the main objects of the observations was to ascertain how the young birds were removed from the roof. The young could have remained only a few hours at most after hatching.

My attention was attracted shortly, however, to a Killdeer about fifty yards southeast of the grandstand upon the ground. The bird seemed to be wandering aimlessly about a certain area there, running rapidly a few feet, stooping, now crouching down and remaining motionless, now arising and going through the entire performance again. Presently the bird arose and flew about 150 yards northeast of the grandstand and alighted near a deserted railway. The other bird, I noticed, was near this location. Both birds seemed highly excited for they were seldom quiet for more than a few moments at a time and they kept up a persistent "killdeer" intermingled with other calls. After a moment the first bird returned to the position I had first noticed near the southeast corner of the grandstand. From these movements I decided that the young had reached the ground successfully and were still in the vicinity.

I then descended from the stand and walked over to the old track hoping to find one of the young birds there. Upon my approach the Killdeers became greatly excited and performed for me all of the antics that they had ever gone through upon the roof. In addition they flew wildly back and forth, now alighting here, now there, occasionally, spreading out the tail after alighting and uttering a low "k-k-k-k-k" which was wound up with a sharp "k-kak." For nearly two hours they continued this commotion without betraying the position of the young bird. In despair I was about to leave when my attention was called to a weak cry of the Killdeer that seemed to come from some distance behind me. Upon searching the ground under an old loading platform a short distance behind me I found a little Killdeer tottering weakly over the ground. The long wait had taxed his patience too severely and he had betrayed himself. The tremendous solicitude of the old birds was now explained: I had been within fifteen feet of the young one all the time.

Later I learned that waiting was a better method than vain

searching for the concealed young. The protective instinct will, ultimately, give way to hunger or a desire for parents and the young then will move and call a weak "killdeer" which betrays their position.

For a moment I watched the parent bird who had doubled her wailing when she saw that I had discovered her treasure. She flew now and alighted on the loading platform immediately above my head, now on the rails not ten feet away, time and again crouching down and spreading out her wings and tail feathers in a semblance of helpless distress. Her loud "killdeer" had been softened to a low, plaintive "k-k-k-k-k" and her distress was evidently very acute. The mate was not observed near at this time but was discovered a moment later at the position where the Killdeer had first been discovered. A moment later I searched this place near the stand for the other young but, though one of the adult birds was there to bewail my approach, I did not succeed in finding them.

I had believed the Killdeer story practically closed, but on May 19 while watching a Forster's Tern over a small pond about 100 yards from the grandstand a young Killdeer was seen again. This time the bird was found by searching the location where the adults were displaying the greatest solicitude. The distress of the adults was as great as it had been upon the previous occasion.

Again on May 21 the Fair Grounds were visited and to our pleasure we heard the adult birds crying about a second small pond about 150 yards from the last location but not over fifty yards from the loading platform where the young bird was first seen. After watching the adult birds for some time a young Killdeer appeared beside them on a little pile of rubbish. The old bird did not seem to heed the little one and it ran here and there beside her.

A moment later two little Killdeers were noted on the same mound. One of the parent birds in the meantime was busily feeding in the water and along the edge, picking up insects which were swallowed. At no time did the parent birds carry food to the young in their beaks. The Killdeers were observed closely for more than an hour.

Four days later, May 25, after uninterrupted rain the race track

ditch just north of the grandstand became filled with water and here we found the parent birds. This was not over 100 yards from the small pond where the birds were last seen. After a careful but fruitless search of the area we stationed ourselves where the solicitude of the adult Killdeers was greatest in an endeavor to outwait the patience of the young birds. We were soon rewarded by hearing the faint "killdee, killdee" of one of the little birds. Even then some search was necessary before the youngster was discovered, though it was not six feet from the spot where I had been standing for thirty minutes.

The bird was very small though all evidence seemed to show that it was of the grandstand clutch and it was still so weak, after eight days from hatching, that it tripped itself several times in trying to escape us. It is my belief that these birds did not reach maturity because of disease resulting from the unusual weather.

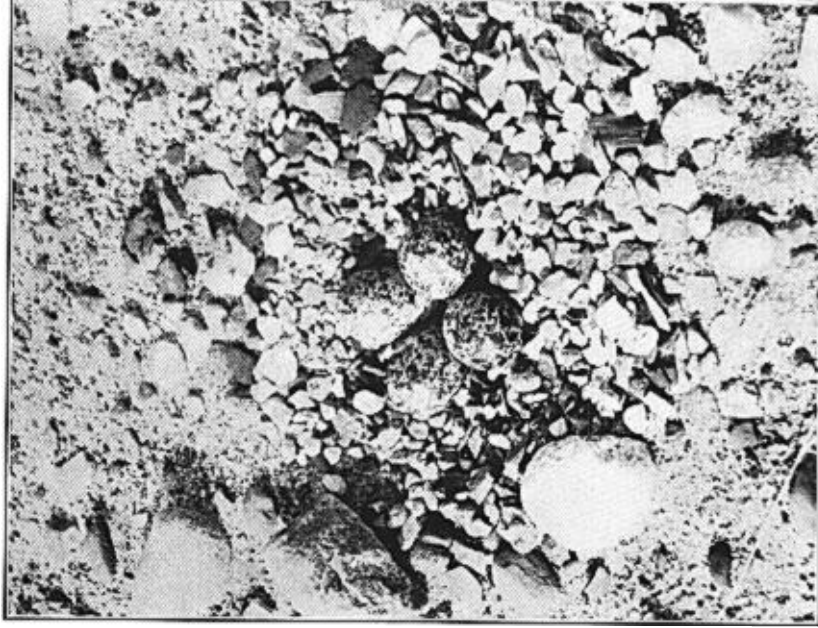
On later visits the parent birds had quitted the vicinity and the young Killdeers were never seen again.

June 11. Happening in the vicinity of the Fair Grounds this day I was persuaded to climb to the grandstand roof again to see if the Killdeer had renested. When I lifted the trap the bird was seen standing near the center of the roof. A moment later she slipped off over the edge, as was her custom, but returned almost immediately. I located the nest near the position where the bird was observed and noted that the clutch was complete and that incubation had already begun.

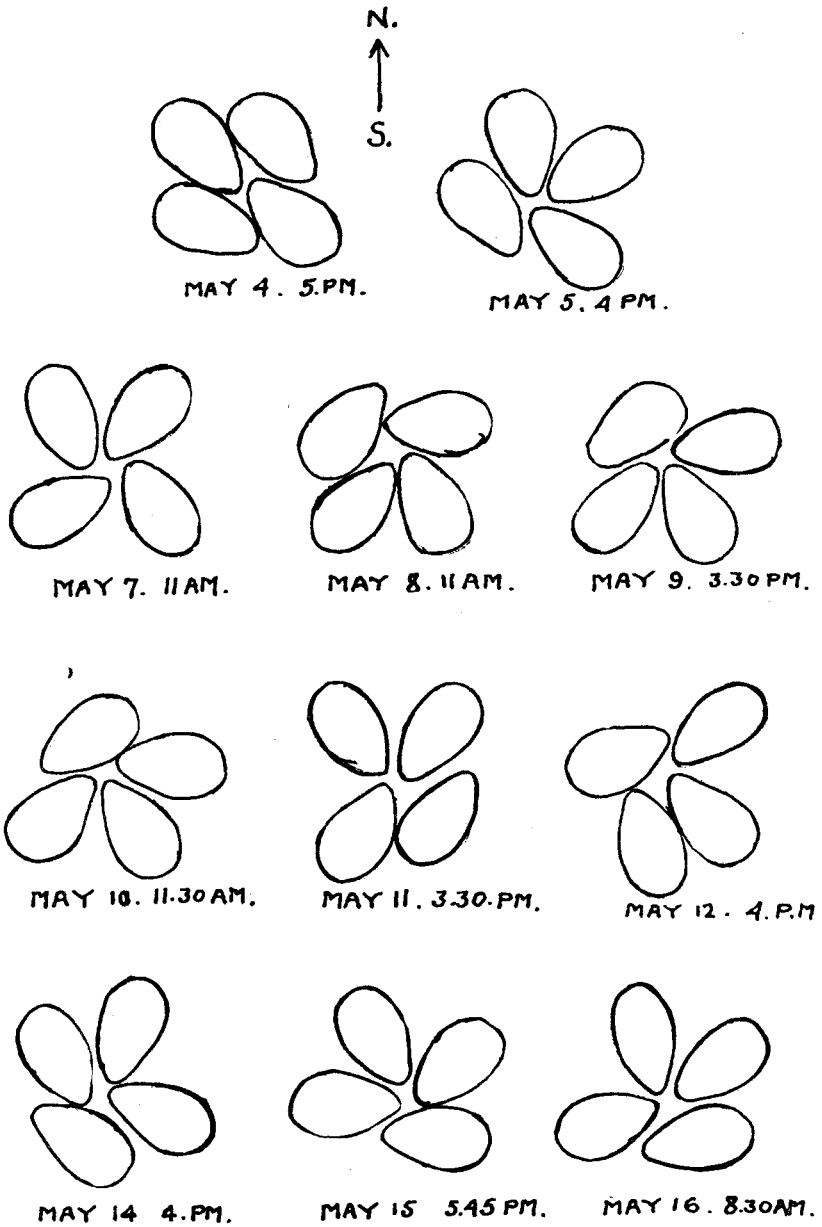
June 28. I had not had the time to spend upon this nesting that had been spent upon the others and, consequently, I was not greatly surprised to find that the Killdeers had just finished hatching. Three were yet in the nest but two left with the old bird and tottered away on insecure legs for a short distance. The third was not quite dry.

Very early on June 29, the following day, I visited the Killdeer's nest hoping to observe the manner in which the young were removed from the roof. But there were no birds, neither adults nor young, on the roof and there had been but little wind the preceding night. The adult birds were heard near the drainage ditch in the race track meadow.

The Killdeer did not nest again upon the roof during the summer



1. KILLDEERS' NEST ON PEBBLED BEACH.
2. KILLDEER'S NEST ON RUBBISH HEAP.



POSITIONS OF KILLDEER EGGS IN NEST FROM DAY TO DAY. PRIOR TO 11:30 A. M., POSITION WAS THE SAME AS AT 3 P. M. ON THE PRECEDING DAY (SEE MAY 9 AND 10, 15 AND 16), INDICATING THAT THEY WERE TURNED DAILY BETWEEN THESE HOURS.

of 1922, and, so far as can be learned, the roof was not occupied in 1923 or 1924.

SUMMARY.

1. The Killdeer, a shore bird, was found nesting, in the summer of 1922, in a rubbish heap, on a gravel beach and on a high pebbled roof.

2. The Killdeer's eggs are so colored that they have good harmonizing qualities for all of these diverse nesting sites and seemed to be equally well protected by their markings in all of them.

3. Some of the Killdeer brood were successful in reaching the ground from the roof nest.

4. It is believed that the adult carried the young down from the roof for the shallowest fall would have been more than forty-five feet and it is unlikely, though not impossible, that the young could have survived this; moreover the young were off the roof within twelve hours after each hatching.

5. The Killdeer laid at least three clutches of eggs during the season, extending from early April to the last of June, and she may have reared two broods. (It is inferred that the same pair of Killdeers were responsible for all of the nests upon the roof. This is a reasonable inference because of the unusual position of the nests and because a thorough survey of the surrounding territory showed not a single pair of Killdeers nearer than a half mile.)

6. The Killdeer displayed an invariable reaction upon the approach of an observer to the nest, viz.: The brooding bird would slip off, without a sound, at the distant approach of a stranger but if that person remained but a few minutes near the nest the bird would, inconsistently, return and betray the nest with much noise and solicitude.

7. Minor observations showed that the eggs in the nest did not always point inward; that the eggs were turned regularly between 11:30 A. M. and 3:00 P. M., see p. 495; that the male joined in with the solicitude displayed by the female but was not observed to brood.

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