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significant. Here, again, the wide variations which occurred in the original data will account for the differences not proving to be significant.

Conclusions

1. The presence of organic material in sandy soils slows down the rate of capillary rise in soil columns.
2. Calcium stearate in the soil has a similar but more pronounced effect on capillary rise than the presence of organic matter.
3. Urea shows a slight tendency to decrease the capillary rise of water in burned soil.
4. In general, the same properties which affect the movement of water in soils by capillarity also affect the rate of percolation.
5. The interfacial tension between the soil particles and the soil water is an important factor in the movement of water in soils.

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HIEMENZ'S STUDY OF THE HERON LAKE FRANKLIN'S GULL COLONY

AS REPORTED BY NESTOR M. HIEMENZ

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The Franklin's Gull has been rather extensively studied by Roberts, father of Minnesota Ornithology and reported in the Auk in 1900 and more recently in his *Birds of Minnesota.* Report of a study of this bird was also made by Bent in the U. S. Natural Museum Bulletin, 1921.

This study was made in the hope of adding to the knowledge already obtained by Roberts and Bent. Much of it will be found to be in the nature of verification of these works but additional information was also obtained as will be developed later.

A research grant was given to Hiemenz by the Minnesota Academy of Science which made possible this study of the Heron Lake colony.

I quote Hiemenz extensively throughout most of the paper.

LOCATION AND SIZE OF COLONY. The Franklin's Gulls were nesting in the area known variously as "the marsh," "Mallard Bay," and "Hanson's Bay" just east of the town of Heron Lake. In reality it was a marsh covered with sedges over much of the area, with dense stands of "white cane" (Pharagmites) in some places, and fringed along the shore with bulrushes. There was very little open water, and what there was extended a few feet outward from the

shore and in several spots within the marsh proper. The depth of the water varied from one to three feet with an average of about two feet.

The area covered by the marsh is about one and one-half square miles and of it at least one-half square mile is dotted with the nests of the Franklin's Gull. Test counts were made of measured sections to determine the actual size of the colony. A portion of the area 20 feet wide by 60 rods long contained 154 nests. This area comprised 19,800 square feet. Since an acre consists of 43,560 square feet, or 2.2 times the area measured, 338.8 nests should be contained in an acre. One-half square mile which is equal to 320 acres would contain 320 times 338.8 or 108,316 nests. The portion selected for the count contained not more than an average number of nests. Many parts of the area were much more densely covered while others were less so. Although it is difficult to comprehend such a high number of nests, actual counts served to bear out our earlier estimate of at least 100,000.

NESTS AND EGGS. Almost all of the nests were located in the sedge with only a few in the "canes." In some places the birds avoided the canes entirely and preferred to nest in the more open sedge. In certain concentrated areas it was impossible to push a small duck boat through without damaging some of the nests.

The usual nest is a fairly well made structure, built upon a floating platform about two feet across at the base. It rises cone-shaped eight to ten inches above the base or water line; the top is about six inches in diameter. Occasional nests are built exceptionally high, the top rising in one to fourteen inches above the base. As this area was well sheltered there seemed little need for these well made structures. That they were commonly found indicated their well established instinct to build good nests from their experiences near open water where wind and waves cause havoc to the structures.

The birds continually repair their nests while incubation is in progress, and it is not an uncommon sight to see a bird flying to its nest with long pieces of dead vegetation streaming back from each side of the bill. This added material is often stolen from another nest and the action usually results in an aerial combat between the two birds and often the thief is made to drop the stolen reeds. As the eggs hatch the nests fall into disrepair and soon become flattened structures, sinking almost to the water line.

The usual number of eggs was three and nests containing only one or two eggs were largely those from which young already had hatched. No sets of four eggs were seen but on one occasion four dead young were seen in one nest. There is an endless variation in the color and markings of the eggs but eggs of the same set are usually alike in ground color and in general type of markings. On two occasions eggs in one clutch were completely different even to

ground color. This may have been due to deposition by more than one female in the nest.

YOUNG. The downy young vary in shade and markings with the eggs, and like the eggs the young of a brood are alike. Two general color types prevail, a deep buffy and light gray. In several nests which held eggs and young it was noted that when the eggs were dark the young were dark and when the eggs were light the young were light.

The young are precocial. In one nest where the egg was pipped it required exactly one minute and forty-five seconds for the young to emerge from the shell. For the next thirty minutes the chick lay in the nest barely moving as it dried. It soon began to take an interest in life and started moving about exploring the recesses of its home.

Very small young do not leave the nest when frightened but prefer rather to hide in its sides, sticking their little heads under the loose material and letting their bodies protrude. After the young are a day old they readily take to the water much in the manner of young ducks. However, there is one exception, they do not dive to escape but rather try to evade the pursuer by swimming away as fast as possible. In places where the water was covered with algae the small young had difficulty in swimming but usually plodded onward until quite exhausted. The thick growth of vegetation offered many difficulties but the young gulls attempted to swim straight ahead and push their way through rather than go around the vegetation.

The young swim some distance from their home nest and usually show no inclination to return. Rather they crawl up on the nest nearest them. As they grow older they spend more time in the water where the old birds feed them, and use the nest only as a roost.

FOOD. As was reported by Roberts the food of the Gulls consisted almost entirely of insects. Birds were seen following plows, corn cultivators, and even mowing machines. In following the mowers the Gulls proved themselves very adept at catching insects on the wing. Dragon and damsel flies were the most common insects in the meadows and these made up the bulk of the food of the birds. In following corn cultivators the Gulls were seen picking up any available grubs and earthworms. That earthworms made up a considerable part of the food of the Gulls was attested to by the little storage piles of these invertebrates seen on many of the Gulls' nests. A captive Gull fed readily on any insect proffered and relished also large sphynx moths fed it.

While during the day the Gulls sought their food in the fields, the favorite feeding place toward evening was their own marsh. Here they would fly back and forth with their bills pointed downward much in the manner of Terns, hovering for a moment over

some spot and then diving head first into the water. Unlike the Terns, however, the Gulls would usually light on the water for about thirty seconds before gracefully flying up. The food consisted of insects secured just above, on, or in the water. As many thousands of Gulls were capturing insects all over the marsh this explained sufficiently why we were not bothered with the pests.

On one occasion a Gull was seen carrying a fish fully four inches long, but as fish life was very scarce at the lake they were only a minor factor in the diet. Almost every nest contained a number of small white shells for no very apparent reason. Whether they were placed there as grit or merely as ornaments could not be ascertained. Crayfish were very abundant in the marsh but they did not seem to enter into the Gulls' diet. That this huge colony represented all the Gulls from a large area was attested to by the distance the birds flew to secure food. On one occasion these birds were seen fully twenty miles from home and as individuals were observed all of the way enroute they evidently came from this one colony.

BEHAVIOR. As one approaches "the marsh" all that can be heard is a continual chatter from the throats of thousands of Gulls. When one walks along the shore even quite a distance from the nests an individual Gull will fly overhead calling and soon will be joined by others. As soon as a person pushes off from the shore in a boat a particular Gull becomes unusually interested. It seems to be the sentinel that warns the rest of the colony. This individual continues to fly overhead calling angrily even though the nests are some distance off. At all times there was a group of loiterers on the shore and this group, numbering about a thousand individuals, was the first to heed the leader's call. The group was comprised mainly of immature one year old birds with mottled heads (later this group of immatures left the vicinity and may have composed part of the group of three thousand seen at Spirit Lake, Iowa, on June 30). This large group of birds flew around overhead very mildly interested, seemingly curious. For the most part they were quiet and only the sentinel would continue to voice his disapproval of the intrusion. About one hundred feet before the first nest was reached all the Gulls in the vicinity left their nests and joined others flying about overhead. As the boat moved forward more birds flew up and the clamor increased. Many thousands of Gulls were in the air at the same time. Usually about half of the birds flew around the boat one way and the rest the other. Sometimes when they passed too close they fought for an instant and then flew on. The birds chattered incessantly and at times flew very close to the observers' heads, sometimes only two or three feet away. These angry individuals were usually the owners of the nests nearest the observers. The Forster's Terns continued to fly about with the Gulls but usually remained high in the air. Some birds continually dropped back to their nests as soon as the observers had passed. In mid-afternoon

when the sun was hottest the birds returned to their nests earlier than at any other time.

A certain group of birds followed us wherever we went although some individuals dropped back to their nests. This group may have been composed of males as the females were probably busy incubating. Usually there were several immatures in this group. They were not nearly so pugnacious as the adults but seemed to be caught in the maelstrom of birds flying about. One wondered how such a vast concourse of birds could fly, some clockwise and some counter-clockwise, without colliding although at times they barely did avoid each other. When the observers ceased to move around more Gulls dropped down to their nests. Some of them rose immediately, however, while others remained. Often two Gulls could be seen on one nest which indicated that both parents were present. Occasionally a bird would scratch its bill with its feet while it was flying. At times birds would be seen flying around with their legs dangling. In flight the tail is usually carried spread and when the bird dives at an intruder it is spread to its fullest extent. When the birds light they extend their legs downward and raise their wings high overhead, dropping lightly to their nests.

Some adults spend the greater part of the day sitting in large groups on the shore or in fields apparently just resting. Others fly to and from the nesting area at all times during the day. They come in on set wings from high in the air, dropping down gracefully and joining the group flying about. Some individuals seemingly unmindful of cries from these groups sailed directly to their nests in other parts of the colony.

The rosy tint of the underparts, a commonly recorded flesh color, was not evident on them in bright light even at close range through high-powered binoculars. The rosy hue, however, was very evident at dusk, that is eight P. M. on a June day.

MORTALITY. The greatest enemy of the Gulls appeared to be the mink. "The marsh" is a favorite haunt of these ruthless killers and the havoc wrought by them was very great. A mink home found in the Gull colony on June 25 held four young about a month old. The home of the mink was a former Gull nest and in the debris around it there were wings and feet of about twenty-seven young Gulls. The Gull nests in the vicinity all told a tale of wanton destruction. Forty-one nests were examined with the following results:

> Twenty-one nests were empty; in each case the nests were torn up indicating a struggle. A hole in the side of each nest showed how the mink entered. Addled or broken eggs were found in the water beside or under all of these nests. Five nests held three dead young each, one nest held two large dead young, and four nests held one broken egg and one dead young each. There were dead adults on or beside four of the nests. No live young were seen in this area!

Although this stretch of the marsh suffered most, depredations by mink were noted throughout the entire nesting area indicating that there were more mink present. Two crippled adults, each with a broken wing, were captured. They evidently had managed to escape the mink. Even though this colony of Gulls numbered many thousands it was evident that it could not continue to thrive with mink in its midst.

On two occasions large Ribbon Garter Snakes were noted far from the shore, on Gulls' nests, containing young. Both snakes escaped before we were able to capture them. The abundance of snakes in the vicinity would seem to indicate that they might be factors in the taking of the very small young.

Crows were present in small numbers in the groves surrounding the marsh but no crows were seen flying above the nesting area. No hawks of any species were seen about the marsh although a sharp-shinned hawk was seen in a grove of trees bordering the marsh.

Rain and extreme heat were important factors in causing the death of the young. After several heavy rains many young were found dead in their nests. Whether the adults were not on the nests or were unable to fully shelter the young was not ascertained. Very small young were affected by the extreme heat as the sun beat down mercilessly on them in the absence of the adults. It was noted that during the hottest part of the day the adults seemed most anxious to return to their nests.

RELATIONSHIPS WITH OTHER BIRDS. As far as could be ascertained the Gulls lived peaceably with all of the various other species of birds found in the vicinity. Coots, ducks, blackbirds, Black and Forster's Terns, and Pied-billed Grebes were found nesting among the Gulls, but no signs of conflict were in evidence. The Forster's Terns nested in small colonies scattered throughout "the marsh" and whenever we approached the gull colony they were the first to fly about us. The Terns were more pugnacious than the Gulls especially when we were near their nests.

A Pied-billed Grebe's egg was found in an empty Gull's nest and another in a nearby empty Forster's Tern's nest on June 2. The fact that the eggs were whole and that there was a Pied-billed Grebe's nest close by indicated that the Grebe deposited its eggs in the other birds' nests.

The only conflict noted was between individual Gulls and not between Gulls and the other species of birds found in the vicinity.

We took actual counts of all of the nests and their contents in various areas of the marsh. By this sampling method we were able to check the actual conditions existing for the colony as a whole. It will be noted from Table I that incubation was far advanced when the study was begun. The percentage of empty nests increased from day to day until July 2 when practically all of the nests were empty. Different groups of nests of the area were studied each day, the

total number being 1,551. Had the investigator reported the number of unoccupied nests each day for a given number of nests, the percentages in the last column would show the progressive rate of incubation more clearly.

TABLE I. PROGRESSIVE RATE OF INCUBATION

Date	Number of Nests	Number of Nests Previously Occupied	Number of Occupied Nests (with Eggs or Young)	Per Cent of Previously Occupied Nests
June 22	311	216	95	69.4
June 23	512	264	248	51.5
June 25	157	75	82	47.7
June 26	14	7	7	50.0
June 27	59	40	19	67.8
June 29	111	70	41	63.1
June 30	73	71	2	97.3
July 1	308	273	35	88.6
July 2	6	5	1	83.3

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GEORGE H. PRIMMER
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REV. HENRY RETZEK
West Union

A THYROID STIMULATING SUBSTANCE FROM THE PROSTATE GLAND

B. H. KETTELKAMP
State Teachers College, River Falls, Wisconsin

CULTURAL PRACTISES AND CHEMICAL TREATMENTS IN RELATION TO WEED CONTROL

LEONARD M. STAHLER
Bureau of Plant Industry, U.S.D.A.