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THE FLORIDA GALLINULE BREEDING BIRDS OF THE PHILADELPHIA REGION (Part III)

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This is my third paper on the Breeding Birds of the Philadelphia Region. The other treatises on the Pied-billed Grebe and the Great Blue Heron were published in *Cassinia*, 1942, p. 22; 1943, p. 1.

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FLORIDA GALLINULE

Gallinula chloropus cachinnans Bangs

Local Names.—Commonly known as Mud Hen, Water Hen, or Marsh Hen. Mud Hen is its universal name. It is practically unknown as Gallinule, except by ornithologists. Sometimes qualified, though rarely, as Red-billed Marsh Hen to distinguish it from the Coot, which is commonly called Chicken-billed Duck or Blue Nancy. Burns mentions Wild Hen and Blue Rail (Birds Chester Co.). Although the latter is a common appellation in the south, I have never heard it so called in our area. Spinner mentions Indian Hen for the Bombay Hook, Del. region. It has been appropriately called Moorhen by Englishmen.

In Trumbull's "Names and Portraits of Birds," 1888, is a list of 20 vernacular names; and it is known by as many others throughout its range in eastern North America.

The word Gallinule means little hen, which seems an appropriate name, as it has a large vocabulary of hen-like cries, cackles, clucks, etc.

HISTORY

The Florida Gallinule is said, by the old ornithologists, to have escaped notice on account of its secretiveness; and yet, it is the nosiest of the rails, and, excepting the Coot, the most conspicuous. It is also the least nocturnal.

The Florida Gallinule was virtually unknown to the older ornithologists. They regarded it as a rare transient, and there are only two records of its breeding in our area prior to the time when I found it nesting at Bridesburg, Pa., viz. Trenton, N. J., July, 1866 (Abbott, *Birds of N. J.*, 1866) and Odessa, Del., July 5, 1902, adult and 4 very small young (Pennock and Rhoads, *Birds of Del.*, April 1905, p. 199). Neither Wilson nor Audubon ever saw the bird in our region. Old time gunners rarely shot it. Woolman tells me that his father occasionally shot it over 80 years ago in the fall gunning season. The late Edwin C. Axe, a well-known Frankford, Phila. taxidermist and ardent hunter, who shot reed and rail birds annually for 50 years, prior to 1914, never saw it nor had one brought to his shop to be mounted. It was never seen in the glass cases of stuffed birds that graced the parlors of our grandparents. In 1906, two years after I found it nesting at Richmond, it was found breeding commonly in the fresh water cattail marshes along the Hackensack River at Newark, N. J. by C. G. Abbott, Hann and Callender (*Auk*, Jan. 1907, p. 1).

The existence of the Florida Gallinule in the Philadelphia area was unknown until 1904, when I found it nesting in a deep water cattail marsh of about 30 acres at Richmond, in the northeastern section of the city, along the Delaware River. As in all such discoveries, the detection of the birds was purely accidental. My first acquaintance with the bird was on June 1, of that year, while marsh-nest hunting, when I suddenly flushed a bird from a patch of tules. Two weeks later, I found a nest with ten eggs, which was, to my knowledge, the first authentic nesting record for southeastern Penna. Subsequent explorations of the marsh, during that same year, revealed just one nesting pair. At that time, this marsh was the only one, in Philadelphia, suitable for breeding purposes.

In 1905 and 1906, three pairs bred in this marsh; and by 1912 these increased to 12 pairs. In the meantime, this marsh was annually decreasing in size. A city dumping operation was gradually filling it in. By 1913, only one pair was left, and it continued to breed until 1915, when the marsh area became completely buried in trash.

About the year 1910, the meadows farther up the river from Richmond at Bridesburg had been changing in environment. Farm and meadow land disappeared, and grasses, sedges and rushes took possession. In the ditches which drained the area, the growth of spatterdock, arrow-arum and wild-rice plants increased. These conditions persisted for over a decade. The cattails, at that time occurred sparingly in small clumps. The sluices along the dike

were neglected and therefore clogged up. As the water deepened, the cattails grew into dense thickets and eventually took possession of the area. Inside of 20 years, the tules were the dominant vegetation. Their rapid growth wiped out all other plant life.

Before the tules took possession, the Swamp Sparrow was a common breeding bird. It nested in the sedges, rushes, and goldenrod plants, which were common on the meadows at that time; but, with the change of environment, it practically disappeared and was replaced by the Long-billed Marsh Wren. These two species are merely mentioned to show how a change in environment can affect the status of two small birds, and at the same time create a habitat for the Florida Gallinule.

ECOLOGICAL HISTORY OF THE TINICUM MARSHES

On June 7, 1916, McMullen and I found our first Florida Gallinule nest in the Tinicum marshes. It contained 9 eggs and was the first nesting record for Delaware County. On July 1, near the first nest, we found another with 10 eggs in it. At this time, just when it was becoming established as a breeder in this locality, the Federal Government, in 1917, during World War I, drained the entire region. About 10 years later, through neglect to keep the ditches and sluices open, the meadows reverted to their former condition, and the Gallinule came back with the return of cattails and deep water.

The above two nests were built in tussocks of Soft Rush (*Juncus effusus*). They grew with numerous others in a thin patch of cattails and were over water about one foot deep. Before and casually thereafter the cattails became dominant on these meadows, many Gallinules built their nests in tussocks of the Soft Rush as well as in those of the Wool Sedge (*Scirpus cyperinus*).

Many years ago, prior to 1912, before squatters farmed the meadows, the commonest plants in the region were these two species of tussocks. *Juncus effusus* was the commonest, sometimes occurring in dense growths of many acres. The farmers hoed out practically all of these tussocks and tilled the land for several years; then, piggeries sprung up and, for several years, the people of the surrounding town had to tolerate the stench. With their passing, together with the farming, the field reverted to weeds (chiefly Knotweed and Bur Marigold). The rush and sedge tussocks never returned. Subsequently, the few patches that remained were wiped out by flood.

Prior to the coming of the farmer, the Swamp Sparrow was the commonest bird on the Tinicum meadows, nesting by the thousands, mostly in the tussocks of the Wool Sedge and the Soft Rush. Back in 1906 and 1907, I have found as many as 40 nests in less than three hours in fields of these tussocks.

By 1928, water, entering through Muskrat and Norway Rat holes burrowed into the dikes of the Delaware River and the Darby Creek, had formed pools of water and cattail thickets, and the Gallinule was a common nester on the Tinicum marshes. As the water annually deepened, the tule patches increased in size; and by 1931, it was the dominant vegetation and covered large areas.

In 1932, when breaks eventually occurred in the dikes through the intervention of the rodents, the entire Tincum area was flooded and the environment underwent a drastic change. For the next two years, the entire region was overgrown with cattails. In July, 1934, the flood was so serious that it covered the highway, trolley tracks and the railroad. All traffic was halted for over a day until the dikes were repaired.

The flood killed practically all the plant life excepting the cattail, which increased amazingly. Some of the patches were growing in water 6 feet deep and extended to a height of 8 feet above the surface. This vast inundation killed the elm grove at Lester and the hawthorne thicket along Hook Creek and nearly all the bushes, shrubbery and trees.

The Swamp and Song Sparrows practically disappeared. The few that remained during the flood years nested in elderberry bushes over the water. The Maryland Yellow-throat completely disappeared. The Yellow Warbler population decreased 80%. Red-wings were unaffected by the flood. As a paradox to the decrease of the Swamp Sparrow, the Long-billed Marsh Wren population jumped 100% with the increased growth of the tules. The flooded meadows with the extensive cattail thickets brought in Pied-billed Grebes and Coots, the latter found nesting for the first time in Delaware Co. The American and Least Bitterns, King and Virginia Rail decreased. The Sora, always a rare bird here, disappeared. A pair of Ospreys were attracted by the flood. They built a nest in July-August 1933, 50 ft. up in a dead elm tree. In early May, 1934, they laid a clutch of eggs, but, unfortunately, the nest was blown down. It was the first time in over a century that the Osprey nested at Philadelphia. The birds disappeared after they lost their nest. The rookery of Green Herons that bred in the hawthorne trees completely disappeared two years after the trees had died.

In order to give some sort of idea how common the Florida Gallinule was at Tincum in 1934 during the flood year, Reimann found 16 nests on June 9 in a four acre cattail marsh between Darby and Hook Creek, where, subsequently, we found many others. On July 23, in another cattail marsh of about the same size, near the Rifle Range, I examined 16 nests containing 1 to 7 eggs. On May 14, 1935 at Tincum, Pa., I was surprised at the paucity of Gallinules. There was hardly any deep water in the marshes because the dikes had been repaired and the water receded, whereas in 1934 the birds were common when the meadows were flooded. On May 17, 1934, I examined 8 nests containing from 3 to 15 eggs in a cattail marsh. A year later there was not a single bird nesting in it as the marsh was absolutely dry.

HABITAT

General Haunts.—With the exception of the Coot, which is more duck-like in its habits, the Florida Gallinule is the most aquatic of the rails. It requires deep water and a thick coverage of vegetation, preferably cattails, with open spaces of water scattered throughout the marshes. Both of these condi-

tions are necessary for nesting and concealment. Unlike the true rails, which seldom swim, it spends most of its time upon the water. It is rarely seen on land and always in close proximity to marshes. Reimann tells me that he has often seen the European Moorhen, a close relative to our Florida Gallinule, running about in fields and meadows in England, feeding on worms and insects. Herholdt reports that he found the Gallinule around fresh water wells on the salt marshes, and in the salt marsh at Bombay Hook, Del. (Spinner).

Breeding Haunts.—Water is an important factor in the distribution of the Florida Gallinule. It will not nest in dry marshes or open tidewater areas where the water drains off each time the tide falls, but it prefers deep water and, especially, cattail marshes. However, they will nest in other kinds of growth if clumps of cattail are present near the nesting site. The cattail is an essential vegetational requirement.

Before the Bridesburg meadows reverted to cattail marshes, when only scattered clumps of this tule occurred there, the Gallinule nested in patches of Calamus (*Acorus calamus*) and in Arrow-arum (*Peltandria virginica*). At Tincum, where the conditions were the same, it often nested in tussocks of rushes (*Juncus effusus*) and sedges (*Scirpus cyperinus*) and in Calamus. At the present day the Paulsboro gallinules nest in *Peltandria* plants, as there is only a small fringe of cattails on the western side of the marsh. The size of its habitat has the range of from an acre at a cattail marsh at Richmond to tule marshes of 100 acres at Salem. A surprising number of gallinules can exist in a small tule marsh, as at Richmond in 1910, when 12 pairs nested in a ten acre marsh.

OCCURRENCE

January.—I have only two January records. On Jan. 5, 1939, Reimann saw 4 birds in the Richmond marsh, one of which I saw 10 days later on the 15th. The marsh was visited several times in February and March, but these birds could not be found.

February.—I have also but two February records. One was captured alive on Feb. 12, 1913, by my brother George at the Richmond marsh; and on Feb. 12, 1931, William Jay saw two birds in a cattail marsh at League Island. Subsequent search at these localities during the latter part of February and the month of March, failed to reveal any of these birds.

Cruickshank lists 9 winter records for the New York region on Long Island, none later than Feb. 12.

March.—I have been unable to find a March record for the Philadelphia region. There is only one for the New York region—March 29, 1932, a bird seen by Kuerzi (Cruickshank). Because of the lateness of the date, the latter record may have been that of an early migrant. Hickey rightly insinuates, in my opinion, that "the absence of birds subsequent to Feb. 12, is proof that it can not over winter in our latitude, except under the most extraordinary conditions."

April.—Migration is in full swing, and, probably by the end of the month, most of our nesting birds are back. My earliest record is April 13 at Richmond, where I have noted it at this date on three different years, viz. 7 birds in 1932, and one bird each in 1933 and 1935. Our earliest record is April 5, 1932, when 4 birds were seen at Delaware City, Del. by John T. Emlen, Jr. (Cassinia, 1936, p. 46). There is an April 2, 1927 record for the New York region by Hickey (Abs. Proc. Linn. Soc., 1930, p. 37).

The largest number I have ever seen at one locality in April was 18 birds at Delaware City, on April 15, 1938. Until the coming of the Gallinule in spring, the April marshes are quiet, except for the ditty of the Song Sparrow, the *o-karee* of the Red-wing and the frog chorus.

By deducting the incubation period of highly incubated eggs found in mid-May and computing backwards, I find that many Gallinules have commenced nesting as early as April 25.

May.—Practically all of the birds have eggs, and, by the last week of this month, the earlier layers already have chicks out of the nest. There seems to be very few unmated birds. Stragglers are seen well into the middle of the month at some breeding localities.

Cadbury has seen 47 birds in one locality, from Delaware City to Port Penn on May 21, 1939, and on May 10, 1942, he has seen a group of 15 birds at Delaware City.

June.—Probably all of the first broods are hatched before the end of this month. We have no definite inland nesting record of the gallinule in our region, but there are two potential ones judging from the dates, viz., adult presence at Peter's Creek, Ontelaunee, Berks Co., Pa., on June 2, 1945 (Poole), and at Moselem, Pa., on July 14, 1928 by N. Nunnemacher and R. Rollman (Poole).

July.—Many birds are still nesting, as I have found eggs as late as July 22, 1922, which were only slightly incubated. A large increase of chicks occur on the marshes before the end of the month. It is usually in July when we see the young of the first brood feeding the chicks of the second brood.

The largest number I have ever seen in one locality in July was 50 birds at Tincum on July 23, 1934, when the meadows were flooded and when hundreds of birds nested there.

August.—Larger numbers of pullets and less of chicks from late hatchings are seen this month. At Richmond, on Aug. 20, 1927, I saw three broods of 2-2-3 chicks, none over a week old, with their parents. It is in August also, when young of two broods are frequently seen associated together. The highest number I have seen in one locality in August was 30 birds, young and old, at Richmond, on Aug. 18, 1939. Spinner reports having seen 80 birds on a 100 acre fresh water pool at Bombay Hook, Del., in Aug. 1946.

By mid-August, Gallinules begin to migrate, hence we find that some birds are reported seen away from their nesting ground, as at West Chester, Pa., Aug. 14, 1917 (Elinger) (Cassinia, 1917, p. 47).

There is a paucity of post-breeding season habits of the Florida Gallinule.

September.—This month finds the migration in full swing, although there are many young birds unable to fly. On September 19, 1927, at Richmond, I saw a chick as large as a Catbird and on September 22, 1943, Potter saw two half-grown young with two adults on Mannington Creek, N. J.

My largest count in one locality is 31 adults and young at Richmond on Sept. 3, 1939.

October.—By mid-October, the marshes are almost depleted of birds, very few lingering until the last of the month. I have seen it three times on Oct. 31; in 1927, 2 birds; in 1941, 5 birds; and in 1942, 5 birds, all three records at Richmond. It has been seen as late as Oct. 27, 1935 (Stone), and Oct. 27, 1938 (Carson and Hess) at Cape May Point; and Oct. 27, 1941 at Marshalltown, N. J. (Potter).

On Oct. 8, 1933, at Richmond, I saw two chicks as large as Catbirds with their parents, and on Oct. 9, 1945, in the same marsh, two half grown young.

The largest number I have ever seen in one locality in this month is 12 birds at Richmond on Oct. 5, 1938.

November.—I have seen the gallinule 9 times in November, one bird on Nov. 16, 1906 and 2 birds on Nov. 10, 1939. There were never more than two birds in all of these records at Richmond.

Cooke (Dist. and Migration of N. American Rails, p. 41) mentions two November Records for Canada; the latest one was Nov. 18, 1888, at Halifax, N. S.

December.—On Dec. 17, 1910, a bird was found dead in the Richmond marsh by George Petrick. The writer saw one bird at Richmond on Dec. 1, 1931. On Dec. 24, 1938, Reimann saw 2 birds at the same marsh, and I subsequently saw one of these birds one week later on the 31st.

It is my opinion that most of these winter records are wounded individuals unable to fly. The bird that Petrick found dead contained several pieces of shot lodged in the muscles of its wings; and the bird that my brother George captured alive was likewise a wounded individual, and had a no. 6 shot lodged in the muscles of its right wing. The stomach contents of both of these birds consisted of fine sand and gravel, and a greenish liquid which was also present in the intestines. Petrick's bird was frozen to death. It was a juvenile and, when found, it was squatted down beside a muskrat house, apparently asleep with its head over on its back.

Occurrences away from Usual Haunts.—During the spring migration the Florida Gallinule has been found in many unusual places, viz.

On April 21, 1905, a man captured one in a concrete mixing box at Clearfield and Cedar St., in a built-up section of the city, less than one-quarter mile from the Richmond marsh.

In the spring of 1912, a milkman gave Potter a live bird with an injured wing which he picked up in a city street. A male found dead on May 4, 1912, at Moorestown, N. J. (Mickle, Cassinia, 1912, p. 46). One found dead in May,

1917, at Haddonfield, N. J. (Rhoads, *Ibid.* 1917, p. 47). One came aboard Five Fathom Lightship off Cape May on May 18, 1924. (*Ibid.* 1924, p. 45). A dead bird found at Salem, N. J. on May 30, 1943 on the highway north of Fenwick Creek by Miller and Jacobs. After the hurricane of Sept. 17, 1944, a live bird was picked up on the beach at Barnegat, N. J. by Miller and Newman. It was photographed and released. Goldstein saw a bird just off a highway some distance from a marsh at Delaware City. Potter gave me the only authentic record of a bird seen on salt water. On Oct. 31, 1937, at Peermont, N. J., Lee Edwards showed him a Florida Gallinule swimming in the surf. It was a calm day with little wind.

Breeding Localities.—The Florida Gallinule has been found breeding in the following localities in our area.

<i>Locality</i>	<i>First Breeding record and data</i>
PENNSYLVANIA	
Richmond, Philadelphia	June 14, 1904, 10 eggs
Tinicum, Delaware Co.	June 7, 1916, 9 eggs
League Island, Philadelphia	June 20, 1929, 6 eggs
Penn Manor, Bucks Co.	May 1943, nest (Ashton)
NEW JERSEY	
Mannington Tp., Salem Co.	June 4, 1922, 5 eggs
Hook's Bridge, Salem Co.	June 16, 1932, 4 chicks (Miller, Kessler & Reimann)
Riggin's Ditch, Cumberland Co.	Aug. 18, 1933, several families seen by Stone and Potter (Stone, <i>Birds of Old Cape May</i> , p. 350)
Camden, Camden Co.	May 25, 1935, 11 eggs (<i>Ibid.</i>)
Maurice River, Cumberland Co.	June 16, 1932, nesting (Prince) (<i>Cassinia</i> , 1932, p. 46)
Paulsboro, Gloucester Co.	June 12, 1938, 8 chicks
Westville, Gloucester Co.	July 13, 1941, 2 young (Manners)
Brooklawn, Gloucester Co.	May 31, 1943, 9 eggs (Manners)
Fenwick Creek, Salem Co.	June 27, 1944, 4 downy young (Potter)
DELAWARE	
Odessa, New Castle Co.	July 5, 1902, adult and 4 very small young (Pennock and Rhoads, <i>Birds of Delaware</i> , Auk, April, 1905, p. 199)
Wilmington, New Castle Co.	May 30, 1929, 15 eggs (Carter)
Bombay Hook, Kent Co.	
NESTING	

The Florida Gallinule is an early breeder. It arrives in April, generally after the middle of the month and before the vegetation, usually cattails, has reached a height sufficient to afford concealment. It commences nest building as soon as the vegetation is high enough to build in. Some of the early nests are only partly concealed.

The enclosed table correlating the spring arrival of the bird with data on the nest when found together with the state of incubation will indicate how early some of them nest after they are first observed. The period of incubation in each of these clutches was approximately 15 days. Therefore, the date of

clutch completion was approximately 15 days before the date the nest was found. Reasoning that one egg was laid daily in regular sequence until the clutch was completed, we can estimate the approximate date of nest completion by subtracting the number of eggs from the date of clutch completion.

Considering the date the bird was first observed, these suppositions tend to prove that the gallinule loses little time in beginning to nest once it reaches its breeding locality. In nest no. 2 the bird was observed 2 days later than the estimated date of nest completion which is possible due to the secretive habits of the bird.

	<i>Date Bird First Noted</i>	<i>Date Nest First Noted</i>	<i>Contents of Nest</i>	<i>(Estimated) Date Clutch Completion</i>	<i>(Estimated) Date Nest Completion</i>
1.	Apr. 21, 1905	May 31,	12 eggs highly incubated	May 16	May 4
2.	Apr. 27, 1906	May 22,	12 eggs highly incubated	May 7	April 25
3.	Apr. 28, 1907	May 29,	14 eggs highly incubated	May 14	April 30
4.	Apr. 25, 1908	May 27,	11 eggs highly incubated	May 12	May 1
5.	Apr. 16, 1909	May 22,	13 eggs highly incubated	May 7	April 24
6.	Apr. 21, 1910	May 26,	9 eggs highly incubated	May 11	May 2
7.	Apr. 25, 1911	May 31,	10 eggs highly incubated	May 16	May 6

When nesting in tussocks, there is always a coverage of tules close by. I never found a nest in a solitary sedge tussock away from patches of cattails. Many arrow arum nests, however, were many yards from tule patches, but always in dense growths of these plants. Nests are sometimes built within 2 or 3 feet of muskrat houses in tule marshes, but I have no evidence to prove that this rodent ever molested them or robbed their nests. However, I have found droppings of the muskrat on the sham nests indicating that they were feeding or resting there. The interval between nest completion and laying sometimes varies a day or two. Sometimes it postpones nest-building until the eleventh hour, and lays in partially built nests and completing them before the full set has been laid. Very little time elapses after the arrival of the birds in spring, until they begin nesting. Sometimes they add material to the nest during the egg-laying period. Nest building is performed by both sexes, both parents incubating and caring for the young.

Eggs.—The eggs of the Florida Gallinule and the King Rail are usually described as so greatly resembling each other that it is almost impossible to distinguish them. As a matter of fact, the eggs of the former species, are

slightly larger in size and the ground color is noticeably darker with markings of a darker coloration. The ground color is usually a wood brown or a pinkish buff, whereas those of the King Rail, white or a creamy white. The markings are always well scattered over the entire shell in splotches, spots and minute specks of ecro-drab, lavender-grey, and chestnut brown of equal distribution. The eggs vary in shape from ovate to elongate and vary in size from 1.65 to 2.10 in. long by 1.20 to 1.36 in. broad. Average size—1.85 in. x 1.25 in. They are usually confounded with the eggs of the Coot which are clayey-white always dotted over with specks of dark brown and a blackish color.

Eggs—8 to 15, usually 9 or 10, rarely more. One record each of 15 and 18 eggs and 2 records of 17.

Earliest date—May 10, 1935, 9 slightly incubated eggs, Mannington Twp., Salem Co., N. J. (F. B. Philipp).

Latest date—July 22, 1922, 10 slightly incubated eggs, Richmond Marsh.

Average date—May 22.

The Gallinule is also a prolific layer. I once robbed a pair 3 times in 1908, just to ascertain how often they would lay. On May 27, June 12 and July 10 I took from their nest clutches of 9, 9, and 18 eggs respectively and have no doubt that they had another clutch in August. The large clutch was probably the product of two females as the birds occasionally lay in each other's nests.

Nest.—The Florida Gallinule nest is always built upon or over water varying in depth from several inches to as much as four feet, whether nesting in cattails, sedges, or any other kind of vegetation. Nests are usually built upon the surface, but elevated nests are constructed anywhere from several inches to as high as three feet above the water in thick tules. These nests have a platform of bent down tule blades woven together as a foundation to which the nest is interwoven. They are usually well built structures and are frequently arched over with tule blades. The few nests I have seen built over mud were originally built over water which had receded as the marsh dried up. Nests built in tussocks (*Scirpus cyperinus* and *Juncus effusus*) are invariably smaller than tule built nests, but those constructed in arrow arum and calmus plants are almost as large. Sedge built nests are usually made of dried sedge blades; those in tules, calmus and arrow arum are chiefly of dried tule blades. The nests are deeply saucered structures of coarse dried tule blades lined with broken dried pieces of tule. Late in the season, dead heads of typha have been used. They are usually well constructed, shapely and well built. Many have runways or ramps a foot or more long on one side to enable the bird to enter it. An average sized nest measures 12 inches across the top and 5 inches inside. It is 8 in. thick, with an inside depth of 3 in. They vary greatly in size but very little in inside depth. Nests built upon water range in height from 3 to 6 in. above the surface and 2 to 4 inches underneath. All the tule nests I have seen have been loosely attached to upright stalks and blades well anchored and incapable of floating away but able to rise up and down with changes in the tide or a sudden rise of water after a heavy rain.

Of the 267 nests I have examined, 75% of them have been built in cattails, mostly in the broad-leaved species. 15% were in tussocks of the species mentioned above, 5% were in arrow arum plants, and 5% were in calamus.

Locational Preference of Nest in Breeding Area.—Scattered in tule marshes are tiny islets from 12 in. to 30 in. or more in diameter, separated from the denser growth of tules, in which the Gallinule occasionally builds its nests where they stand out conspicuously. Sham nests are usually slovenly built, and are always near the used nest. They are usually smaller, flatter, and shallower and are used by the parents and young as a roost. Sometimes sham nests are built upon a flat mass of dead vegetation and mud several inches high. They are also built beside old muskrat houses.

Incubation.—The eggs are laid daily. Sometime incubation begins with the first egg, but sometimes not until the clutch is complete. Incubation period varies from 19 to 21 days, hence, in a clutch of ten eggs, if incubation commenced with the first egg, it would be ten days or half-incubated by the time the last egg had been laid, in which case the young would hatch out at intervals of over several days up to a week. I have blown many clutches in which every egg was perfectly fresh, not a vestige of incubation in any. This conclusively proves that incubation does not always begin with the laying of the first egg, as most ornithologists contend. It is in these nests uniform in incubation that all the young hatch out inside of a day.

Broods.—The second nest is built near the first. When robbed it will build the second nest close by the first one. The interval of starting to lay after losing the first clutch is from one week to ten days.

The Middletons, at the Paulsboro marsh on Aug. 5, 1945, observed three families at one time with the young in three stages of development. One brood of 4 young was about a week old. A second brood of 3 young was about 10 days old. A third brood of 2 young was slightly over half-grown.

The Florida Gallinule is definitely a double brooded bird and it is probable that three broods may be raised in one season. When the hen loses a clutch, it will lay again in a new nest; and should that set be taken, a third clutch is deposited in another new nest. All of these nests will be built in close proximity to each other. The second and third clutches are usually smaller in number than the first one. When the hen loses her eggs, she will have had a new clutch started inside of a week to ten days afterwards.

The reproductive cycle of the Gallinule is longer than generally credited to it, and while it may vary in individuals, nature has provided the bird for such a contingency in case it loses its eggs by flood and predators. It is instinctive for the bird to raise a brood and it probably always does so whether it loses one or more clutches, as the reproductive organs retain their full vigor until late in the season, which accounts for the many broods of chicks occurring in late August and September and rarely into October.

Young—Description and Mortality.—Gallinule chicks have enormous feet, twice as large as those of the King Rail. They have no difficulty in swimming

with them. When born, like all rails, with the exception of the Coot, they are covered with fine black down and are wet and unable to stand until they have dried. They remain in the nest unless prematurely disturbed. They are usually possessed with instinctive fear as soon as they are born.

I have never seen a brood of over 8 chicks with their parents, and only once, have I seen that many. On three occasions I have seen broods of seven; once, six; and twice, five. The number of young seen with their parents, is usually three or four.

Infant mortality must exceed 40%. The average number of eggs in a set is 9, and often 10 or more eggs are laid; yet, there is no record of over 8 young being seen with their parents. Infertile eggs are not uncommon, and chicks frequently die in the eggs.

BEHAVIOR

Vocal Performance.—The Florida Gallinule has a great variety of hen-like cries, cackles, chucks, grunts, squawks, as well as soft purring notes and it is possible that any strange cry heard in the marsh inhabited by these birds is made by one of them, as they sometimes utter the most eerie cries.

Natatorial Behavior.—It is a dainty swimmer, although it has large, chicken-like feet which seem ill-equipped natatorially, and it can swim almost as well as the lobe footed Coot. It sits well up on the surface of the water, and, when swimming, it twitches its tail nervously up and down showing its white flanks, and bobs its head with each stroke of its feet. When suddenly flushed, it skitters a few yards over the water and flies straight away with dangling legs for short distances, usually in vocal silence. I have never seen it submerge like a Grebe with only its bill protruding, which habit is said to be common with the Moorhen.

It rarely dives for food like a Coot. Most observers have never seen it dive, and neither have I, although the European species possesses this habit.

The gallinule often swims with its head submerged under water feeding upon aquatic vegetation, and it frequently dabbles like a duck.

Interspecific and other Relations.—Although it nests in proximity to others of its kind, it respects the territorial rights of the others. I have never seen it quarrel with nesting birds of its own kind or any other species.

It nests in the same locality with the Blue-winged Teal, Coot, Least Bittern, American Bittern, Virginia, Sora, and King Rail, competing for food and territorial rights with these species, but, as far as I have observed, living peacefully with them, The Red-wing Blackbird, Swamp Sparrow and Long-billed Marsh Wren also nest in the same environment, sometimes in proximity. I have frequently found the Marsh Wren nest built 2 or 3 feet directly above a Gallinule nest. I have found the Gallinule and the Pied-billed Grebe nesting within 50 feet of each other. On one occasion a King Rail nest was not over 20 feet distant. I have seen Gallinules with young feeding right beside the Pied-billed Grebe and Coot. Once I saw a Pied-billed pop out on the surface of the

water beside a Gallinule which, though startled, showed no resentment whatever.

The Florida Gallinule is not a very social bird. It has been seen by myself and others in association with Pied-billed Grebe, Mallard, Black Duck, Wood Duck, Blue-winged Teal, and Coot. Spinner has seen it associating with rails. He says, "It appears to go anywhere it desires and brook no interference from any other water birds." It gets along amicably, generally, and this has been the experience of several other observers. The Middletons have seen it near Wood Ducks at various times with no display of hostilities. They have also seen it with Coots, peacefully sunning themselves on floating logs. I have also observed it taking sun baths on logs in the marshes.

Goldstein mentions having seen the Gallinule chase a Pied-billed Grebe at Hog Island. It uttered a cry, the likes of which he never heard before, and which he was unable to describe. It is not unusual to hear the Gallinule utter strange and unearthly cries.

Spinner mentions seeing it quarrel with its own kind and with the Coot. He says that the Gallinule is always the victor. Muskrats are found in all marshes inhabited by the Gallinule. They play an important part in the ecology of the marsh by keeping the vegetation from choking up sloughs and open spaces. Old muskrat houses are used by Gallinules as loafing spots and sometimes a bird will build a sham nest on a dilapidated structure if it is surrounded by tules.

Relations with Man.—When encountered, rather than taking wing, it largely depends on concealment in the vegetation and is difficult to startle into flight, except when surprised in open water. The bird is rarely seen on the nest. It usually slips off unperceived before the intruder has found it, and while he is inspecting the nest, the owner skulks about close by in the vegetation, always out of sight and incessantly scolding with hen-like cackles, which persist until he has left the vicinity.

Very seldom have I surprised a bird on the nest, and only when the eggs were highly incubated or pipped. I have rarely inspected a nest without one of the owners close by and scolding. One nest which I examined when the bird was absent, held two pipped and two infertile eggs. While I was at this nest, one of the owners appeared. She swam straight towards me, crying loudly, and when within several feet of me, she splashed and jumped excitedly about on the water, and ran about with drooping wings. This performance was to attract my attention away from the nest. Then she realized that her clever ruse to deceive me had failed, she swam quietly about near by in small circles, but continued cackling and was very much agitated. As I approached, she swam away, protesting loudly.

I have vainly tried to flush birds in the marshes, but they always seemed to realize my purpose and tantalizingly attempted to lead me on through the thick vegetation, keeping several yards ahead, crying incessantly and usually out of sight.

On May 30, 1928, Jay and I captured a bird in the Richmond marsh that trapped itself when trying to escape us by swimming half under the water and trying to fly at the same time. It became entangled and was covered over with duckweed and a mucky vegetation of tules in water a foot deep. When rescued and released the bird appeared none the worse.

During the advanced stages of incubation, the hen remains on the nest until the intruder is quite close. She never defecates on her eggs while flushing as do some wild ducks. It was only during the advanced stages of incubation that I have ever seen any injury-feigning done by the birds.

Injury Feigning.—An instance of injury feigning to come under my observation happened at the Richmond marsh on May 26, 1910, when I encountered a Gallinule nest containing 9 highly incubated eggs. It was built in tules 7 feet high where the water was 36 inches deep, and was poorly hidden. I saw the bird on the nest when I was 10 feet away. As I approached, it sat close and watched me nervously until I was about a yard away, and then it splashed off into the water away from me. The bird swam a short distance away and, when I reached the nest, she immediately turned around and charged me belligerently, crying loudly as she ran over the water with her wings partly raised. She did not strike me, but jumped about excitedly. She splashed and displayed upon the water and pecked frequently at the duck weed which covered her. Her cries (inferring it was the hen) attracted her mate, and, with loud cries, he swam up to her. He behaved just as excitedly, as he jumped up and down on the water feigning a broken wing. When I waded toward the birds, they retreated slowly and cried continuously. When I was about 10 feet away from the nest, the hen returned and brooded the eggs in silence, while her mate swam off into the tules and continued to cry until I left the vicinity.

Feeding Habits.—July 6, 1941 at Westville, N. J., "Heard the Florida Gallinule calling in spatterdocks. After several minutes, it came out into the open along the stream. While picking around in the mud, it was joined by another calling bird. At the approach of the second bird, the first assumed a goose-like position with its neck arched and its bill nearly touching the mud, but instead of charging it ran along the stream with the second bird in hot pursuit. After chasing around in this manner for several moments, a school of small minnows attracted their attention and they started fishing. When stalking the minnows, they used the same technique as American Egrets, stretching their necks out and standing quite erect, while their feet moved continuously through the water. They often rushed forward to seize their prey. Every once in a while one bird walked to a bunch of spatterdocks and carefully looked them over. With one swift stroke of its bill, it cut off a stalk close to the base, and carried it to the water. Both birds took a halfhearted peck or two and then moved away to something more interesting." (Manners).

June 20, 1941, Westville, N. J. "A Gallinule waded into a stream up to its belly and bathed. It fed for a minute or two by putting its head completely under water and pulling something up from the bottom." (Manners).

Food.—According to my observation, and that of many other observers, aquatic vegetation is the chief food of the Florida Gallinule. I have seen it eat Duckweed (*Lemna* sp.) and Bladderwort (*Utricularia vulgaris*) plants and have also seen them feed both kinds to their chicks. Many times I have watched birds pull up billfulls of bladderwort plants and picked something indiscernible to me from them, which I suspected to be tiny snails of *Amnicola limosa* and *Segmentia armigera* which occur commonly on this aquatic vegetation. I have never seen them eat fish, but others have reported them eating small "minnows." Manners mentions seeing them chase minnows, presumably a species of *Fundulus*. When pollution killed all of the animal life in one of the Richmond marshes over a decade ago, millions of *Daphnia* appeared, and the Gallinule was seen eating these crustaceans. Earthworms, insects, and chrysalides of dragonflies are also eaten. In stomachs of birds that were shot in September and October I have found seeds of Smartweed, sedge and rushes, and also unidentified insect and vegetal remains.

Behavior at Nest.—During torrential rains, the birds build up their nests usually building beneath the eggs so that as the nest is raised, so are the eggs. These elevated nests are usually shallower and larger than the typical ones.

Care and Feeding of Young.—Goldstein mentions having seen an adult and 2 black, downy chicks at Hog Island on June 19, 1938, catching insects or other fast moving animals by making quick darts at this prey.

At Mannington Creek, "On Aug. 16, 1942, while Dr. Coman and I were looking at 2 adults tending their 3 downy chicks, we were surprised to see 2 immature Gallinules in the same group feed the downy young. They would pick up something from a duckweed covered cove and deliberately swim up to the downy young. As I recall, they took the offerings from the bills of the immature birds. The performance was repeated several times. The whole picture presented by the feeding groups of 7 birds was one of tranquil contentment, no bickering or scolding in the picture." (Potter).

Young birds of the first brood feed the young of the second brood. On some occasions I have seen the older young of the first brood snatch food from the younger brood without any parental interference.

Behavior of Young.—Chicks feed with their parents out in open spots in tule marshes. Sometimes they get separated, but the parents pay no attention to them. Under such conditions I have seen the parents, suddenly frightened, fly headlong into the vegetation, apparently abandoning the young. The chicks, however, are dazed for several seconds at their parents' behavior, but they rapidly skitter over the water after them. Young chicks are never strung out in single file like ducklings when swimming with their parents but scatter about without any order. When frightened by an intruder, they scramble from the nest into the water and quickly swim away into the vegetation. They dive and swim several inches beneath the surface when pursued. They use their wings in swimming through the vegetation by grasping plants with the sharp claws located on the ends of the wings. I have frequently seen

chicks, only several days old, swim and dive to escape capture. One chick that dove came up through a thick scum of duck weed, through which it could barely make its way. It seemed exhausted but when put back in the nest it immediately scrambled off.

Chicks react differently when captured. One, a few days old, which I caught on a bare mud flat in a tule marsh, made no effort to escape when I picked it up or resented being handled. It cuddled in my hand and stayed on the flat when released. It exhibited no fear. On another occasion, I found a wet chick in the nest. It could hardly raise itself erect but when I reached down to pick it up, it managed to scramble up the 3 inch side and fell into the water. It was too weak to move and when I put it back into the nest, it lay exhausted.

ENEMIES

Snapping Turtle (*Chelydra serpentina*); Banded Water Snake (*Natrix sipedon*); Pilot Blacksnake (*Elaphe obsoleta*); Bull Frog (*Rana catesbiana*); Pike (*Esox americanus*); Black Bass (*Micropterus dolomieu*); Raccoon (*Procyon lotor*), nest destroyed by raccoon (Spinner); Muskrat (*Ondatra zibethicus*); Norway Rat (*Rattus Norvegicus*); Opposum (*Didelphis virginiana*); Fish Crow (*Corvus ossifragus*); Crow (*Corvus brachyrhyncus*); Man; Great Horned Owl (*Bubo virginianus*), found remains in nest of this species (Cadbury); Red-bellied Turtle (*Pseudemys rubriventris*); Painted Turtle (*Chrysemys picta*); Automobiles.

The most serious enemy of the Florida Gallinule in our area is man who is constantly destroying its nesting habitat by drainage and the filling in of marshes. These operations are progressing steadily all along the Delaware River at the present time. The Richmond, Bridesburg and Camden marshes have been destroyed by these filling operations and those at Tinicum and Penn Manor are scheduled for the same fate. "Partial filling of the Camden marsh drove away the birds." (Cadbury). "Influx of sand and gravel filled Penn Manor marsh to such an extent that it destroyed the habitat." (Ashton). On May 30, 1944, Jacobs and I picked up a dead Gallinule on the highway north of Salem, N. J. At this locality, above French Creek, the highway crosses a marsh. The bird was evidently killed by an automobile as it tried to cross the road from one part of the marsh to the other.

PROBLEMS

There is very little known regarding the courtship or territorial claims of the Florida Gallinule. There is also a dearth of data on its food habits. According to local observers, there is very little agreement as to whether the adult bird dives or not. Is the bird really triple brooded or are the many instances of small young seen in late September and October the result of broken-up second nests?

Do young birds return to the marshes in which they were born or do they breed elsewhere?