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THE PURPLE GALLINULE (*IONORNIS MARTINICUS*)  
OF BARRO COLORADO ISLAND, CANAL ZONE.

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*Plates XX-XXIV.*

BARRO COLORADO is an island formed at the time the Chagres River was dammed in constructing the Panama Canal. This island, about four miles long and three and a half miles wide, comprising nearly 3800 acres, is covered with a dense growth of virgin "rain forest." Fortunately, the Canal Zone government has set aside the island as a wild life reservation to be preserved for all time for students of tropical biology. A large laboratory with excellent facilities located in the midst of the jungle, enables visiting ornithologists to conduct intensive life history studies, which otherwise would be very difficult and in many cases impossible.

The coastline of the island is very jagged in outline, producing numerous protected coves. These coves are still dotted with the stumps and trunks of trees of the partially submerged forest which was flooded by the rising waters of Gatun Lake, more than fifteen years ago. Many of the trees have rotted at the water level, fallen, and then driven by the winds have collected in the recesses of the coves, there to form floating islands. Some of these islands, anchored by snags of tree stumps, are now grown over with ferns, grasses and other plants, producing ideal nesting sites for certain species of water birds. It was one of these floating islands situated in a protected cove within sight of the laboratory



UPPER.—PURPLE GALLINULE (*Isonornis martinicus*) INCUBATING HER EGGS.

SHANNON COVE, BARRO COLORADO ISLAND, JULY 28, 1925.

LOWER.—NEST AND EGGS OF PURPLE GALLINULE, JULY 28, 1925.

that a pair of Purple Gallinules built their nest during the summer of 1925. The nest was constructed near the outer edge of an island and was so completely hidden from view by the overarching grasses that its existence would never be suspected by a passing observer. It required the sharp eyes of Donato, the Indian boy employed at the laboratory, to locate the nest for us. It was only twenty feet away from the shores of Barro Colorado Island where the jungle rose sheer from the water's edge. The tall dense vegetation with its screaming Parrots, its gorgeous Trogons and howling monkeys, produced an environment of striking contrast to what we generally associate with the surroundings of the homes of water birds in the north. The diversity of life in the vicinity of the nest proved of the greatest interest to the observers who spent many hours in the Gallinule blind.

The Purple Gallinule is a breeding bird of the southern sections of the Gulf States and nests have been found as far north as Charleston, South Carolina. Birds have also been reported in New England, southern Canada and the states of the Middle West. The results of a study of this bird in the Tropics will, we hope, be of interest for comparison with similar studies made of this species in the north.

#### THE NEST.

The foundation of the Barro Colorado Island nest was made largely of undetached green grass blades which were pulled down and woven together by the birds to form a hollowed platform, the hollow being about five centimeters deep. To this platform the birds added a few dead reeds and grass stems. The platform was thirty-five centimeters across but the nest proper (the part occupied by the nesting bird) was only about twenty centimeters in diameter. At the time the nest was discovered it was twenty-five centimeters above the water level of the lake, but this level gradually rose as the rainy season progressed and before the young were hatched the nest was in danger of being flooded. Indeed, several nests of the Gallinule in other parts of the lake were destroyed in this manner.

One of the striking features of a Gallinule's nest is the runway which the birds construct. This runway is an important part of the bird's nesting activities and as a structure is second only to

the nest proper which supports the eggs and the incubating bird. In this case the nest was closed in by a thick fringe of tall grass except on the south or land side which opened up to a well constructed runway. The runway led downward almost to the level of the water to a rather open spot among the tall grass. From this point there was a much more pretentious trestle of woven grass which led up to a frail platform about two feet above the water and more than ten feet away from the nest. It required more time and effort on the part of the birds to construct this runway and platform than the nest itself and during the incubation period it was in constant need of repairs and was continually undergoing slight changes and additions. It was used by the birds in approaching and in leaving the nest. The incubating bird, when suddenly surprised would stealthily sneak down this runway and up to the platform from which it could easily take flight, a feat not so readily accomplished from a lower level among the reeds and grasses. We have not noted a description of such an elaborate runway in the accounts of other Purple Gallinule nests, but less pretentious pathways have been observed in connection with the nests of the Florida Gallinule. Mr. William Brewster<sup>1</sup> describes a pathway about six inches in length which led from the nest of a Florida Gallinule near Cambridge, Massachusetts. Mr. Clinton S. Abbott<sup>2</sup> states that most every nest found by him in the Hackensack Meadows, New Jersey, had a sloping runway to the water's edge by which the bird probably always entered and left the nest.

#### THE EGGS.

The Barro Colorado Island nest when found on the evening of July 12, 1925 was said to contain three eggs and when we examined it the following morning there were four eggs, thus assuring us that our study of this nest started at the time the set was completed on July 13. Two young hatched on August 2 and the other two on August 3, indicating that incubation probably started at the time that the second egg was layed. This record indicates an incubation period of about twenty-two days. The

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<sup>1</sup> Brewster, William, 1891. A study of a Florida Gallinule's nest with some notes on a nest found at Cambridge, Massachusetts. *Auk*, vol. 8, pp. 1-7.

<sup>2</sup> Abbott, Clinton G. 1907. *Auk*, vol. 24, pp. 1-11.

eggs have a ground color of cartridge buff finely marked with irregular spots of cinnamon brown, pale violet gray and lilac gray. The markings were heaviest at the larger end of the eggs.

The weights and measurements of the eggs were as follows:—

Number	Long Diameter	Short Diameter	Weight
1.	40.2 mm.	29.8 mm.	16.10 gram.
2.	42.8 "	28.9 "	16.35 "
3.	41.1 "	28.5 "	16.08 "
4.	39.1 "	29.0 "	15.15 "

The weights and measurements of a nest of three eggs found on a floating island in Shannon's Cove on the opposite side of the island were as follows:—

Number	Long Diameter	Short Diameter	Weight
1.	39.5 mm	27.8 mm.	15.9 grams
2.	39.1 "	27.5 "	15.4 "
3.	38.9 "	27.1 "	14.95 "

As would be expected the number of eggs in sets of the Gallinule found in the Tropics are smaller than those nesting in the Temperate Zone of North America; a condition previously noted among representatives of other families of birds.<sup>1</sup> In the north the Purple Gallinule usually lays from six to eight eggs and some sets as large as ten have been recorded. Mr. A. C. Bent<sup>2</sup> records five as the minimum number of eggs layed by the species.

#### BEHAVIOR.

In order to study the normal activities and behavior of the birds we constructed a blind, the front of which was less than four feet from the nest. There were several feet of water beneath the floating island, hence it was necessary to fasten the platform of the blind to long poles which were driven into the mud and secured to logs constituting a part of the island. The blind was built a little at a time over a period of several days in order to reduce the disturbance to the birds to a minimum. By the time the blind was completed the birds behaved in an apparently normal

<sup>1</sup> Gross, Alfred O. 1927. Barro Colorado Island Biological Station Smithsonian Report for 1926, p. 337.

<sup>2</sup> Bent, A. C. 1926. U. S. Nat. Mus. Bull. 135, p. 342.



UPPER.—PURPLR GALLINULE PROTECTING HER EGGS FROM HEAT OF TROPICAL SUN. CONTROLLING TEMPERATURE BY RAPID RESPIRATION. JULY 25.  
LOWER.—INCUBATING EGGS, AS SEEN THROUGH TALL GRASS. JULY 24.

manner paying not the least attention to it as they went back and forth to the nest. They were, however, very sensitive to noises and other disturbances especially those originating from the lake side of the nest. We always approached the nest from the lake by means of a cayuca, the native dug-out canoe. During our first visits, when we were within thirty to fifty feet of the blind the brooding bird would leave quietly and skulk down the runway. As we approached nearer she would arise and with her long yellow legs dangling would fly to the outer branches of the dense thicket along the shore. There she would clamber awkwardly about the branches, balancing herself with half spread wings, twitch her tail nervously and peer out at us as she anxiously watched our inspection of her nest. As the bird became more accustomed to our visits she would disappear in the tall grass without flushing. On such occasions as soon as we entered the blind the bird would return immediately; or less frequently, after noting all was well, she would idle about the nest for a quarter or half an hour before incubating the eggs again.

Sometimes both birds appeared on the scene and with their brilliant colors made a striking and beautiful picture as they gracefully moved through the grass now preening their glossy blue and purple plumage, now idly searching for food, but more frequently working on the runway. Construction of the runway was accomplished by pulling down an overhanging blade of grass with the bill and then holding it down with one foot, dexterously weaving it into the structure. This done the bird carefully selected another long grass stem and repeated the process until many such additions had been made. The birds however, never neglected the eggs for any great length of time for the sake of building or repairing the runway, but sooner or later one of the pair would cautiously make its way back to the nest. As we watched the birds proceed over the tangled masses of grass stems, we were impressed with the admirable adaptation of the long toes and nails for walking on such uneven surfaces. The bird on arriving at the nest, briefly inspected it, then awkwardly walked on to the eggs with her head faced toward the lake. Invariably however, the bird shifted its position immediately so that it faced the entrance of the runway toward the jungle. This

position enabled the bird to leave quickly when alarmed, with a minimum disturbance to the nest.

Both the male and female took their turns at incubation regularly every three or four hours. At the end of the shift the mate would come flying in, usually alighting on the elevated platform at the end of the runway. The exchange of the birds was attended by the most interesting ceremony of which the following account taken from our notes is typical of their behavior. After some delay at the platform he (as the returning bird may be designated) walked leisurely down the path a short distance and then began pulling and tugging at a dead reed. After considerable effort he dislodged a piece about six inches long and came triumphantly up the path toward the nest. Meanwhile, the female (the bird on the nest) who had been carefully watching the proceedings, picked nervously at the materials comprising the edge of the nest. The male now came up and presented the piece of dead reed to his mate. She took it and carefully added it to the nest. The male gazed at her expectantly but as she showed no inclination to go he returned for more nesting materials. After a very brief search he secured a dead leaf which, like the reed, was offered to his mate. The female added the leaf to the nest and then abruptly walked off past the waiting male to the end of the runway. Without any delay she flew down the shore to a point out of sight of the blind. The male then carefully examined the eggs, rolled them and awkwardly adjusted himself to the nest facing as usual toward the shore.

The nest building instinct was very strong in these birds and during the entire three weeks of incubation it was rare that either of the pair returned to the nest without bringing a piece of grass or leaf to be added to the structure. This behavior continued up to the time the young left the nest as is indicated beyond in the account of the young.

July is a rainy month in the Canal Zone and the sky was usually clouded over all day, even though it did not actually rain. At mid-day therefore, it was often very warm and cloudy and incubation was unnecessary. At such times the nest was left unattended for short periods. With these exceptions, the eggs were kept covered continuously by the faithful parents. After three weeks



of incubation the sitting bird was often seen to arise and turn the eggs with its bill and again settle on them. Sometimes it was done so frequently as to be little more than a nervous habit, for certainly three times in a bare half hour can hardly serve any useful purpose. When the task of incubation became burdensome, the sitting bird would yawn widely and then perhaps doze a while. Any unusual noise would instantly arouse the bird and it would look anxiously in the direction of the sound and if much alarmed, would raise slightly the feathers of the crown. The Gallinules seemed to discriminate but little and a passing flock of screaming Parrots or a pair of Toucans foraging noisily in a nearby tree alarmed them quite as much as the approach of some predatory mammal.

Upon our arrival at the nest on the morning of July 24 we found the nest had sagged so much toward the rising waters of the lake that it was in imminent danger of destruction. We raised it some six inches and propped it securely in that position. After completing this we entered the blind and within five minutes the bird, which had been flushed from the nest by our arrival came back walking up the runway with a piece of grass in its bill. But arriving at the nest the bird appeared confused and tried again and again to go under it and only after a minute and a half of this did the bird discover the nest in its slightly raised position. It was in plain sight all this time but the bird was evidently so accustomed to locating the nest by its remembered position that the evidence of sight was entirely disregarded until all efforts to locate the nest by position had failed. The bird then inspected the eggs and settled down to incubate without further ado. A half hour later a loud splash nearby, presumably a crocodile, frightened the Gallinule from the nest, but within fifteen minutes the bird came cautiously back along the runway. This time the bird seemed to profit some by experience and after only two attempts to go under the nest, she rediscovered its new position and again settled on the eggs.

#### NOTES AND CALLS.

We found the Gallinules to have a great diversity of calls and they seemed to have special notes for most every occasion. Usually

when the bird was disturbed by our approach, it would utter a single sharply accented note before it took flight to the shore of the cove. After alighting it frequently gave in addition to this preliminary note, a guttural sound and occasionally a loud hen-like "co-doodle." Either bird when flying to the nesting island would utter a very loud metallic clucking call which apparently was for the purpose of attracting attention. If no enemies were in evidence after waiting at the lookout for a time, the birds would deem it safe to proceed. While approaching the nest down the runway the birds were silent, but when settled on the nest and apparently free from all fear the bird would utter a guttural "whonk" followed by a queer snapping of the bill. This snapping sound proved to be one of the most characteristic notes uttered by the birds. It was evidently a sign of "all is well" for it was very often answered by the mate although the latter was not in view of the blind but somewhere in the dense grass or shrubbery along the shore. At times the bird on shore would utter a clucking sound which was answered immediately by the snapping-of-the-beak sound by the bird on the nest. Though we watched the performance many times we could not definitely determine whether the mandible actually struck the maxilla or not because of the rapid vibration. (This snapping note was frequently heard in November when collecting birds in the grassy inlets of Gatun Lake. In fact it was this note which invariably led me to the discovery of their presence in the tall reeds and grass.) At intervals the nesting bird would give a *cac-cac-cac* or *cut-cut-cut* call, the significance of which we could not determine.

On October 23, 1927 while watching an adult and an immature bird in juvenal plumage in a marsh near Frijoles the birds gave certain calls which were quite unlike those we heard during the nesting period. The adult gave a call which I thought was an outcry of the Ani bird nearby when I first heard it, whereas the young responded with a queer "*awnk, awnk, awnk*" as they answered the parent and attempted to follow her through the tall grasses and reeds.

#### BEHAVIOR OF PARENTS AT HATCHING TIME.

These Gallinules, like most other birds, at the time of the hatching of the young, exhibited a marked difference in their general



UPPER.—PURPLE GALLINULE ON LOWER SUBMERGED PART OF RUNWAY.  
LONG TOES AND NAILS ADMIRABLY ADAPTED TO WALKING OVER SUCH SPOTS.  
LOWER.—ADULT PRESENTING PIECE OF PALM LEAF TO MATE WHICH SHE HAD  
ATTEMPTED TO FEED TO YOUNG. NOTE NEWLY HATCHED YOUNG IN  
FRONT OF BREAST.

behavior. This important event seemed to stimulate their activity about the nest and both birds exhibited a greater indifference to our presence and to outside disturbances.

On the morning of August 2 we found one black downy chick newly hatched and one egg well pipped. One of the parent birds was brooding the young and showed little fear as we approached the nest. She merely retired a few feet away and there watched anxiously as we entered the blind. A few minutes later she (so sexed by courtesy only) returned to brood the youngster who had kept up a shrill peeping during her absence. She climbed into the nest immediately, tramping over the chick with the greatest indifference. Even after she had covered it, it continued to peep vigorously. In a short time the hatched chick worked itself forward but when its head protruded through her breast feathers the parent bird immediately pushed it back out of sight. Later, however, the young were often permitted to remain in this position. Within an hour the second one had hatched. The old bird then left the nest and the two chicks huddled silently together until she returned twenty minutes later. She brought no food and seemed somewhat surprised to see the young. As she peered over the edge of the nest the young began to peep and to jump up and grasp her bill as if begging for food. They continued this performance while she attempted to brood them but finally were reconciled. She sometimes arose to examine them or, more frequently, inserted her head under the breast feathers without rising. After half an hour she left the nest to search for food in the marsh grass near the nest. In a few minutes she returned bearing a small insect in her beak. The downy young became excited at her approach, peeping and waving their heads about frantically. Without coming on the nest the parent with neck outstretched held the food before the elder chick who made eager but ill directed snatches at it and finally secured and swallowed it. The procedure was watched on many subsequent occasions and was found to vary but little. The parent bird usually reached into the nest from the outside and never did more than dangle the insect before the chick. On one occasion the parent bird brought to the young a rather large spider. The young one made repeated passes at this handsome morsel but the spider was too

large and the chick dropped it after each try. The old bird then picked it up again and held it before the chick. After four such failures the old bird seemed puzzled and, taking up the bedraggled spider, walked off a few feet. Standing undecided a few minutes she dipped the spider in the water a few times and squeezing it a little again brought it to the nest. Three more attempts sufficed to wear down the recalcitrant spider to a more convenient size and it was eventually eaten. A similar performance took place when a tough water beetle was offered, but this time no amount of washing and mashing would avail and in the end the insect was eaten by the old bird. Both parents fed and cared for the chicks and neither seemed to stray far from the nest after incubation was completed. A great variety of insects and spiders were brought to the young and probably insect life constitutes the main part of the food of the young.

By one-thirty in the afternoon of August 2, the chick in the third egg could be heard peeping but had not yet pipped the shell. It had made no further progress when we left at dark but the next morning early it was out of the shell. The fourth and last egg was pipped by noon of the second day and hatched by night. The hatching of the four eggs from the pipping of the first egg to the emergence of the last chick required about forty-eight hours. The egg shells usually remained in the nest a few hours and then were carried away by the old birds. The chicks sometimes seemed to pick at the egg shells in the nest and appeared to eat particles of them. The sanitation of the nest was carefully preserved by the parent birds who ate the faeces of the young.

As previously mentioned the adults continued to bring grass when they relieved each other even after the young were hatched and about to leave the nest. On the first day that young were in the nest a very interesting incident occurred. About two o'clock in the afternoon one of the parents had just fed the young and was brooding them when its mate came up to the nest bearing a dead reed and relieved the sitting bird in the usual way. The young began to peep loudly for food and he (as we guessed at the sex from the bird's incompetence) rose and left the nest in search of it to silence their clamoring. Walking down the road a few feet he stopped irresolutely and began picking about in the water.

Then seeing a loose piece of reed about three inches in length, he seized it and walked confidently back to the nest. The chicks reached eagerly toward him and peeped loudly. Thereupon the old bird went through all the motions of feeding and held the particle before them as though it were food. They picked at it hungrily, but, of course, could do nothing with it. Seeing that they would not eat it he seemed satisfied that they could not be hungry and so he climbed on the nest and proceeded to brood them while they fairly screamed to be fed. This curious behavior was noted not once but several times during the first day and both sexes were guilty of this apparent confusion of instincts. We were in no doubt of what occurred for we were watching carefully at a range of barely three feet and clearly saw the bird hold the grass or leaf to the young just as it had done but a few minutes before with a bit of food.

The first egg hatched very early on the morning of August 2, 1925. On the morning of August 3 the older chicks began to leave the nest. This may have been hastened a few hours by our presence, but we believe they would have left normally before night at least. As it was, they became alarmed by our movements and one of the parent birds gave a peculiar note whereupon the three young scrambled from the nest leaving the fourth chick to complete its escape from the egg, which it did successfully. The young were very active and exhibited great ability in climbing over the tangled reed and grass stems in response to the calls of the parent birds. The outspread wings aided the young in balancing their tiny bodies and the little claw-like appendage at the tip of the manus of the wing was frequently employed in holding onto a stem or in climbing over an obstacle. As soon as they reached the edge of the grassy island the youngsters did not hesitate but plunged into water as readily as seasoned swimmers. They were very adept at swimming and made rapid progress in their attempt to escape to the grass and shrubbery of a larger neighboring island.

The nesting season of the Purple Gallinule in the Canal Zone is prolonged and perhaps continues throughout the year. Mr. Walter E. Hastings found a nesting pair at Barro Colorado Island in March, 1927 and the senior author found a pair of birds with

young in natal down near Frijoles, Gatun Lake on November 5, 1927. He also noted a pair of birds nesting on a banana plantation at Monte Verdi, Costa Rica during December, 1927. The gonads of two adult birds collected in the Canal Zone in November were of a size to indicate that they were sexually active. Three young birds collected the first week of November and many others observed during October and November were in juvenal plumage approximately three months old. It would appear from this observation that even though the nesting period is a prolonged one the majority of the birds in the vicinity of Barro Colorado Island nest during the months of July and August.

#### DESCRIPTION OF PLUMAGES.

*Natal Down.*—The young when hatched are covered with thick black down less thickly distributed in the region of the head. The down of the back is glossy black whereas that of the underparts is a dull or slaty black. The head is also thickly set with heavy gray bristles. In the freshly hatched young there are crisp white tips to the down of the back but this quickly frays away.

The colors of the iris and soft parts are as follows,—iris, chaetura drab; tarsus, vinaceous-drab; feet, light russet-vinaceous; claws, mouse gray; claw at tip of manus, white. The mandibles are very highly colored as follows:—base of maxilla, eugenia red extending forward to an irregular black line which runs through the nostril, bordering this black line in front is a band of pale livid pink, the remainder of the maxilla distal to the latter band is black except the chalky white egg tooth at the tip. The tip of the mandible (lower) is black, the base flesh pink with a narrow black band and one of hydrangea pink just posterior to the black of the distal end of the lower mandible. The distribution of these colors is so complex that it seems best to present an outline drawing of the bill with an indication of the colors.

*Juvenal Plumage.*—The following description of the juvenal plumage is based on two male specimens collected near Frijoles, Canal Zone, November 5, 1927.

Upper parts. Crown and nape olive-brown shading to a light tawny-olive on the sides of the head. Back of the neck and scapular region deep olive-green. Lower back, rump and upper



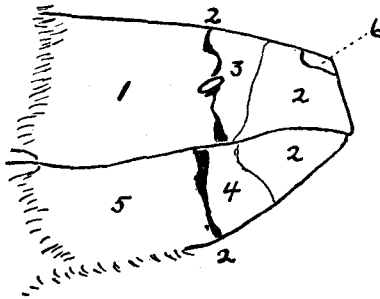
UPPER.—PURPLE GALLINULE APPROACHES NEST WITHOUT FOOD. YOUNG  
JUMP UP TO GRASP BILL.  
LOWER.—PAUSES TO INSPECT BLIND BEFORE GOING TO NEST.



tail coverts clove brown; tail feathers olive-brown without the gloss of green present in the adults; feathers at bend of wing and outer vanes of coverts Niagara green; outer vane of primaries grape green with metallic green reflections.

Lower parts. Chin and throat and undertail coverts white; breast and sides of belly tawny-olive shading to iron gray on the flanks; middle of belly white tinged with olive-buff. Some of the juvenals have white extending well up towards the region of the breast.

Another specimen collected November 5, 1927 was in a state of transition from the juvenal to the first winter or adult plumage.



BILL OF DOWNY NESTLING.

- |                     |                    |
|---------------------|--------------------|
| 1. Eugenia red.     | 4. Hydrangea pink. |
| 2. Black.           | 5. Flesh pink.     |
| 3. Pale livid pink. | 6. White.          |

In this bird the upper parts are similar to those described for the juvenal above. The throat and chin are white but the breast is a mixture of new and old feathers, the Windsor blue feathers predominating especially in the region of the breast. Many of the black feathers of the belly and legs characteristic of the adult plumage have made their appearance. The under tail coverts are pure white.

The colors of the iris and soft parts of the birds in juvenal plumage are as follows,—iris, sayal brown; bill, grape green shading to vinaceous-drab at the base; frontal plate, neutral gray; tarsus, dark olive-buff; toes, olive-ochre; nails olive-buff. These

colors in the bird representing a transitional state of plumage described above are as follows,—iris, pecan brown, maxilla tip, deep chrysolite green, base of maxilla, sorghum brown; base of mandible, russet-vinaceous; tip of mandible deep chrysolite green; frontal plate, dark glaucous-gray, tarsus and toes similar to that of the juvenal.

*Adult*.—The description of the adult Purple Gallinule is well known but it seems desirable to record the color determinations of the iris and the soft and naked parts which quickly change color after death. The following descriptions are based on the examination of one female and three male adult birds collected in the Canal Zone. Iris, Hay's russet; the distal 12 mm. of the bill, light viridine yellow, base of bill, jasper red; frontal plate, light forget-me-not blue; tarsus and feet, amber yellow; claws, naples yellow.

The bright colors of the frontal plate and bill are most conspicuous features in the colorations of these birds. It was these parts which invariably first attracted our eye when observing them in the grassy marshes. The bright yellow color of the legs and the white under tail coverts were distinguishing marks which we used to identify these birds when they flew away in front of us.

#### WEIGHTS AND MEASUREMENTS.

The weights are given in grams and measurements in millimetres. Specimens in Bowdoin College Collection.

Young in natal down age one day. Taken from the nest on Barro Colorado Island, August 4, 1925.

Weight.....	10.7 grams	10.6	10.7	12.2
Length.....	98 mm.	97 mm.	96 mm.	96 mm.
Bill.....	11.5	11.3	11.1	10.9
Extent.....	98	97	98	92
Wing.....	22	22	21	21.5

	Juvenals.			Adults.		
	Female	Male	Male	Female	Male	Male
Sex.....	Female	Male	Male	Female	Male	Male
Date.....	Nov. 5	Nov. 5	Nov. 5	Jul. 28	Oct. 21	Nov. 5
Weight.....	141.7 gms.	229.9	218.4	190.3	203.7	229.2
Length....	312 mm.	335	315	295	299	327
Tail.....	71	75	69	71	74	72
Bill.....	43	43	46	47	45	48
Extent....	547	571	532	539	550	568
Wing.....	170	181	171	171	176	181
						192

## FOOD.

The following notes on the food of the Purple Gallinule are based on an examination of the stomach contents of the three juvenal and four adults. The stomach contents of female number 44 collected July 28, 1925, on Barro Colorado Island weighed 4.6 grams. The food was chiefly animal matter, for the determinations of which we are indebted to F. M. Gaige of the University of Michigan. The contents were as follows,—

3 adult aphids.	5 spiders.
3 grasshoppers.	1 small hemipteron.
1 moth.	1 tick.
12 fly larvae (8 <i>Chironomus</i> , 3 syrphid).	3 small crustacea.
2 beetle larvae.	10 small ants ( <i>Ponera opaciceps</i> ).

In addition to the above animal matter there was some fine gravel and small brown seeds we could not identify.

The stomach contents of male number 90 collected near Balboa October 21, 1927 contained parts of seven water beetles, a small amount of vegetable pulp and a few grains of gravel making a total of 5.2 grams.

A male number 91 collected at Frijoles on Gatun Lake, November 5, 1927 contained vegetable matter, chiefly seeds, and a few grains of gravel. The total weight of the contents was 2.2 grams.

An adult male number 109 collected at Frijoles on November 15, 1927 had stomach contents weighing 4.7 grams. The food consisted of grass, grass seeds and vegetable pulp. There was also a dozen grains of gravel.

The stomach contents of three juvenals 2 males and 1 female collected November 5, 1927 consisted of vegetable matter, chiefly seeds and vegetable pulp, and small amounts of gravel. The weights of the contents were 2.9, 3.9 and 2.3 grams respectively.

Mr. A. C. Bent<sup>1</sup> states "very little has been published about the food of the Purple Gallinule—Probably they live chiefly on grains, seeds, and other vegetable food but there is some evidence that they also eat snails and perhaps insects."

Judging from our field studies on the feeding of the young and the stomach contents of two adults collected in different parts of

<sup>1</sup>Bent, A. C., 1926, U. S. Nat. Mus. Bull. 135, p. 343.

the Canal Zone it is reasonable to infer that insects constitute an important part of the food of the Gallinule in the Tropics. It is also apparent that they are adaptable to both vegetable and animal food. As in the case of most grain and vegetable eating birds the young are given, at least in the beginning, chiefly an animal diet.

*Bowdoin College, Brunswick, Me.*

*University of Michigan, Ann Arbor, Mich.*



UPPER.—YOUNG PURPLE GALLINULES POSED IN NEST AFTER FOURTH EGG HAD HATCHED. AUGUST 4, 1925.

LOWER.—AUTHOR'S BLIND, WITH SHEET METAL FOR ROOF AND PLANTAIN LEAVES FOR SIDES. WATER LEVEL NOW ABOVE WOODEN PLATFORM; YOUNG HAD LEFT NEST THREE DAYS BEFORE.