ERRATA.

Page 12, lines 16 and 17, for *one* hundred read *three* hundred and for *one thousand* read *six hundred.*

Page 17, line 2, dele first letter in the line.

Page 168, line 12, page 177, lines 13 and 14, and page 271, line 10, for *Lemna trisulca* read *Spirodela polyrhiza.*

Page 209, line 2 of foot-note, after *but* insert *represents.*

Page 256, line 7, and page 266, line 19: *snowi* n. s. has been shown to be *hieroglyphica*, ♂.

Page 257, insert as line 8 as follows: -ken to the office produced young in ten days. The

Page 272, line 13, for *P. biguttatus* read *Pompilus biguttatus.*

Page 278, Plate V., 16, after *view* insert as follows: *a*, mentum; *b*, labial rudiment; *c*, maxillary palpi; *d*, maxilla; *e*, labrum; *f*, antenna; *g*, eye; *h*, mandible.

Page 286, line 11, drop initial *the* one line.

Page 386, line 1, for *Comstocki* read *Comstock.*

Page 399, line 17, for *specimens* read *specimen.*

Page 411, line 10, for *Michaelson* read *Michaelsen.*

Page 441, line 3 from bottom, for *66* read *68.*

Page 445, line 10 from bottom, for *57* read *58.*

Page 466, line 1 from bottom, for *Cypria* read *Cypris.*

ARTICLE III.—*The Life History and Distribution of the Prothonotary Warbler in Illinois.* By W. E. LOUCKS, PEORIA, ILLINOIS.

INTRODUCTION.

During the latter part of the year 1892, Dr. A. C. Murchison and the writer issued circulars to some two hundred persons in the State of Illinois who were known to be interested in ornithology, soliciting their coöperation in ascertaining the distribution of certain birds in this State. Though at first the response was very light, it has since proved highly gratifying, far exceeding expectations. The object in view was to obtain by means of coöperative labor the present range of certain species of birds in Illinois, and to issue monthly reports, based on the contributors' notes and such information as could be obtained from lists and catalogues, both state and local. By January 1, 1893, we had the assurance of aid from about forty ornithologists, taxidermists, and collectors residing in Illinois, or in adjacent states, in close proximity to the Illinois line. Through the kindness of Mr. Frank B. Webster, the first paper, by Dr. A. C. Murchison, treating of the long-eared owl, appeared in the February number of the *Ornithologist and Oölogist*, together with a reference map, an incomplete list of the contributors' names, and a few introductory remarks by the writer. Up to January 1, 1894, articles on the distribution of the long-eared owl, Cooper's hawk, bobolink, mockingbird, black-crowned night heron, and yellow-headed blackbird, had appeared in the above magazine.

In preparing the present paper, the seventh in the series, the writer has relied chiefly on the notes of his correspondents, especially in that portion treating of

the distribution of the warbler. He therefore has the pleasure of acknowledging his indebtedness to those who have contributed, and thanks each one for assistance received and courtesy shown. He feels under especial obligation to those along the Illinois River, Dr. W. S Strode, W. S. Cobleigh, B. F. Bolt, and R. M. Barnes, Esq., who have so kindly given him their time and willing aid. Nor should the valuable papers of Mr. O. Widmann, of Old Orchard, Mo., be forgotten, nor the kindness of Prof. S. A. Forbes, in the loan of lists and in assistance rendered.

LIFE HISTORY AND DISTRIBUTION.

A most attractive and abundant bird in certain portions of the Mississippi Valley is that beautiful feathered gem, the Prothonotary Warbler. Its biography, prior to the last few years, has been somewhat erroneous and fragmentary, the bird being to many only a dried skin in the cabinet drawer.

The subject of the present sketch is a difficult one to treat; and notwithstanding the copious notes so generously furnished me by my correspondents, and my own careful observation, it is with considerable hesitation that I begin this paper. This warbler is so at home in the prevailing river bottoms of the State, that ample opportunity is offered for a thorough study of its habits; and yet the most versatile pen could never portray the natural elegance, the charming grace, and the exquisite beauty of this fascinating swamp warbler, as it appears in the willow swamps of Illinois. I feel the impossibility of doing my subject justice, and this bit of biographical sketch is presented, not as a complete and final result, but merely as material for future elaboration.

To one unacquainted with *Protonotaria citrea* its distribution might seem peculiar; but a study of the topography of the country in relation to the bird's geographical range, will reveal the cause of the irregularity.

Rivers, lakes, or ponds bordered with willow swamps, are essential to its presence; hence it is not surprising that in great tracts of Illinois the bird is wanting, while in adjoining portions it may be present in great numbers.

Formerly Illinois was a typical prairie state, but the rapid advance of civilization has converted the rolling prairies into cultivated farms, has dotted the land with villages and cities of wondrous growth, and has utterly eliminated the characteristics of the western prairie. The original timber is restricted chiefly to the river courses and to precarious growths along the smaller streams. The river bottoms, lying as they do in many places between high and sheltering bluffs, and well watered by inundations and the numerous tributary streams, prove the richest portions of the State in vegetation. Their elevation varies from one hundred to one thousand feet above the sea, gradually increasing northward, the country also assuming a more rugged character, until, finally, the southern type is lost altogether. As I have stated, these bottoms are exceedingly rich in vegetation, especially in those lowest portions bordering the rivers, where are found vast willow swamps and immense tracts of huge timber, standing through the greater part of the year in black and sluggish backwaters, and in many places extending over a number of miles. These tracts are the home of the prothonotary warbler. Probably in no other locality in the great Mississippi Valley is this warbler found in greater abundance than in the timbered swamps along the Illinois River, and in southern, southeastern, and western Illinois. Although a common and characteristic bird in these localities, in those parts of the State wherein no suitable environment for its nidification exists, the prothonotary, or golden swamp warbler, as it is frequently and appropriately called, is extremely rare. Its northern range has never been exactly stated in any of the standard works. Only by a comparison of local lists can this be authentically ascertained or the distribution of the bird definitely traced.

When migrating, the great Mississippi Valley is the highway up which these transient warblers pass, until, finally reaching the mouth of the Ohio, the hosts separate, immense numbers traveling up the latter stream, and the rest, perhaps the majority, continuing up the Mississippi. Many of those passing up the Ohio Valley find summer homes along its numerous tributaries and around the many sloughs, bayous, and lagoons in southern Illinois; while the rest, pushing on, deviate from their course only at the mouth of the Wabash River. But few, if any, continue up the Ohio, there being comparatively no attractions for them in its valley east of the Wabash. In the lower valley of the latter stream the prothonotary warbler is exceedingly abundant, inhabiting the timbered bayous and lagoons, the cypress swamps, and the willow-environed lakes and ponds. Mr. Wm. Brewster's account of this warbler in Wabash county, undoubtedly the most elaborate biography of this species yet written, gives some idea of its abundance in this attractive locality.* Mr. E. W. Nelson also gives it as a common bird in the same locality in his excellent paper, "Notes upon Birds observed in Southern Illinois between July 17 and September 4, 1875."† As far north as Danville the bird appears to be common, as Mr. G. C. Pearson reports it as well represented in that vicinity. In a recent letter, Mr. J. H. Hitt, of Indianapolis, Ind., informs me that the warbler is quite rare there, only one nest having been found, and that at New Castle. It extends its migration up the Wabash River to certain points in Indiana, although at present it appears to be very sparingly distributed in that State. The bird is considered a "rare summer resident" in Carroll county, Ind., by Mr. B. W. Evermann.

Although great numbers of this species pass up the Ohio, and thus to the Wabash, undoubtedly the majority continue up the Mississippi, some branching off at the Kaskaskia and Missouri, immense numbers

*Bull. Nutt. Ornith. Club, Vol. III. (1878), p. 155.
†Bull. Essex Inst., Vol. IX., p. 34.

at the Illinois, and the rest traveling north at least to 41°. In the summer of 1875, Mr. E. W. Nelson found it a common bird at Anna, Union county, Ill., but at Cairo, just south of Anna, he did not find it so, as he says: "Very uncommon, probably owing to the late high water. Only a few were observed about the borders of lagoons in dense bushes."*

Mr. Philo Smith, Jr., writes that he has found this warbler in abundance in certain localities along the Okaw River, and also in St. Clair and Calhoun counties along the Mississippi. From a most interesting letter from Mr. Louis Fuchs, of Belleville, Ill., I extract the following: "In 1849, I commenced collecting here for a French firm. My particular attention was to the golden swamp warbler drawn on account of his peculiar and sedate habits, and no inclination to observe danger ahead. I found him and nests only in the neighborhood of streams. (This was Kaskaskia River, at that time very abundant; more so near Green River, Kentucky.)" In his own locality (Belleville) he considers the warbler a very rare summer resident, having procured only two specimens within five years. Mr. Fuchs, with his forty-four years' experience with this bird, might reveal some interesting facts concerning it, and the writer regrets that the manuscripts are so brief. The bird is undoubtedly abundant along the Kaskaskia for some distance north. In a recent communication, Mr. E. F. Steinhaur, of Vandalia, informs me that the prothonotary is an abundant summer resident along the Kaskaskia in his locality, and that there is a great deal of rich bottomland and quite a number of small lakes in the vicinity.

The bird is given as an abundant summer sojourner in Madison county, by Mr. J. Hurter,† and is reported by W. L. Jones as an abundant summer resident around St. Louis. In a valuable communication from Mr. O. Widmann, of Old Orchard, Mo., is the following:

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*Bull. Essex Inst., Vol. IX., p. 52.

†Ornithologist and Oölogist, Vol. IX., p. 86.

"Protonotaria is a denizen of the wooded borders of lakes, and it does not matter whether they are in the midst of the deep forest or only fringed by a few rows of willows, provided that the bird finds a suitable hole for a nest. It is one of the most abundant birds in the swampy lands of S. E. Missouri, where it was apparently in full force and pairs, visiting tree holes as early as April 12. Around St. Louis, in ordinary seasons, it does not become numerous before the last week of that month."

As far north as Muscatine, Iowa, the prothonotary is an abundant summer resident. Mr. E. S. Currier has found it breeding commonly in the vicinity of Keokuk; it is abundant near Warsaw; and Mr. C. P. Fore writes me that the bird breeds around the mouth of the Des Moines River. From Mr. D. L. Savage, of Salem, Iowa, I have the following: "I have found it here about the middle of May, but have never found it nesting in this county, although I have no doubt but that it does in favorite localities, as it nests in the adjoining counties, Lee county especially, which borders the Mississippi River and has many favorite localities for this warbler." A large and valuable series of eggs has been taken near Burlington, Iowa, many of which are now in the possession of J. P. Norris, Esq., and are described by him in the *Ornithologist and Oölogist* (Vol. XV., Dec., 1890, pp. 177–182). An interesting article by Mr. O. C. Poling, of Quincy, Ill. appeared in the same publication* in 1887, in which, of the bird in his locality, Mr. Poling writes: "The Golden Swamp Warbler (*Protónotaria citrea*) is perhaps the most abundant bird in the bottom-lands on either side of the Mississippi for about twenty miles north of Quincy, and in Missouri, it is most plentiful just across the river."

Mr. B. H. Wilson has found this species breeding abundantly in the willow swamps near Muscatine, Iowa, but he considers the bird a rare summer resident at

*Vol. XII., p. 160.

Davenport. The comparative absence of the species in the vicinity of Davenport would seem to indicate the scarcity of suitable places for nidification, but, unfortunately, data is meagre from this point, and having never investigated the locality in question, I can give nothing further. From Davenport to the northern part of the State, I have no information whatever, which will necessitate our leaving the Mississippi and tracing its distribution elsewhere.

Retracing our steps to the mouth of the Illinois, we find the golden swamp warbler one of the most abundant birds in the rich bottom-lands of this river. It is reported by R. M. Barnes, Esq., as a very common summer resident as far north as Lacon, but the writer has found it considerably north of this. South of Lacon, the bird is exceedingly plentiful in the prevailing willow swamps, and around the numerous small lakes and lagoons which are found bordering the river. Dr. W. S. Strode writes that they arrive at Thompson's lake about May 1 to 10, and that they have greatly increased in the last four or five years along the Illinois and its tributaries. It is reported from the vicinity of Duck Island and Spring Lake as very abundant, by W. S. Cobleigh; and also from Peoria by B. F. Bolt, who has made some valuable observations on this species. The writer has found the prothonotary warbler very plentiful at all points along this river as far north as Senachwine Lake.

About fifty miles north of Lacon, the prothonotary seems to decrease in numbers somewhat abruptly. From Ottawa, Mr. A. Hamfeldt writes: "The prothonotary warbler is quite unknown hereabouts. I saw only one two years ago in May, and this must have been only a straggler." Evidently the limit to its abundance on the Illinois is reached a little south of this point, the essential bottom-lands and willow swamps being here practically exhausted. Although with us the vicinities of Ottawa and Davenport are apparently at the extreme northern limit of its breeding range, the warbler certainly appears much

farther north as a summer resident. Mr. George C. Canttwell, in "A List of the Birds of Minnesota," says of this species: "Common along the Mississippi in the south, as at Redwing and La Crescent, breeding at both places."* These points are certainly localities well suited to the bird, as it passes over a great amount of territory in reaching them and yet remains at few, if any, intervening points. A record was made at Shiocton, Outagamie county, Wis., May 4, 1882, a male bird being taken there by F. L. Grundtvig.†

A *rara avis* is the prothonotary warbler in northern Illinois, the few records we possess being only of stragglers. Mr. J. E. Dickinson, of Rockford, writes that he has never met the bird in that part of the State. It is not likely that this warbler will be found in this part of Illinois, as the elevation here, especially in the northwestern corner, including Jo Daviess and Stephenson counties, is the highest in the State, rising some two hundred feet above the surrounding country, or about 1,250 feet above the sea.

The prothonotary warbler is given as a rare summer visitant in Lake and Cook counties by Mr. E. W. Nelson, and he mentions taking two specimens in that region in the summer of 1875.‡ Mr. W. E. Pratt informs me that he has found no suitable locality in either of these counties for the prothonotary warbler. Mr. B. F. Gault, of Glen Ellyn, Du Page county, gives me but one record, May 13, 1893, as does also Mr. L. W. Nichols, of Somonauk: "June 27, one male bird." These two records were the only ones which I procured out of the notes of fifteen correspondents in this portion of the State.§

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*Ornithologist and Oölogist, Vol. XV. (1890), p. 136.

†Bull. Nutt. Ornith. Club, Vol. VIII. (1883), p. 68.

‡"Birds of Northeastern Illinois," *Bull. Essex Inst.*, Vol. VIII., p. 98.

§According to a note received June 9, 1892, from Mr. Martin D. Atkins, of Irving Park, a fine male of this species was shot at Fourth Lake, in Lake county, Illinois, about April 27, 1892. The bird was alone in the willows bordering the lake, and no more were found on thorough search. The specimen is now in the collection of the Jefferson High School in Chicago.—S. A. F.

I am informed by Mr. W. E. Pratt, that he found this warbler in great abundance along the Kankakee River, near English Lake, Ind.; and Mr. H. K. Coale found great numbers of this species some sixty miles southeast of Chicago, in Stark county, Indiana, along the Kankakee, which river he regards as the northern limit of its breeding range.* Mr. A. W. Butler, in his "Notes on the Range of the Prothonotary Warbler in Indiana," an interesting article published in the *Ornithologist and Oölogist* (Vol. XIII., March, 1888), propounds the question as to what route is chosen by the birds in reaching the locality in which Mr. Coale found them. He speaks of the warbler in this region as follows:

"For several years, since making the acquaintance of this attractive bird, Mr. Coale has visited the Kankakee swamps in Stark county. Each year the warblers appear to be as common and as ready to be studied as when he first saw them. The northward range of this species, however, does not stop here. Mr. Coale, in his persistent searchings, has traced it to the shores of Lake Michigan, along which he has occasionally taken it both in Indiana and in Illinois." He continues, "Whether these birds pass the narrow and almost imperceptible division between the drainage of the Wabash and the Kankakee, or also extend their semi-annual pilgrimages along the latter stream, remains to be determined. It seems certain, however, that they must pass over the indistinguishable watershed between Kankakee Valley and the Lake Basin, the waters of which, at certain seasons of the year, find common feeders in many swamps and lakes in northwestern Indiana. No barriers of any consequence being present, it seems probable that the Wabash Valley is the route by which this species is distributed over the region considered."

So far, the distribution of the prothonotary warbler has been traced only along the courses of the larger rivers. Were we to follow it up the numerous tributaries of these larger streams, its range would be consid-

*Nat. Hist. Surv. Ill., Vol. I., pp. 199, 120.

erably increased and, in some instances, penetrate far into the interior of the State. Preëminently a bird of the timbered creek and river bottoms, its geographical range is coextensive with them, the records of its occurrence elsewhere being limited to an occasional straggler.

The arrival of these birds in spring is scarcely noted by the casual observer. No heraldic song proclaims that they are here, and were it not for their bright, gleaming color among the trees, they would be entirely unobserved.

In the latter part of April or the first of May, as the locality may chance to be, if we paddle the canoe along the willow-fringed banks of the river, or among the trees in the back-water, we shall be very sure to find a few early-arrived prothonotaries—probably old birds eager for their return to a northern clime, or perhaps hasty and impatient migrants, far in advance of the hosts which are to follow, but shy and silent, seemingly ashamed of being so premature. Their numbers rapidly increase, however, as that wonderful and mysterious instinct which prompts birds to semi-annual migration brings hosts of them northward and drops them here and there among the willows. Timidity wears away as their numbers increase, and they may be seen now clinging and creeping, in creeper-like manner, on moss-covered stumps and trunks of trees, sometimes head downwards, now expanding their steel-blue tails, and greatly contrasting with a background of bright green moss or gray-colored bark. The males, as is customary with most mirgatory birds, arrive first, the females making their appearance shortly afterward.

I have no data of their arrival in the extreme southern end of the State. Mr. O. Widmann writes that by the last week in April they become quite numerous around St. Louis, Mo. It arrives at Mt. Carmel, Wabash county, Ill., about April 23, according to Mr. Robert Ridgway;* and April 19 to 27 is given by Mr. Wm. Brewster, in his charming account of this bird in Wabash county, as the period of spring arrivals.† In central Illinois, the last

*Nat. Hist. Surv. Ill., Vol. I., p. 32.
†Bull. Nutt. Ornith. Club, Vol. III., pp. 154,155.

days in April generally bring a few of these birds, the bulk of them arriving, however, between May 1 and 10. It is reported from Davenport, Iowa, about the 10th of May, and I find a record of May 3 for its arrival in the vicinity of Burlington, Iowa.* Northward, the arrivals are a little later. Mr. H. K. Coale found a few of these birds in Stark county, Ind., on the 11th of May, but they became more abundant on and after the 18th.†

Their departure in the fall is as mysterious and as quiet as their arrival in the spring. There seems to be a gradual falling off in their number after the breeding season, until but few are seen, and when these depart, the vacancy caused by their absence is hardly perceptible. The last and lingering individuals take leave in central Illinois about the first or middle of September, but whether they linger in the southern part of the State or pass directly south, I am unable to say.

Soon after the arrival of the females, mating begins, and at this time they are the most interesting to observe. Many a love match takes place in the willow woods. Should another male intrude upon the scene, a conflict is certain, and should the intruder be victorious, he immediately makes love to the fair one, and indifferent as she is, it is readily accepted. These conflicts are frequent between the male birds, even though no female be at hand, the males seeming to have a fighting propensity whenever they meet. I have often stopped rowing my boat to watch a couple of them battling in mid-air, and not until they had fallen into the dark, murky-colored water below, did they cease, and dart off in opposite directions, apparently much startled by their sudden plunge. At other times, a mischievously inclined little fellow will dart recklessly at some unsuspecting one, who, being startled by the onset, will at once retreat. The pursurer gives chase, and away they go, not far apart, over the tree tops, through the underbrush and thickets, now darting directly along the surface of the

*U. S. Dept. Agr., Div. Economic Ornith., Bull. 2, p. 239.
†Nat Hist. Surv. Ill., Vol. I., p. 119.

water, then among the trees, seemingly to illuminate the dark shadows beneath, until they are lost to view and one wonders at the finale. The courting of the male bird is a pretty sight. Swelling with pride in his bright, golden coat, this little lover in feathers presents his case in the most loving and winning manner, hovering around or perched near the object of his adoration with spread wings and tail extended, fairly outdoing himself in his efforts to make an impression. She, with bewitching indifference, seems to care but little as to the outcome, but finally matters are amicably settled between them and household duties are almost immediately commenced. The birds, especially the males, have a pretty habit of carrying their tails spread, much in the manner of the redstart. When the sexes meet, a tender note, that of salutation or recognition, is barely audible.

The most difficult feature to describe in the biography of a bird is its song. Even the most elaborate treatise fails to bring to the unaccustomed ear a true conception of it, and as I pen these lines, I feel my utter inability to convey to the reader's imagination the notes of the prothonotary warbler. True, they do not vie with the melodious ditties of some other woodland songsters, but they are very striking, even pleasing, and when once heard are not easily forgotten. Six or, sometimes, seven syllables, uttered in rapid succession but with an instantaneous pause after the first note, constitute the regular song. It much resembles, *peet, tsweet, tsweet, tsweet, tsweet, tsweet, tsweet*, uttered in a ringing or penetrating tone and on a tolerably high pitch. At a distance, it much resembles the notes of the solitary sandpiper, and I have frequently found it somewhat difficult when the two species were in the immediate vicinity, to distinguish between them: but upon a closer approach, the resemblance is lost, the penetrating ring in the warbler's notes being then audible. The male is an incessant singer, caring not for the elemental conditions nor for the time of day. He is as likely to be heard in the early morning as at noon or in the evening Frequently he will sit amidst the green

foliage, dividing his time between adjusting his plumage and singing sweet little ditties to his mate, she, more than likely, being just within the entrance of her domicile on her eggs. Occasionally he remains perfectly motionless on his green perch, probably deep in thought or in a reminiscent mood, but suddenly bursting out with *pee'*, *tsweet*, *tsweet*, *tsweet*, *tsweet*, *tsweet*, he darts away in search of some fat unsuspecting spider for his better half.

The notes of alarm, anger, or distress, are somewhat sharp, being compared to those of the large-billed water thrush by Mr. Wm. Brewster. According to this author, there is another song, which might be termed a love song. He describes it as follows: "In addition to the song above described the male has a different and far sweeter one, which is reserved for select occasions,—an outpouring of the bird's most tender feelings, intended for the ears of his mate alone, like the rare evening warble of the oven-bird (*Siurus auricapillus*). It is apparently uttered only while on the wing. Although so low and feeble as to be inaudible many rods away, it is very sweet, resembling somewhat the song of the canary, given in an undertone, with trills or 'water-notes' interspersed. The flight during its delivery is very different from that at all other times. The bird progresses slowly, with a trembling, fluttering motion, its head raised and tail expanded. This song was heard most frequently after incubation had begun."* I cannot remember ever hearing this song. It certainly must be quite rare, and, as Mr. Brewster says, kept for select occasions. After nesting, the males gradually stop singing, although a few persistent ones may be occasionally heard quite late in the season.

The fast decaying driftwood, tossed among the trees by the surging waters of a spring freshet. and left floating or partly submerged in the stagnant pools or backwater, contains myriads of insects upon which the pro-

*Bull. Nutt. Ornith. Club, Vol. III. (1878), p. 157.

thonotary warbler feeds. Now he may be seen flitting from log to log, pulling some unfortunate spider from a crevice, and scanning every dark-looking cranny in search of the coveted bug; then away he darts to a water-soaked stump, where, in spiral like manner, he winds his way to the top, frequently turning his golden breast to the sun, and glancing downwards as if to catch a glimpse of himself in the mirror-like water beneath.

These birds confine themselves almost exclusively to decayed stumps and driftwood in search of food, but occasionally venture up the trunks of trees and hunt for insects concealed in the bark. I have never observed them feeding among the leaves, as is the habit of many of our warblers. The flight of the bird is swift and decided, slightly undulating when crossing an open or flying for some distance among the trees.

There are two kinds of bottom-land in which the prothonotary breeds: the willow swamp consisting entirely of a heavy growth of large willows, interspersed here and there with rotten stubs; and the bottom-land covered with a forest of elm, oak, cotton-wood, and maple, with an occasional willow and many decaying stumps. While both of these are acceptable to the warbler for nesting purposes, I am inclined to believe the latter situation is the more often chosen. Throughout the greater part of the year, these bottoms are overflowed, making it impossible to visit them without the aid of a skiff or canoe.

As previously stated, soon after mating the birds begin to build their nests, usually, in central Illinois, about the middle of May, although many pairs do not begin until the latter part of this month. I have found nests under construction on the 12th of May, but this is exceptional in this part of the State. Mr. Wm. Brewster says in his account of this bird, that Mr. Robert Ridgway found a nest with four fresh eggs on April 27, near Mt. Carmel, Ill. He considers this an exceptionally early date. The greater portion of the nests Mr. Brewster found in the same locality between May 8 and 12, con-

tained fresh eggs.* I find that the precise time of nest-building along the Illinois River depends upon the water level, the bird being seriously delayed some seasons. The few cavities that are not submerged are quickly taken, and birds not so fortunate are compelled to wait for the receding water, unless, perchance, they steal a site from another pair.

A typical nesting site is in the cavity of an old water-soaked stump, either standing in or projecting over the water. Occasionally stumps containing nests are found on comparatively dry land, but in these instances the nests were probably built at high water, which, upon receding, left the stumps high and dry. The stump selected is generally a short, smooth one, rotten, and so water-soaked that it can easily be torn asunder with the fingers. The heights of the cavities vary from a few inches to twenty-five feet or more, the extremes being exceedingly rare. In fact, nests more than ten feet above the water must be considered exceptional. The only reasonable conjecture I can offer for the high positions, is that they are due to the receding water. A low position is preferred by the birds, but if one is chosen, a sudden inundation often causes the destruction of the nest. I have frequently found submerged or partly submerged nests, with the distressed parent birds flying around. The birds seem indifferent as to the condition, depth, or shape of the cavity. Every conceivable kind of a hole or crevice to be found in stumps, stubs, or snags, from a rent in the side of a stump to a deserted woodpecker's hole, is acceptable. Generally, however, the selection is a cavity once occupied by a chickadee or small woodpecker, but now long forgotten by its previous owner, and open to any tenant chancing along.

In the construction of the nest, the female bird works alone. I have never yet seen a male really aiding in this task. He frequently accompanies his mate on trips after building material, hunting here and there for choice pieces

*Bull. Nutt. Ornith. Club, Vol. III. (1878), p. 158

of moss, or climbing a wild grape-vine with the view of getting a strip of bark, but always failing to bring it home. However, we must not censure him too severely, for he apparently takes great interest in the construction of the nest, watching for the return of his mate and accompanying her to the entrance of their domicile, perhaps following her within—but here we are intruding upon their private affairs. If the cavity be deep, it is filled up to within a few inches of the entrance before the nest proper is begun. The materials used for this purpose are various, probably those most convenient or accessible. In one case, I took from under the nest proper a quart, or more, of moss which had been utilized in filling a cavity nearly a foot deep. The foundation of a typical nest is composed largely of green moss, intermixed with pieces of dead leaves and rubbish. A few nests that I found had a foundation made entirely of large burrs and a little moss. A female was once timed to ascertain the speed she made in gathering material from a moss-covered tree trunk some seventy-five or a hundred feet distant from the cavity in which she was building. She was very active, and evidently desired to get the cavity filled as quickly as possible. No time was wasted in idle loafing or wandering, for she went from tree trunk to stump, carrying huge bunches of green moss, depositing them in the cavity, and returning within a minute. Frequently she made it in less time. On every trip, she would alight on a small limb of an adjacent tree before entering the hole, and utter a *tchip* now and then, even though her bill was full of moss. Almost immediately after her entrance, she would reappear, apparently only dumping the moss on the bottom, as she seldom remained within long enough to arrange it. Very unsuspicious of us, she worked steadily for the half hour we remained. Where her husband was, I am unable to say, for we saw nothing of him during our sojourn.

The materials in the nest proper are various. Bark strips, fibrous roots, pieces of dried grass, small weed stems, bits of decayed wood, a few wisps of straw, in fact

almost any bit of vegetable rubbish the builder can find near at hand may enter into the make-up of the nest. The moss is frequently lacking; sometimes found only in small quantities; and at other times in large bunches. The lining is chiefly of rootlets or fine dry grass. The nest is generally very compact, although sometimes so loosely put together that it falls apart on removal from its resting place. The shape and size correspond to that of the interior of the cavity. Some nests, taken from particularly deep holes, are five or six inches deep and from three to four across. The interior of an average nest is well-rounded and cup-shaped, from one to one and a half inches deep, and about two in diameter. A nest taken from a very shallow cavity will prove a very flat affair, frequently not more than a lining. The top of the nest is, in nearly every case, within three or four inches of the entrance, and often the bird can be seen sitting on her eggs. At least a full week is consumed in building the structure, and a few days intervene between its completion and the deposition of the eggs.

Within the last few years I have found and heard of some very curious nests of this warbler, which were peculiar either in their position or construction, or because of the materials used. I have read of its nesting in an outbuilding, and also in a tin can. While this is certainly unusual, it is not to be wondered at, for this species is as apt to deviate from its natural mode of nest-building as are others which have been found so doing. I have never noticed a prothonotary around a house, but they are frequently or continually seen around the ice-breakers of one of the old wagon bridges near Peoria. These may possibly be only wandering males from an adjacent willow swamp, still I should not be surprised to find a nest in one of those old piles. Mr. Otho C. Poling mentions finding a nest in a bridge pier near Quincy, Ill.*

Two curious nests, heretofore described by me,† are certainly worth noting here. One, placed in a cavity of a dry

*Ornithologist and Oölogist, Vol. XII., p. 160.
†Oölogist, Vol. X., p. 20.

stump, was composed partly of cast-off snake skins; and the other—the finest and most beautiful specimen that I have ever seen—was built in a cavity of an old water-soaked stump, the entrance of which was within a few inches of the water. This nest was composed entirely of bright green moss, kept fresh by its damp and low situation. It was slightly lined with grass, and contained five beautiful eggs. A nest was found several years ago about twenty-five feet above the water, in a cavity of a live willow tree. Another was discovered in a bowl-shaped cavity in the top of a small stub, the entrance being at the top. Occasionally nests are found in huge stumps two or three feet in diameter, the bark of which still remains, environing a mass of decayed and crumbling wood. Under this shell-like covering, in pocket-shaped cavities, I have found their nests. In no case, however, should I have discovered the nest, had not the golden-colored head of the owner popped out of the small round orifice in the side of the bark.

As previously stated, a few days elapse between the completion of the nest and the deposition of the eggs. As far as my observations go, an egg is laid daily until the clutch is complete. There has been considerable controversy regarding the number of eggs laid. Four, five, and six are the usual numbers, sets of seven being occasionally found, and sets of eight and nine in extremely rare instances. Many regard the set of seven a rare find, but I do not consider it so, having found it frequently around Peoria. Mr. W. S. Cobleigh informs me that he found a set of ten eggs in the Mackinaw Creek Bottoms. This is the largest clutch that has been reported to me. The first sets of the season are probably the largest, consisting of five, six, or seven eggs; the second laying is of four, and frequently five eggs; and if a third, it is very small. During the month of July, I have found nests with one, two, and three incubated eggs, undoubtedly the third clutch of the year, and probably belonging to birds repeatedly robbed of their previous nests. If unmolested, the warbler generally raises two broods in

a season, but if deprived of their first and second sets, a third is deposited. In the series of seventy sets of prothonotary warblers' eggs described by J. Parker Norris, Esq., in the *Ornithologist and Oölogist* (Vol. XV., pp. 177–182), nearly all of which were collected in or near the State of Illinois, there are thirty-two sets containing six eggs each, eighteen containing five, fifteen of seven, three of four, and two of eight.

The coloration of the eggs is a broad subject, and were I to do it justice, the text would be voluminous. I have examined many, and have found a limitless variation in their markings. I find two, three, four, and even more, types of coloration in a large series of eggs, and have selected for description, from a series of my own, seven sets fairly representing these types.

Set. I. Six eggs. Ground a glossy white, blotched at larger ends with chestnut and lilac. Rest of surface more or less spotted, speckled, and seemingly streaked, with light chestnut. Two of the eggs have the larger ends entirely covered with large blotches of rich chestnut, and another has a large blotch of light brown overlapping lilac, producing an intermediate color.

Set. II. Six eggs. These eggs resemble those of a wren in their markings, the whole surface being marked with light chestnut and lilac, not blotched, but so finely speckled that the ground of the larger ends is nearly obscured.

Set III. Four eggs. Ground glossy white, covered with blotches of pale lilac and light chestnut. The former are large, lilac being the predominating color on two of the eggs. The chestnut is streaked and daubed on in very small blotches, one of the specimens, however, having two large chestnut blotches on one side. The colors seem to run into each other, giving the eggs a daubed appearance.

Set IV. Four eggs. These are beautiful eggs. The colors are a rich chestnut and a shade that is nearer lavender than the lilac of other specimens, a purple effect

being produced where the two colors combine. The markings extend over the whole surface in small blotches and spots, and at the larger ends are so confused that the ground is partly obscured.

SET V. Six eggs. Ground glossy white, spotted, speckled, and minutely blotched with varying shades of chestnut and lilac. The markings are thickest around the larger ends, but they are defined, and nowhere do they obscure the ground by blending.

SET VI. Four eggs. These specimens are not pretty, but are smeared and blotched with light brown and buff, the ground, where visible, being of a dirty white. Very little, if any, lilac appears.

SET VII. Four eggs. These eggs have comparatively few markings. Each of them has a wreath around the larger end and a blotch on one side. The wreath in two of the eggs is quite distinct, and the blotch quite dark and bold, the latter being dark lilac overlaid with dark chestnut, and the former light chestnut and pale lilac. The third specimen is semi-wreathed, and has a trace of the blotch on one side; while the fourth has a distinct wreath of lilac blotches, and the china-white background sprinkled all over with light chestnut. The ground of the first three is of a pinkish cast, the slight marking being at the larger ends.

I have never found the markings to consist of more than two colors, lilac and chestnut, each varying in tints and shades in the different eggs. The lilac markings are often styled "shell markings" from their appearance of being within the shell, and are frequently so dim that they are barely perceptible. In the majority of specimens having blotches, the chestnut overlaps the lilac, producing a purple effect.

The typical shell is china white, very glossy, and quite thick and strong. Occasionally a calcareous shell is found, but these are always of yellowish cast, and very slightly, if at all, marked with pale lilac. A fresh egg is of a beautiful pinkish color, which is lost upon blowing the specimen. Albinism frequently occurs. I have found

numbers of white specimens, and Mr. R. M. Barnes, of Lacon, Ill., reports taking a whole set of white eggs.*

The endless variation in the coloration of the eggs is only equaled by the vast variation in their sizes and shapes. The extreme measurements of an exceedingly large series of these eggs are .62 and .79 in length, by .50 and .62 in width. In the *Ornithologist and Oölogist* (Vol. XIV., p. 38), R. M. Barnes, Esq., writes: "I have in my collection one 'runt' egg of this species that is not larger than a pea. It measures .48 x .40. The other four eggs in this set average .73 x .55. The 'little fellow' is in every way as perfectly marked and formed as any of its larger brothers."

As a rule, the eggs are blunt at the smaller end; and while some are quite elongated and others approach a spherical shape, probably the greater number are ovate. One egg that I found in a set of four was ovate pyriform, the other three being normal.

Incubation is carried on entirely by the female, and extends over a period of ten days or two weeks. During incubation the male spends the most of his time exploring every nook and crevice in the vicinity, often meeting another husband on a similar foraging expedition. He keeps his mate well supplied with food, but should there be any spare time, he indulges in singing. After the young are hatched, both birds are kept continually busy filling the hungry little mouths with insect delicacies. After the nesting season, the birds are usually found in small flocks, consisting of the parents and the young, and so they remain until their departure.

Frequently these birds are found breeding in colonies, and many nests are found in a surprisingly small area. In some localities there are more pairs of birds than there are holes or cavities to nest in. This scarcity of nesting sites is undoubtedly the cause of the large sets of eggs and double nests that have been found. The set of ten eggs, previously mentioned, taken by Mr. W. S.

*Ornithologist and Oölogist, Vol. XIV., p. 38.

Cobleigh, certainly must have been a double set. I can think of no warbler that lays a corresponding number of eggs. Mr. B. F. Bolt, of Peoria, Ill., found a double nest a number of years ago, the lower half containing seven eggs, and the upper five. I am therefore quite positive that two females will lay their eggs in the same cavity, and that one pair of birds will deprive another of their nesting site, and build another nest over that of the original owner, in localities wherein nesting sites are few. I have never noticed but one published account of such a procedure on the part of this bird. Mr. O. C. Poling, who found double nests and sets of the prothonotary warbler near Quincy, Ill., says:*

"It is also characteristic of this warbler to remain close about the nest at all times to avoid being deprived of its home by some neighboring pair, for there are more birds than nesting places in the localities searched.

"On several occasions a hole would contain a nest and fresh eggs, with still another nest built on top of it, also containing eggs, thus showing that some pair had driven off the first occupants. Several of these two-story nests which I brought home with me got somewhat crushed in packing, and the eggs were found broken within them.

"Still another nest was found, in which two females had laid, containing nine eggs which were of two different types and piled up on top of each other. Both females were near and they appeared quarrelsome during the time I watched them."

Another interesting feature connected with the nesting of the prothonotary warbler is the imposition of the cowbird. It is not universally known or believed that this parasite will enter a cavity to deposit her egg or eggs; but it is not unusual to find one or more eggs of the cowbird in a prothonotary's nest. Mr. R. M. Barnes informs me that he has in his possession sets as follows: two eggs of the warbler and three of the cowbird; three of the warbler and two of the cowbird; four of the warbler

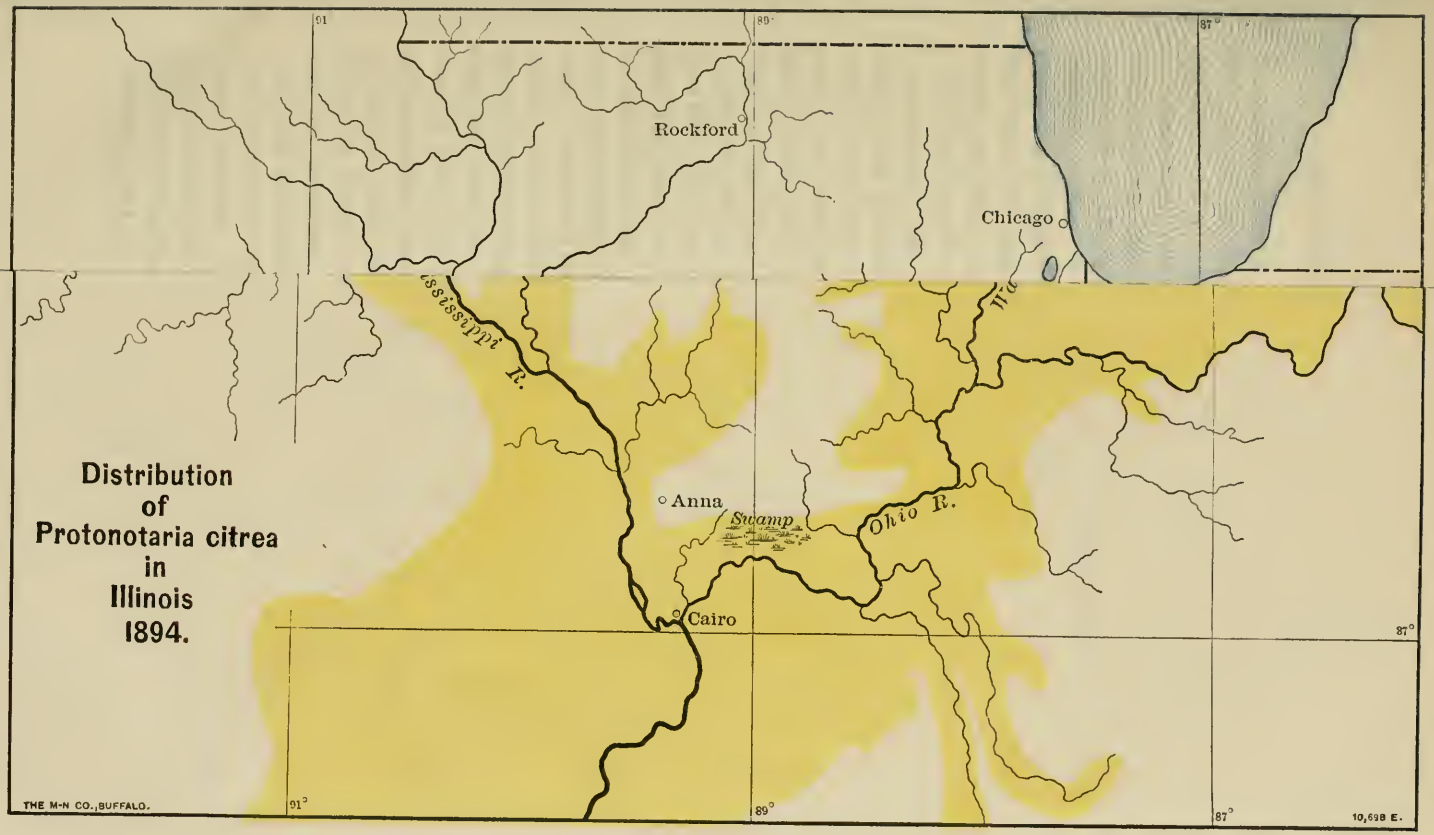
*Ornithologist and Oölogist, Vol. XV., p. 92.

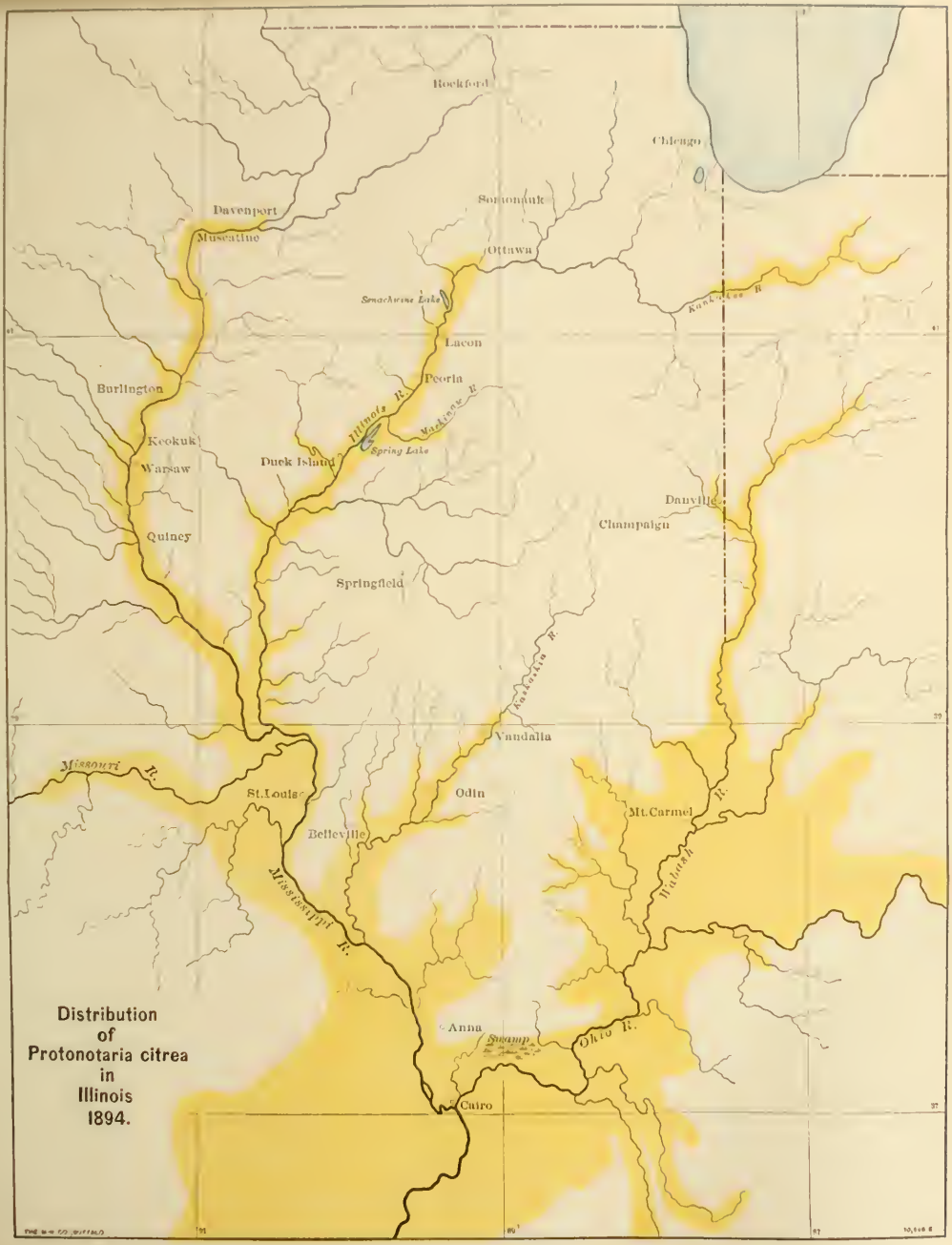
and two of the cowbird; five of the warbler and one of the cowbird. Some have expressed their belief that the cowbird only deposits her egg when the nest is in a large, natural cavity, and that she never enters an excavated hole for this purpose; but the entrances to many of the nests containing the parasites' eggs are so small and round, that apparently only the owners can slip through. How the large and awkward cowbirds deposit their eggs is a question yet to be solved.

The warblers never wander far from the location of their nest, and the song of the male bird can always be heard in the immediate vicinity. In fact, when looking for a nest, I invariably listen for the song, and with a little searching, I soon have the cavity located. When a nest is molested, unless it contains young, the birds are very indifferent and seldom come near. The female sits very closely, and can easily be caught by clapping the hand over the entrance.

Perhaps the only enemies this bird has to contend with, except the egg collectors, are the snakes. I have had many fine sets destroyed by the intrusion of a water snake before the clutch was completed. The first nest of the prothonotary warbler that I ever found, was discovered by seeing a snake crawl slowly out of a hole in a stump with a beautiful egg in its mouth.

A memorable visit was made, a year or two ago, in the congenial company of my friend, B. F. Bolt, to Spring Lake, a veritable paradise for the golden swamp warbler. This lake is one of the many lying along the Illinois River, and has gained the reputation of being one of the finest fishing and hunting resorts in the State. It is situated between the wooded bluffs on the east, and the river on the west, bounded on all sides by miasmatic swamps, luxurious growths of aquatic vegetation, impenetrable and vast in extent, interspersed with heavy willow growths, miniature forests of dead and lifeless trees, in many of which are visible, for a great distance, the bulky nests of the cormorant. Isolated patches of beautiful and graceful trees, some of them venerable forest


Distribution
of
Protonotaria citrea
in
Illinois
1894.
Rockford
Chicago
Mississippi R.
Anna
Swamp
Ohio R.
Cairo
91°
89°
87°
THE M-N CO., BUFFALO.
10,698 E.


Rockford
Chicago
Davenport
Muscatine
Somonauk
Ottawa
Kankakee R.
Lacon
Peoria
Burlington
Illinois R.
Mackinaw R.
Keokuk
Warsaw
Duck Island
Spring Lake
Danville
Champaign
Quincy
Springfield
Vandalia
Missouri R.
St. Louis
Odin
Mt. Carmel
Belleville
Wabash R.
Mississippi R.
Anna
Swamp
Ohio R.
Cairo
Distribution
of
Protonotaria citrea
in
Illinois
1894.

monarchs, give a pleasant diversity to the monotony of this marsh, and afford summer homes to many woodland species. At a low stage of the water, the lake proper is comparatively small in area, and has no outlet save the canal cut some years ago from the river to the lake. Nowhere is the water very deep, in many places not exceeding a foot. Its surface is bordered by a dark, rich carpet of the leaves and blossoms of the water-lily, among the roots of which brilliantly colored sunfish, palatable bass, and the wary pickerel play.

At the time of our visit, the water being at a high stage, the aspect of the country was far different. As we stood early that morning on the high bluffs overlooking the whole river valley, an immense expanse of water met our view. No small lake was discernible, as that and the river had joined as one, covering everything from bluff to bluff except the timber.

Our arrival at the small inn-like hotel the night previous had quite astonished the natives. The month of May was far too early in the season for fishing and too late for hunting, and what else did we desire. The object of our visit being made known, they were equally astonished to learn that we had come for the sole purpose of seeing a cormorant roost. The landlord's wife being busy in getting our supper, we chatted with the men on bird lore and kindred subjects, and soon had the exact location of the roost. By this time a great number of the surrounding farmers had dropped into the tavern, and invariably each one had a cob pipe fixed between his teeth. While in Rome, do as Romans do, so we procured cobs and did likewise.

In the morning, an early start was made. Paddling northward to avoid the driftwood, we struck across a broad expanse of water some two miles distant, beyond which lay the desired roost. The early start had enabled us to reach our goal in a much shorter time than was anticipated, and investigations to that end being completed,

we turned our exclusive attention to the prothonotary warbler, which we found in great abundance.

It was the most attractive inhabitant of these picturesque woods, flying hither and thither, flashing like a golden streak, brightening the whole scene before us, the males making the woods fairly echo with their penetrating notes. All day we idled in our canoe, watching this bird in its native haunts, now and then peeping into a nest to learn of its household affairs, or following one on a foraging expedition. Occasionally one would treat us with a special concert, or two males would exhibit their courage by entering into combat. The females apparently perform all drudgeries in nest building; not once did I observe a male lending the least bit of aid, and yet I have no doubt but that perfect felicity reigned in each household.

Aimless paddling had eventually brought the canoe into a beautiful sylvan retreat, a perfect prothonotarian haunt. Seemingly all avian songsters had centered in this wood, each striving to contribute his mite to the chorus. The monotonous drum of a woodpecker on a sun-bleached limb of a tree, the incessant singing of the warbling vireo, or ditty of the nervous redstart, with now and then the harsh guttural croak of a heron, or the booming of a bittern which had by the inundation been deprived of its abode and was now the occupant of adjacent driftwood, gave a sort of zest to this scene, the home of *Protonotaria citrea*. Above all songsters, the clear, penetrating notes of this interesting warbler were audible, now coming from a point behind and echoed and re-echoed by other individuals throughout the wood. Even at noontide, when otherwise a silent hush prevailed, the oppressive heat seeming to have dampened the spirits of the most ardent singer, the drowsy drone of insects being alone wafted to our ears by an occasional breeze,—even then the persistent prothonotaries still continued the avian concert. We lingered till the waning of the

day, long after the golden sun had sunk in the distant west, and not until issuing stars cast dim reflections in the dark waters beneath did we resume our paddling, loath, though now compelled, to depart from this bird's domain. Nature was hushed in slumber, and not a sound broke the enchanting quiet save the splash of the paddle, the weird hoot of an owl, and the notes of a whip-poor-will in the distance.