

THE DISTRIBUTION AND ECOLOGY  
OF BIRDS IN  
SUCCESSIONAL COMMUNITIES

BY

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A study of the successional communities of the Indian River Marsh was undertaken in an effort to determine the distribution of birds in relation to different types of habitat. Members of the University of Michigan Biological Station class in advanced ornithology and other interested persons participated in the study making a total of eighteen in the party. The study was made on June 28th, 1947 between the hours of 7:00 and 11:30 A.M. Acknowledgement is due Dr. Olin Sewell Pettingill Jr. for assistance in identification and interpretation of the phenomena observed.

The Indian River of the lower peninsula of Michigan is a slow-moving stream of approximately four miles in length. It has its source in Burt Lake and empties into Mullet Lake and much of its length is characterized by sluggish water which gives rise to large areas of dense aquatic vegetation. This study was made at a point approximately one mile from the outlet at Mullet Lake in sections seven and eight of township 35N and range 2W. The area bordering the stream was originally a climax coniferous forest. It has long since been cut-over leaving a second growth of spruce and cedar. However, the marsh habitat has not been subjected to drainage.

The weather conditions prevailing at the time of study were ideal with the exception of a sudden and brief thunderstorm occurring in mid-morning. The temperature was unusually high, the sky clear, and only a very light wind was in evidence during most of the study. Precipitation during the period of the storm was light and persisted for less than thirty minutes.

### The Open-water Community

In the area studied, this community is largely in the form of narrow channels linking the islands of aquatic vegetation. The areas of open water occupy roughly one-fourth of the total area of the river bed and extend to a depth of eight to twelve feet. Submerged aquatic plants are numerous making it productive of a rich and varied fauna of invertebrates.

Although limited time would permit only a few observations on the feeding habits of the marsh birds, many species were noted flying over the open water or swimming on its surface. Such birds as the tree swallow, black and common terns and the black duck obviously use the open channels extensively as feeding areas. Many species of aquatic invertebrates thrive in this environment and provide ample food for the avian fauna. Many insects hover above the water surface and fall easy prey to the tree swallows and other insectivorous birds. Although devoid of nesting or protective cover, the narrow open water channels of the Indian River Marsh function as food-producing areas which are used to some extent by all of the marsh dwelling birds.

### The Floating Plant Community

This normally extensive community is not well defined in the Indian River Marsh. The few pond lilies that were observed were only incidental to other communities and were not numerous enough to constitute a well-defined habitat.

### The Bulrush Community

The bulrush (*Scirpus*) and cattail (*Typha*) communities occurred over large areas of the marsh. Usually a species of sedge (*Carex*) was found in association with the cattails. This quality of emergent vegetation gave ample cover for nesting and supported a rich invertebrate fauna which serves as a virtually unlimited food supply. Due to the character of the stream bottom and wide areas of rather shallow water, the two communities were not sharply delineated as to successional rank. Communities of cat-tail and of bulrush were interspersed more or less at random and the mixing of the two to form an ecotone was of common occurrence, especially near the east shore.

The black tern was the only species found nesting in this community. However, many adult redwings gave indication that they were nesting here and undoubtedly the coot and pied-billed grebe use the cover of bulrushes to hide their nests. None of the above mentioned species were limited to this community showing a capacity for adapting nesting and feeding habits to either the cattail or the bulrush environment. The primary requirement for these birds is evidently for emergent vegetation of relatively great height to serve as protective cover for the nest.

Both of the black tern nests found in the bulrush community were near the open water margin, contained three eggs each and were floating on water two feet in depth. This phenomena of birds preferring to nest near the edge of a vegetational type was illustrated many times in the study.

### The Cattail Community

The dominant bird of the cattail community is the black tern. These birds place their nests near the edge of the vegetation in such close proximity that other species are forced either into the interior or to such portions of the margin not utilized by the terns. These birds ardently defend their nest and territory by diving at intruders and striking them with claw or bill. The finding of an injured young grebe very near the nest of a black tern indicates that this defense is directed against other birds as well as against man.

The nest of the black tern is a floating structure composed of interwoven cattail flags of the previous year reinforced with dead and decaying vegetational debris of many types. The average depth of water where the nests were placed was two feet. One nest found in the cattail community had been built upon a floating board measuring two by eight inches by approximately seven feet in length. Nests containing both eggs and young were found on this date.

Another characteristic bird of the cattail community is the long-billed marsh wren. One nest with young was found to be composed of cattail flags and lined with cattail down. A second nest was located in a cattail-sedge ecotone where use had been made of the smaller sedge leaves in the nest construction. An interesting characteristic of this bird is the male's habit of building a series of dummy nests in the vicinity of the nest being used. These may be virtually complete except for the lining of down. While this, in all probability, is merely an expression of sexual drive at the time of mating, it may serve to decoy would-be predators from the eggs and young.

The single grebe nest examined during the study was located in a cattail community within twenty feet of a black tern's nest. The nest was floating in twenty-five inches of water. Dead cattails had been interwoven to form a structure measuring eighteen inches in diameter. Only a very slight depression was noted. Nests of the pied-billed grebe are commonly found in both bulrush and cattail communities and in this respect, its requirements are similar to those of the black tern. No adult birds were seen although they could occasionally be heard calling from the depths of the marsh.

#### The Sedge Community

This community was represented in the study area by a comparatively narrow strip of *Carex* occupying the swampy ground between the cattails and those shrubs which have progressed furthest into the wet shore area. Since the sedge is of small size and can offer little in the way of nesting support or cover, it is not surprising that no nests were located in the sedge community proper. This area, however, is important in that it produces food such as amphibians and reptiles which are not so abundant elsewhere.

#### The Shrub Community and Coniferous Forest Climax

A distinct community of shrubs alone was not evident in the area studied. These plants were of great importance, however, because of their presence at the forest edge to form a well-developed understory and also because of their encroachment into the sedge community to form an ecotone of considerable importance.

The coniferous forest climax is represented in this area by a dense growth of cut-over spruce and cedar. Time did not permit a study of the ecology of this community and only a list of the more common birds is given.

Black and white warbler	abundant
Redstart	common
Rose-breasted Grosbeak	heard
Crested Flycatcher	heard
Winter Wren	heard

### THE ECOTONES

With a few very important exceptions, the communities of the Indian River Marsh are well-defined. The channels of open-water have clear-cut margins and, as a rule, the communities of bulrushes and cattails were separated by open water areas. However, a species of sedge was often found growing abundantly among the cattails and one of the most productive areas studied was the ecotone formed by shrubs advancing into the soft boggy ground of the sedge community.

#### The Cattail-bulrush Ecotone

Only one large area of mixed *Typha* and *Scirpus* was included in the area studied. This ecotone contained the only nest of the American Bittern located during the course of the study. The adult bird was incubating four clay-colored eggs, one of which had been tipped. The nest had been built of bulrush stems and was placed just above water level.

With the exception of one least bittern seen flying from this association, no other birds were seen using the area. In most respects, the physical and biological characteristics are similar to those of the bulrush or the cattail community.

### The Sedge-cattail Ecotone

A mixed growth of *Scirpus* and *Typha* was noted on the shoreward side of one of the cattail communities. The presence of sedge did not materially change the major characteristics of the environment except that it provided a lighter more flexible leaf for use in nest construction. The long-billed marsh wren nesting in this ecotone was found to be using sedge exclusively for nesting material with the exception of a lining of cattail down. By using a layer of live green sedge leaves for an exterior, a camouflaging effect was obtained which made the nest blend perfectly with the environment.

The red-winged blackbird seemed to prefer this ecotone to pure stands of cattails and it is logical to assume that variety of nesting materials was the determining factor. All of the redwing nests examined were constructed of sedge leaves and suspended from cattail flags twelve to fourteen inches above the water level. Nests of this species were found only forty feet apart and many adults were seen congregating in small areas. It seems likely that active intraspecific competition for food may limit the population of birds in any area of good nesting cover.

### The Sedge-shrub Ecotone

Nests of the northern yellow-throat, the swamp sparrow and the robin were found in this type of environment. Probably the northern yellow-throat is the most characteristic bird of this ecotone exhibiting as it does a decided preference for water or marshy areas and yet requiring the concealment of a small shrub for the placement of its nest. Both yellow-throat nests examined were supported by



the twigs of Myrica gala, a small shrub, and concealed by the growth of sedge. They were placed ten to twelve inches above the water level and sedge leaves were used for the bulk of the nest with a lining of small grass-like leaves.

A nest thought to have been built by a swamp sparrow, was found in a shrub of the same species (Myrica gala) thirteen inches above water and built of sedge leaves. Although this bird was heard singing, none were seen. The robins nest was found high in a small tree to the shoreward edge of the sedge growth and is not considered typical of the ecotone.

#### BIOLOGICAL RELATIONSHIPS .

With reference to a given population of birds, the environment must yield suitable protective and nesting cover, adequate food, nesting material, and other special factors peculiar to each species. In addition, most species are so highly adapted as to require specific kinds of food and nesting cover and materials. For these reasons, we find species limited to certain vegetational areas or sometimes requiring the close proximity of several different communities, each fulfilling part of the peculiar requirements of that bird. Those factors which in any habitat are critical for a species are known as limiting factors for that species.

In the case of the Indian River Marsh, the abundance of insects and other invertebrates makes it unlikely that scarcity of food plays an important part either in limiting populations or regulating their distribution. In the case of the black tern and the

red-winged blackbird where high concentrations of nesting birds occur, there may be some active intraspecific competition for food.

Special requirements for nesting materials seems to play an important role in determining the locality where several species are found. The red-winged blackbird, long-billed marsh wren, northern yellow-throat and swamp sparrowall utilize sedge in nest construction and were not found in areas where this plant was absent. The black tern, grebe, and American bittern require the longer courser leaves of cattail or bulrush and consequently were not found in the sedge community proper. Due to the extensive areas of each of the major communities and ecotones, competition for nesting sites and materials must occur only in exceptional cases.

Inadequate time did not permit the study of predation, interspecific competition or the distribution of special types of food, all of which would be desirable for a complete ecological study of this marsh.

#### DISCUSSION

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The birds of the Indian River Marsh in Michigan's lower peninsula exhibit a graded distribution with reference to the major plant communities. The black tern and pied-billed grebe utilize the rank growths of cattail and bulrush where as the redwing and long-billed marsh wren are confined to the sedge-cattail ecotones. The nests of the American and least bittern are most commonly found where both cattail and bulrush form a mixed growth. In areas where small shrubs have invaded the sedge community, a specialized habitat has been formed characterized by the northern yellow-throat and the swamp sparrow.

The physical and biological factors which determine the distribution of a given species within the area studied are many and their interrelationships complex. However, requirements for special types of nesting material and nesting cover seem to be of first importance with food requirements secondary due to the high productivity of the marsh. Time did not permit the analysis of such important factors as predation, interspecific competition, and food distribution within the area.

#### SUMMARY

A study of the distribution of birds in successional communities was made on the Indian River Marsh in Cheboygan County, Michigan. The successional rank of the communities was found to be: (a) open-water (b) bulrush (c) cattail (d) sedge (f) small shrub and (g) the coniferous forest climax.

A survey of nests was made and the distribution of adults noted. It was found that all species are limited in their distribution to one or more of the above communities.

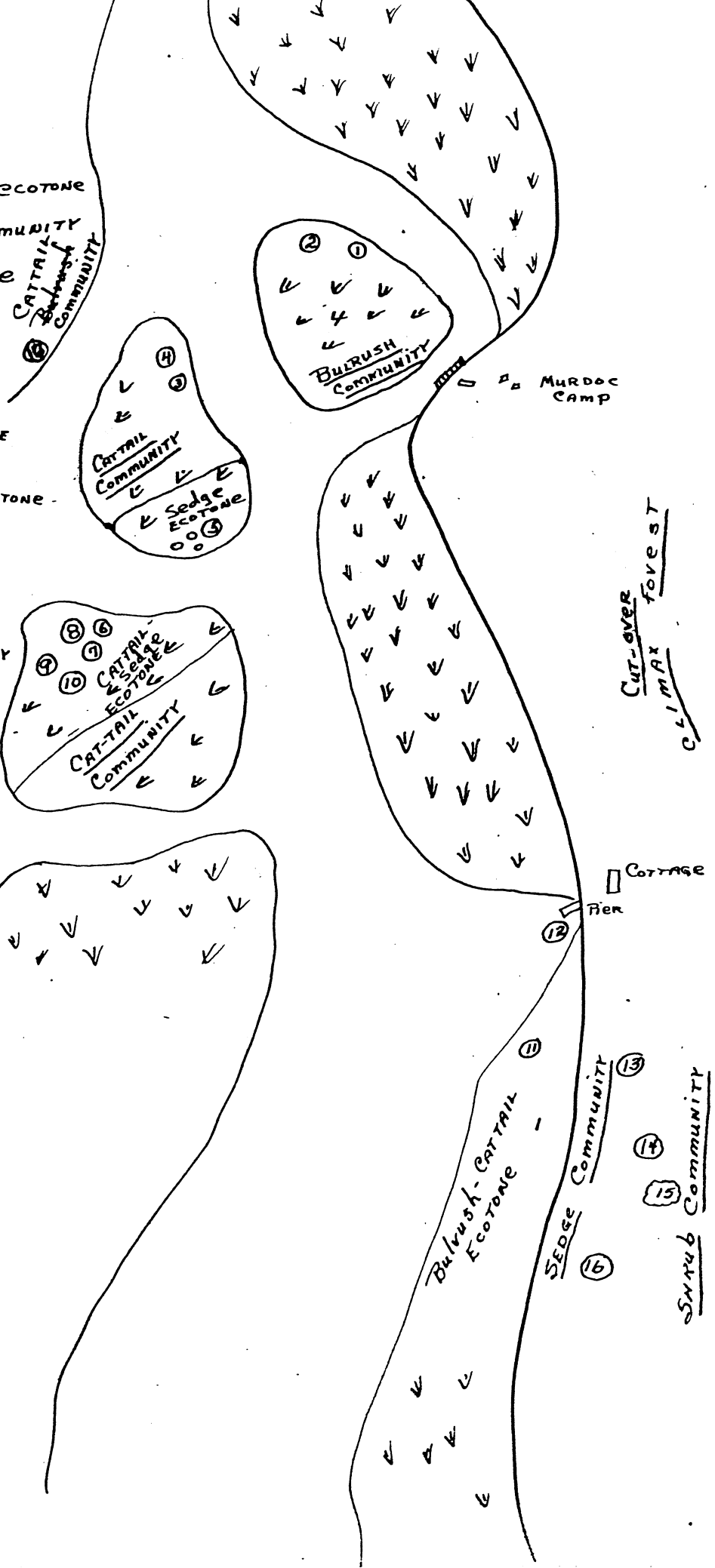
The principal factor limiting the distribution of birds among these communities was special requirements for nesting sites and materials rather than competition for food.

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NESTS

- ① BLACK TERN IN Bulrush Community
- ② " " " " "
- ③ " " " CATTAIL Community
- ④ Pied-billed Grebe - " "
- ⑤ Long-billed MARSH WREN - CATTAIL-Sedge ECOTONE  
ooo - DUMMY NESTS
- ⑥ BLACK-TERN ON 2x8 BOARD - CATTAIL Community
- ⑦ " " - CATTAIL-Sedge ECOTONE
- ⑧ Red-wing - CATTAIL-Sedge ECOTONE
- ⑨ " " " " "
- ⑩ " " " " "
- ⑪ AMERICAN BITTERN - SCIRPUS-Typha ECOTONE
- ⑫ EASTERN Kingbird - ON POST-OVER WATER
- ⑬ NORTHERN Yellow-throat - Sedge-SHRUB ECOTONE
- ⑭ " " " " "
- ⑮ Robin - IN SMALL TREE - " " "
- ⑯ SWAMP SPARROW - " " "
- ⑰ Long-billed MARSH WREN - ~~Bulrush~~ Community  
CATTAIL



INDIAN RIVER MARSH  
(EAST Shore)

Generalized Sketch of Communities