

MICHIGAN GEOLOGICAL AND BIOLOGICAL SURVEY.

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THE CRAWFISHES OF MICHIGAN

BY A. S. PEARSE

THE INSECT GALLS OF MICHIGAN

BY MEL. T. COOK

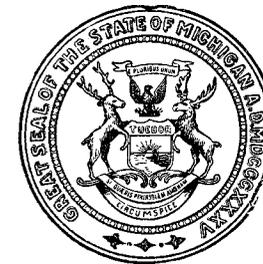
THE BIRDS OF SCHOOL GIRL'S GLEN REGION,
ANN ARBOR, MICHIGAN:

A STUDY IN LOCAL ORNITHOLOGY

BY A. D. TINKER

PRELIMINARY LIST OF THE SITES OF ABORIGI-
NAL REMAINS IN MICHIGAN

BY HARLAN I. SMITH



PUBLISHED AS A PART OF THE ANNUAL REPORT OF THE BOARD OF
GEOLOGICAL SURVEY FOR 1909

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1910

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1909.

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LETTER OF TRANSMITTAL.

*To the Honorable the Board of Geological and Biological Survey
of the State of Michigan:*

Governor Fred M. Warner, President.

Hon. D. M. Ferry, Jr. Vice President.

Hon. L. L. Wright, Secretary.

Gentlemen:—I beg to present herewith as a part of the report for 1909 of the Board of Geological and Biological Survey, Bulletin No. 1, being a contribution to the biological survey of the state authorized by Act No. 250 of the Session of 1905.

Very respectfully,

R. C. ALLEN,

State Geologist.

Ann Arbor, Mich., October 1, 1909.

R. C. Allen, State Geologist, Lansing, Michigan:

Sir—I submit herewith four reports on the natural history of the state, as contributions from the division of biological survey. Two of these (The Crawfishes of Michigan, by Dr. A. S. Pearse, and The Insect Galls of Michigan, by Dr. Mel. T. Cook) are in the form of monographic studies of particular groups, and constitute the first of a series of similar papers on other groups, now in preparation. The third (Notes on the Birds of School Girl's Glen Region, Ann Arbor, Michigan, by A. D. Tinker) is an exhaustive study of the bird life of a limited area in southern Michigan which is recommended for publication, not only because the notes will be of interest to the students of our ornithology, but also as an illustration to teachers and students of the results to be obtained in an intensive study of a small area. The final paper (A Preliminary Catalogue of the Sites of Aboriginal Remains in Michigan, by Mr. Harlin I. Smith), as the name implies, is a summary

of our present knowledge of the occurrence of aboriginal remains in Michigan; as it is compiled by an acknowledged authority on the subject, it may be considered an excellent basis for future work.

Yours respectfully,

ALEXANDER G. RUTHVEN,
Chief Field Naturalist.

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THE CRAWFISHES OF MICHIGAN.

BY A. S. PEARSE.

All the crawfishes of North America are included in two genera, *Potamobius*, which occurs from the eastern edge of the Rocky Mountains westward, and *Cambarus*, which ranges from Guatemala northward through the eastern and central portions of the continent at least as far as Lake Winnipeg. It goes without saying that all crawfishes in Michigan belong to the latter group. Ortmann (:05, :05a) has recently divided the genus *Cambarus* into five subgenera, and three of these are represented in the state fauna. Like Faxon ('85), he has used the form of the copulatory appendages of the male to distinguish the different groups, and I quote the "distinguishing characteristics" which he assigns to these sub-genera and appended the species representing each of them in the state.

Subgenus, **CAMBARUS** (*sens. strict.*) Faxon.

"Sexual organs of male *stout*, more or less straight, and comparatively short, *truncated or blunt at the tip, the outer part ending in 1-3 horny teeth*, which are sometimes recurved, or compressed, or plate like, *and are always sharply distinguishable from the blunt end*. Inner part terminated by a shorter or longer, acute spine, which is sometimes distinct from the tip of this part, so that it appears two pointed. In the male the third or the third and fourth pair of pereiopods have hooks." *Cambarus blandingi acutus* (Girard).

Subgenus, **FAXONIUS** Ortmann.

"Sexual organs of male shorter or longer, *not very stout, generally slender*, or with slightly curved tips. *Tips never truncated, ending always in two more or less elongated spines*, the one formed by the outer part, and horny, the other formed by the inner part and softer. There is *never more than one tip to the outer part*, and there is no terminal tooth distinguishable, but the tip tapers gradually, or the whole outer part is setiform. In the male generally the third pereiopods only have hooks, very rarely (in *C.*

pellucidus) hooks are found on the third and fourth pereiopods." *C. propinquus*, Girard, *C. rusticus* Girard, *C. virilis* Hagen, *C. immunis* Hagen.

Subgenus, **BARTONIUS** Ortmann.

"Sexual organs of male very uniform throughout the sub-genus. They are *short and thick*, inner and outer part each terminating in *only one short and thick spine*, tapering to a point. Both terminal spines are strongly recurved, forming with the basal part about a right angle. In the male, only the third pereiopods possess hooks." *C. bartoni robustus* (Girard), *C. diogenes* Girard, *C. argillicola* Faxon.

According to Ortmann (:05) the present North American crawfish fauna arose from five different centers of distribution, one for each subgenus. He believes that the subgenus *Cambarus* arose in the southwestern portion of the United States (Georgia and Alabama), as well as from an earlier center in Mexico; *Faxonius* originated in the territory about the mouth of the Ohio River; and *Bartoni* spread in every direction from the area now occupied by Tennessee and Arkansas. As to the present distribution of these groups in Michigan, we can say that *Cambarus* barely enters the southwestern portion of the state; *Bartoni* is known to range northward more than half way through the southern peninsula; and that some species of *Faxonius* are found in all parts of the state both *C. propinquus* and *C. virilis* occurring in the northern peninsula. The areas of present distribution thus agree with the migration routes outlined by Ortmann (:05). The data upon which these statements are based were derived from three sources. First, from a careful examination of the literature relating to crawfishes; second, from the collections in the Museum of the University of Michigan; and third, from collections made by the author and other persons. My thanks are due to Mr. E. B. Williamson, Prof. E. R. Downing, Mr. Royden Webster, and Mr. C. J. Conover who sent specimens. It is with great pleasure that I acknowledge my indebtedness to Dr. A. G. Ruthven, Curator of the Museum of the University of Michigan, who not only gave me free access to the collection in that institution, but assisted me in many other ways.

HISTORICAL.

Faxon ('85) in his "Revision of the Astacidae" mentioned four species (*C. argillicola*, *C. diogenes*, *C. immunis*, *C. propinquus*) as having been reported from Michigan, and states that two others (*C. rusticus*, *C. bartoni*) had been said to occur in Lake Superior. *C. virilis* was later ('90) reported by the same author from Kalamazoo as well as *C. rusticus* from Saginaw, making a total of six species. More recently, Ortmann (:05, :06) extended the known range of *C. diogenes*, *C. propinquus*, and *C. virilis* within the state; Adams (:07) reported *C. bartoni* as being a common species at Ann Arbor; and last year Hankinson (:08) reported *C. bartoni robustus*, *C. diogenes* and *C. propinquus* from Oakland County. Though this brief survey of the literature is not complete, it is believed to include all important references to the distribution of the genus *Cambarus* in Michigan. To summarize, the species which had been reported from the state previous to the work recorded in this paper were as follows: (1) *C. argillicola*, (2) *C. bartoni robustus*, (3) *C. diogenes*, (4) *C. immunis*, (5) *C. propinquus*, (6) *C. rusticus*, (7) *C. virilis*.

With the exception of *C. rusticus* new localities are reported for all these species in the present paper and another one (*C. blandingi acutus*) is added to our fauna. *C. rusticus* did not appear in any of the collections and this fact makes it appear that either the earlier records of Faxon were erroneous, or that the range of the species has recently become restricted. *C. bartoni* proves to be represented in the state only by the variety *robustus*.

Compared with neighboring states our crawfish fauna is about what we would expect; Indiana having thirteen species recorded from within its borders; and Ohio, Pennsylvania, and Wisconsin each having seven.

HABITS AND LIFE HISTORY.

Our Michigan crawfishes are found in quite diverse habitats. Some are most at home in the larger rivers (*C. virilis*), and others prefer the swift-flowing brooks (*C. bartoni robustus*); *Cambarus immunis* is usually found in small muddy pools. Some of these dry up during the summer and the animals are then obliged to burrow until water is again available. Perhaps the most inter-

esting of our crawfishes are the burrowing species (*C. diogenes*, *C. argillicola*), which carry mud from their holes and pile it up to form chimneys about the opening. In building these chimneys pellets of dirt are carried between the chelae and successively brought to the surface, where they accumulate as a more or less symmetrical mass around the mouth of the burrow. *C. diogenes* often makes its holes in damp ground at some distance from the open water, which it seldom enters except during the breeding season.

All crawfishes are nocturnal in their habits and usually rest quietly in some crevice during the day. They come forth at night to search for their food, which consists of algae, decaying plants and animals, and such small organisms as they are able to capture. Their activities are strictly utilitarian, being confined to such necessary movements as are concerned in mating, seeking and capturing food, and searching for environmental conditions. Ortman (1906) has collected many interesting facts in regard to the food, which show that they are omnivorous. Crawfishes usually live more than one year and after a certain age is reached they carry on a more or less regular series of moults, the males being more uniform in this respect than the females. The cycle for the year runs somewhat as follows: autumn, all adult males moult to "first form;" later autumn and winter, copulation of males and females; spring, egg-laying by females and moulting to "second form" by males.

ECONOMIC IMPORTANCE.

Crawfishes have many relationships which are of more or less importance to man. They act as scavengers and numbers of them are often found about a dead carcass. Their burrowing is beneficial as the soil is overturned and mixed as well as irrigated to some extent, thus increasing its value for crops. Crawfishes are also of use for fish bait and as food. So far as I know all the species tested have been found to be highly palatable and the restaurants in the larger cities now offer crawfishes on their menus. In some parts of the country (Oregon and Wisconsin) they are collected extensively for shipment to the markets, and this industry promises to be a growing one, as the animals are easily reared and there is an increasing demand for them. They in turn

furnish food for many other animals besides man, and various mammals, birds, snakes, turtles, salamanders and fish are known to feed upon them.

In some respects crawfishes are injurious in their relationships to man. The chimneys sometimes interfere with the action of mowing machines and reapers by clogging them with loose earth, and the holes have been known to cause injury to horses. In other cases they have been affirmed to burrow into dams and dykes to such an extent as to cause leaks.

BASIS FOR CLASSIFICATION.

The selection of characteristics which show little variation, and which are hence of value as a basis for classification, is often a matter of some difficulty. Not only do the male crawfishes differ from the females, among other things in possessing larger chelae and narrower abdomens, but the males differ among themselves and show marked changes in form and proportions at different seasons of the year. Young specimens also differ from adults in the proportions and general coloration of the body.

The organs which are of prime importance in classification are the first pair of abdominal appendages, the *copulatory appendages*, of the male. They have a highly characteristic form for each species but are subject to rather striking changes and "*first form*" and "*second form*" males occur. In the former the chelae are usually larger and stronger and the tips of the processes terminating the first abdominal appendages are more acute and horny than in the latter. The adult males usually change to first form by a moult before the breeding season (autumn) and return to second form after the time for mating has passed (spring). The copulatory appendages are usually folded forward into a groove on the under side of the abdomen and have to be picked out with some sharp instrument to be examined.

Copulatory *hooks* are found on the third segment of the middle pair of walking legs of the male, and these are also present in the same position on the second or fourth pair of legs in some species. These hooks are used in holding the female during copulation.

A peculiar pouch is found in females, on the ventral side of the body between the fourth and fifth walking legs. This is known as the *annulus ventralis* and is used as a sperm receptacle. Its form is

quite characteristic for each species but young individuals do not have it fully developed.

The *rostrum* is the anterior extension of the carapace between the eyes. It ends in a more or less acute tip, or acumen, and may have a lateral spine on each side or bear a longitudinal keel (carina) on the dorsal surface. It is relatively longer in young individuals.

The head is separated from the thorax by a transverse cervical groove and just behind this groove the carapace is distended somewhat on each side to form a branchial chamber. Between these lateral swellings is an elongated space known as the *areola*. It may be wide, narrow, or even entirely obliterated in its middle region.

The general *shape of the carapace* is sometimes of value in distinguishing the different species. It may be flattened dorsally or compressed laterally. The relative length of the head and thorax is usually constant for a particular species. All measurements given in the text are in millimeters and are taken from the largest first form males obtainable.

The large claws, or *chelae*, on the first pair of walking legs attain their specific characters only in adult males, and under such circumstances are highly characteristic. The segments of a walking leg have the following names, beginning at the proximal end: coxa, basal joint, ischium, merus, carpus, propodus (fixed finger), and dactyl (movable finger).

The *color* of different species is usually characteristic but is somewhat dependent upon the conditions of environment, such as the color of the bottom (Kent, :01) and the amount of light. Young specimens are particularly apt to be variable, and any species may appear almost black before it moults an old shell. In the descriptions of species in this paper the numbers which follow the names of colors refer to Kincksieck and Valette's "Code des Couleurs." The descriptions were made from living specimens examined under water.

Finally it is of the utmost importance that a species determination be made if possible from an adult specimen, preferably a male, as the characteristic structures are often undeveloped in young specimens.

KEY TO MICHIGAN SPECIES.*

- A—Rostrum carinated *propinquus* (Pl. II)
 B—Rostrum not carinated.
 a—Rostrum with lateral spines.
 1—Lateral margins of rostrum concave. *rusticus* (Pl. III)
 2—Lateral margins of rostrum not concave
 Areola rather narrow, color of body dark
 red, chelae very slender. *blandingi acutus* (Pl. I)
 Areola of moderate width (Pls. IV, V)
 Carpus (of chela) deeply grooved
 above *immunis spinirostris* (Pl. V)
 Carpus not deeply furrowed above. *virilis* (Pl. IV)
 b—No lateral spines on rostrum.
 1—Areola broad (Pls. V, VI)
 Rostrum long and acute *immunis* (Pl. V)
 Rostrum short and obtuse. *bartoni robustus* (Pl. VI)
 2—Areola narrow or obliterated (Pls. VII, VIII)
 Carapace protruding in an angular process below the eye *diogenes* (Pl. VIII)
 Carapace without such a process, prominent notch at base of movable finger on inner side *argillicola* (Pl. VII)

DISCUSSION OF SPECIES.

1. *Cambarus blandingi acutus* Girard.

Diagnosis.—Size medium; length, 91.2; length of carapace, 47.2; tip of rostrum to cervical groove, 18.5; breadth of carapace, 24; height of carapace, 21. Color dark red (2). Rostrum long and tapering to an acute point. Sides of carapace coarsely granulated. Areola rather narrow, anterior triangular space small. Chelae very slender, with prominent tubercles along inner border. Third and fourth legs hooked in male. Copulatory appendages plainly bifid, both rami end in two spinous processes and the external one bears a tuft of hairs also. Annulus ventralis is much wider than long, with two prominent lateral tubercles which project inward over the center of the deep longitudinal fissure.

Habits.—Hay ('96) says this species "is to be looked for in almost any character of surroundings. Usually, however, they

*For explanation of terms, see preceding basis for classification.

occur in running water where there is an abundant supply of vegetation." Williamson (:07) says "it finds its most congenial environment in woodland swamps, though it has been taken frequently from ditches and creeks." My own experience with this species is too limited for me to speak of its habits.

Distribution.—The writer took a single dead male of this species from the White Pigeon River near White Pigeon, Michigan, April 13, 1909. (Cat. No. 38713, University of Michigan Museum).

2. *Cambarus propinquus* Girard.

Diagnosis.—Size medium; length, male, 78, female, 83; length of carapace, 38.5; tip of rostrum to cervical groove, 24; breadth of carapace, 20; height of carapace, 15. Color of carapace and abdomen, brown, (155), mottled; a light U-shaped band (328 B) along each side of the abdomen and across the sixth segment; chelae cream (253 B) or light green (336) with fine mottling of darker green (334 or 327), tips light orange (136). Rostrum with small lateral teeth between which is a low longitudinal ridge. Areola broad and smooth. Copulatory appendages short and twisted, reaching nearly to base of second pair of legs (abdomen extended), ending in two acutely tapering processes, the inner one of which is somewhat flattened at the tip. Annulus ventralis, rather flat, crossed by a curved fissure.

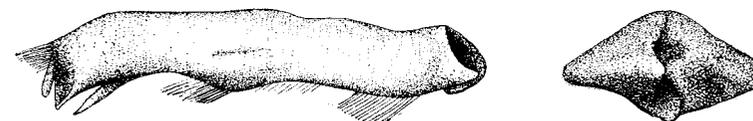
Habits and Life History.—This species is found in rivers, though it is not uncommon along the shores of Lakes Huron and Michigan and is often found in small brooks in company with *C. bartoni robustus*. In fact it is apt to occur almost anywhere. Females carrying eggs were taken at Walnut Lake (Oakland County), May 2 and June 6, 1896, at Coldwater, April 17, 1909, and at Ann Arbor, April 18, 1909. Another female which bore young was taken in Whitmore Lake (Washtenaw County), May 29, 1898.

Distribution.—This is apparently an abundant species throughout the state. Previous records show it in the following counties: (Faxon, '90) Allegan, Calhoun, (Faxon, '98) Saginaw; (Ortmann, :05) Charlevoix; (Ortmann, :06) Calhoun, Emmet, St. Clair, Washtenaw, Wayne, (Hankinson :08) Oakland. The University Museum has specimens from Genesee, Crawford, Gratiot, Huron, Marquette, Oakland, St. Joseph, Oscoda, Washtenaw and Wayne Counties; also from Mackinac Island.

Remarks.—An unusual second form male (68 mm.), collected at

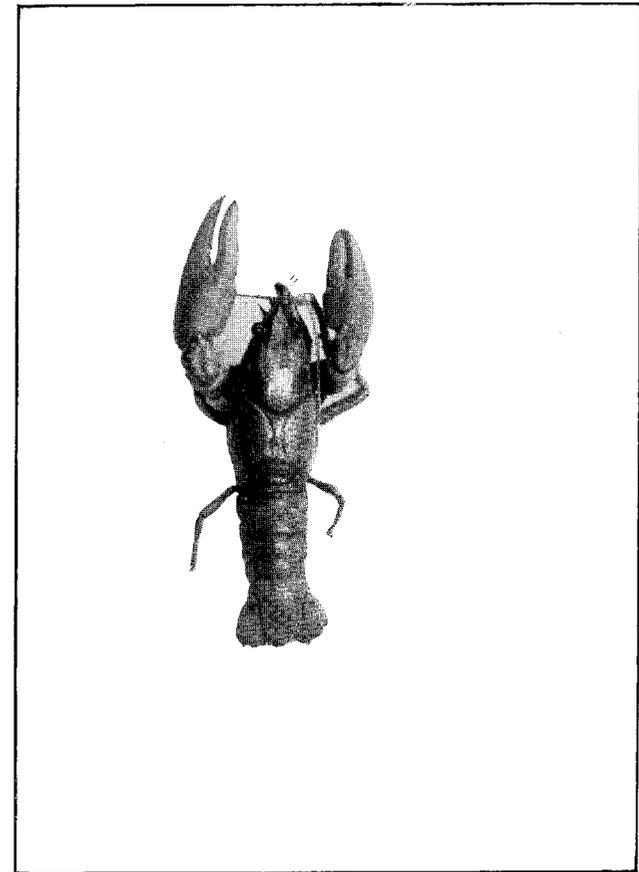


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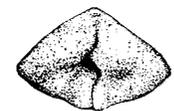
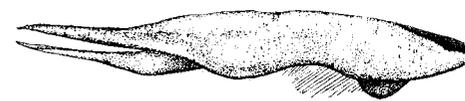


(B)

CAMBARUS BLANDINGI ACUTUS.

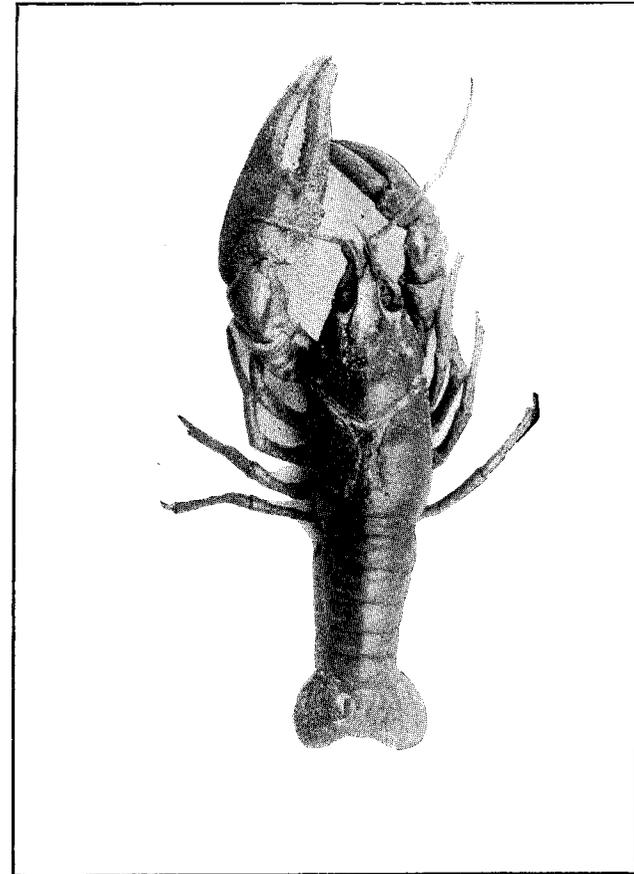


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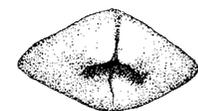
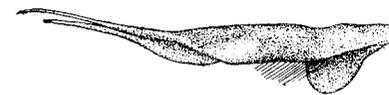


(B)

CAMBARUS PROPINQUUS.

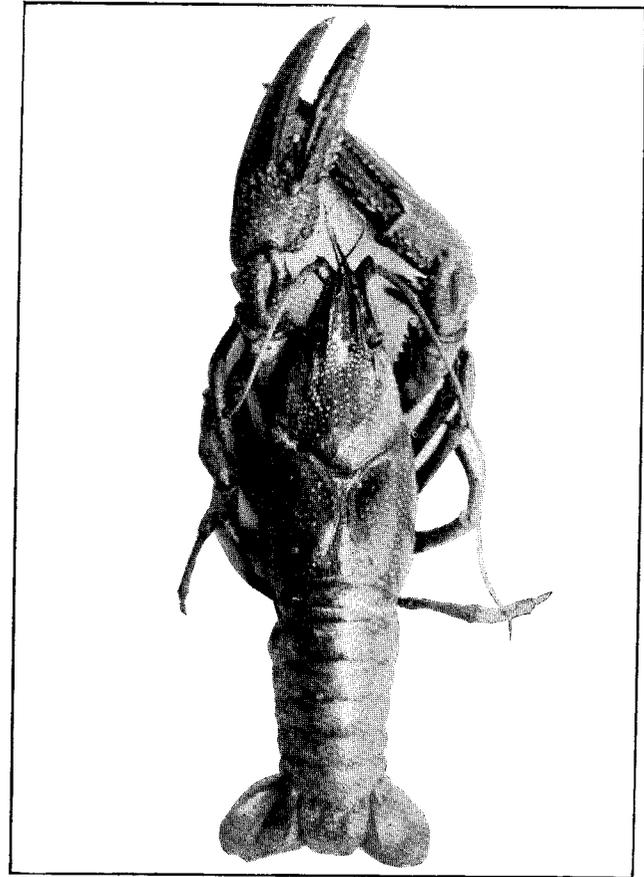


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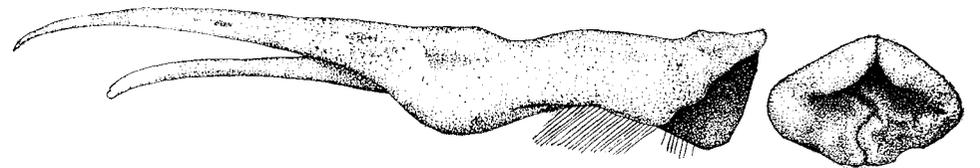


(B)

CAMBARUS RUSTICUS.



(A)

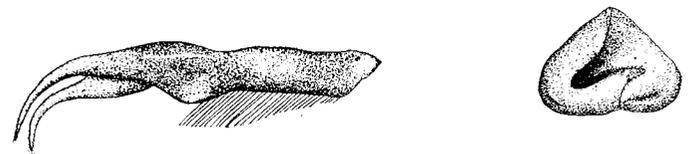


(B)

CAMBARUS VIRILIS.

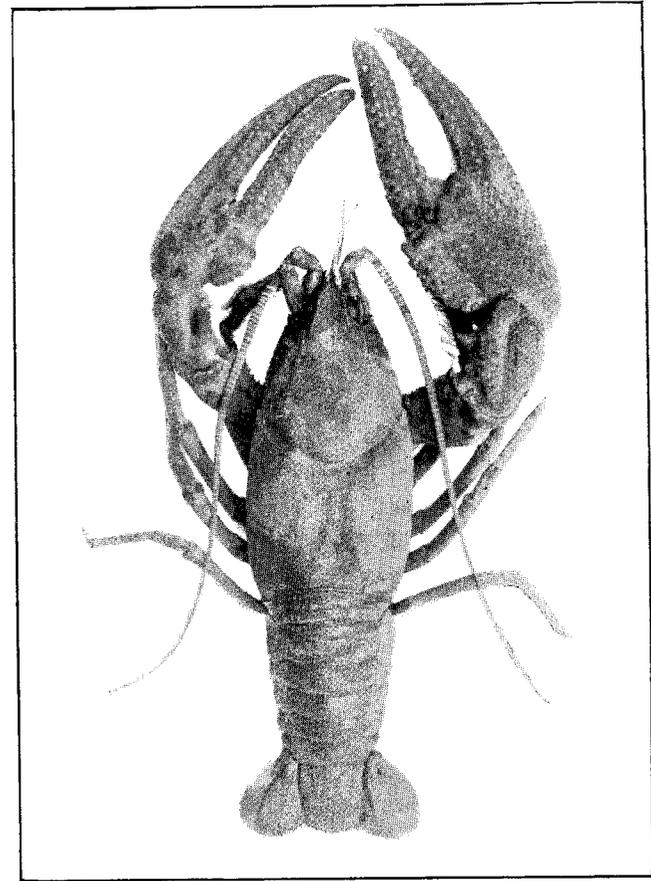


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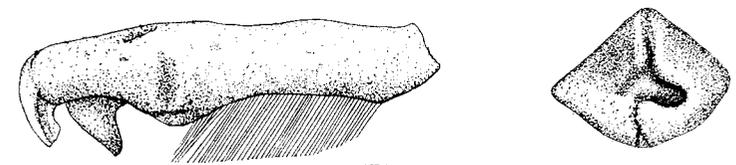


(B)

CAMBARUS IMMUNIS.

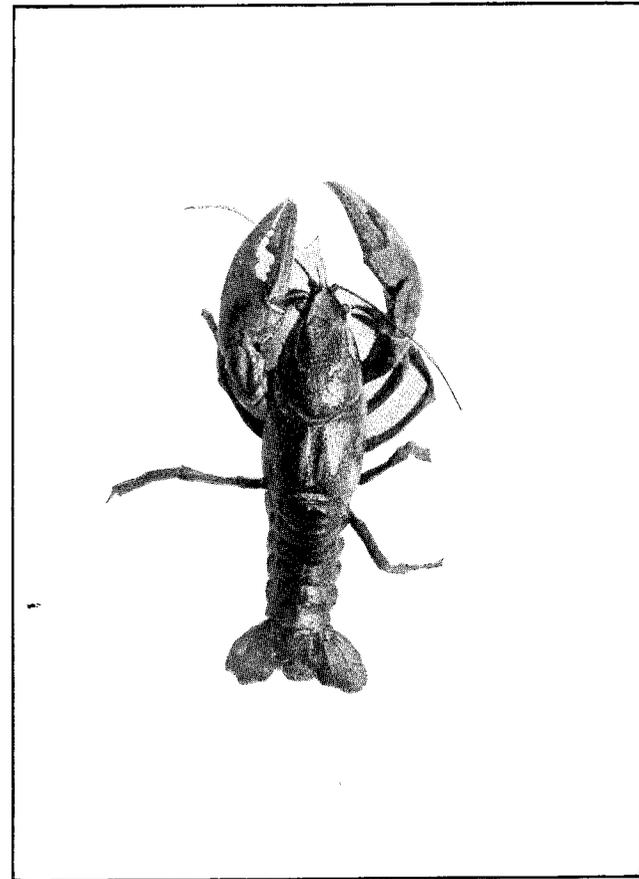


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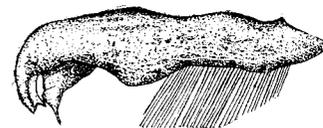


(B)

CAMBARUS BARTONI ROBUSTUS.

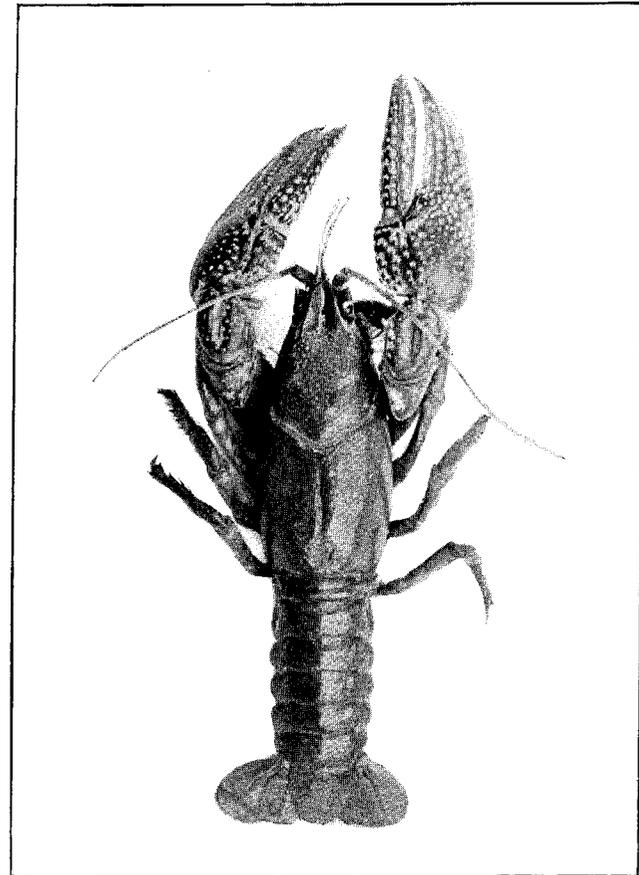


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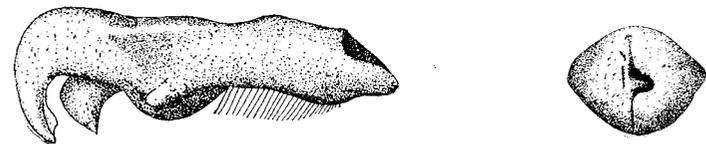


(B)

CAMBARUS ARGILLICOLA.



(A)



(B)

CAMBARUS DIOGENES.

Whitmore Lake, May 29, 1898, has antennae which are a trifle longer than the body, and its chelae are remarkably slender. Some young specimens from Marquette show well marked concavities on the lateral margins of the rostrum, but they have typical *propinquus* characteristics in other respects.

3. *Cambarus rusticus* Girard.

Diagnosis.—Size medium, 99.5; length of carapace, 46; tip of rostrum to cervical groove, 29.6; breadth of carapace, 24; height of carapace, 16.4. Rostrum with lateral spines, lateral margins concave. Areola rather wide. Chelae with fingers gaping at base, tip of dactyl incurved; carpus with a shallow groove on dorsal surface, two strong spines beneath. Third pair of legs hooked in male. Copulatory appendages, long, twisted, deeply split, and ending in two slender rami; inner ramus shorter than outer. Annulus ventralis with two prominent tubercles in front, median depression deep.

Habits.—Williamson (:07) says that, "this is the only species which occurs at all seasons in streams or permanent pools and nowhere else."

Distribution.—This is not a common species in the state, if it occurs at all at the present time. The writer has never seen a specimen which was taken in Michigan. Previous records are: (Faxon, '85) Lake Michigan; (Faxon, '98) Saginaw. The specimens which are figured are from Bluffton, Indiana, and were obtained through the kindness of Mr. E. B. Williamson.

4. *Cambarus virilis* Hagen.

Diagnosis.—Size large; length, 118; length of carapace, 55; rostrum to cervical groove, 35.3; breadth of carapace, 28.2; height of carapace, 21.6. Color of carapace and abdomen brown (78) with more or less darker mottling; chelae greenish blue (337), tips light orange (141), outer margins and tubercles white (153 C); other walking legs greenish (287). Rostrum deeply excavated and bearing lateral spines. Areola rather narrow (1.2) in the middle. Chelae with inner border of propodus and dactyl biserially tuberculate; carpus with a shallow groove above. Hooks on third and sometimes also on second pair of walking legs. Copulatory appendages very long, reaching to base of chelae; deeply bifid, the branches slender and slightly curving backward; outer branch the longer, inner branch flattened at tip. Annulus

ventralis with a narrow high anterior wall which is broken by the longitudinal fissure; medium depression transverse and deep.

Habits and Life History.—This species is found in the lakes and larger streams. Young specimens (74 mm. and less) taken in St. Joseph county, April 14, 1909, showed a coloration which was quite different from that of adults. The whole body presented a mottled appearance, and the blue green on the chelae, which is usually so characteristic, was wholly lacking. The ground color of these specimens was brown (128), mottled with a darker shade of the same color (90). One of the females (57 mm.) carried freshly laid eggs, and all the (5) males were first form except one. Other specimens collected on the same date showed a transitional coloration between that just described and the typical form. At a later date, (April 30, 1909), a female (71 mm.) was found at Ann Arbor which had the mottled coloration and bore freshly laid eggs.

Distribution.—This is the most abundant species in the northern part of the state and is probably found in all other parts as well. Previous records: (Faxon, '90) Calhoun Co.; (Faxon, '98) Cheboygan Co.; (Ortmann, '05) Charlevoix Co. New records: Dickinson, Genesee, Crawford, Houghton, Huron, Iron, Marquette, Oscoda, St. Clair, St. Joseph and Wayne counties; Mackinac Island.

5. *Cambarus immunis* Hagen.

Diagnosis.—Size small; length, 64; length of carapace, 30; rostrum to cervical groove, 19.4; breadth of carapace, 16; height of carapace, 13.3. Color, dark olive green (254), mottled with small dark markings (155); tips of chelae reddish (41). Rostrum long and decurved; acumen triangular with concave sides. Areola rather narrow, anterior triangular space small. Chelae usually rather slender, internal border of hand serrate, carpus deeply furrowed above, dactyl usually excised at base. Second pair of legs with dense tufts of hair on inner side near their extremities. Hooks on third pair of legs. Copulatory appendages reaching to base of second pair of legs, external branch the longer, its tip slender and acute; inner branch slightly flattened at tip; a projecting shoulder on outer side of appendage at base of inner branch. Annulus ventralis with the depression far to one side. The variety *spinirostris* Faxon agrees with this description but has small acute lateral teeth on the rostrum.

Habits and Life History.—This is a mud-loving species, and it is usually found in small pools, though it sometimes occurs in brooks and rivers. Females carrying freshly laid eggs were taken April 18, 1909, at Ann Arbor.

Distribution.—This species has not been found except in the southern portion of the state. Previous records: (Faxon, '85) Detroit. New records: Huron, Saginaw, Washtenaw and Wayne counties.

6. *Cambarus bartoni robustus* (Girard).

Diagnosis.—Size large, 115; length of carapace, 55.2; rostrum to cervical groove, 33.4; breadth of carapace, 29.8; height of carapace, 18.8. Color of carapace and abdomen, brown (109); cervical groove and chelae, bluish (363); tubercles on inner sides of fingers, light yellow (216). Rostrum short, acumen obtuse. Areola wide, and carapace flat on the dorsal surface. Chelae with double row of tubercles on inner margin. Hooks on third pair of legs in male. Copulatory appendages, short and ending in two posteriorly directed hooks; outer hook longer and flattened at tip; inner hook conical. Annulus ventralis without anterior wall, posterior wall raised into a transverse ridge, longitudinal fissure wide in front but narrowing behind where it crosses the ridge.

Habits and Life History.—This is our common brook species in the southern portion of the state. It is found among stones in rapidly flowing streams and not infrequently burrows in the ground.

Distribution.—The range of this crawfish is known to extend northward through most of the southern peninsula.* Previous records: (Faxon, '85) Lake Michigan, (Adams, '07) Washtenaw county, (Hankinson, '98) Oakland county. New records; Alcona, Crawford, Oakland, Oscoda and Wayne counties.

7. *Cambarus argillicola* Faxon.

Diagnosis.—Size small; length, 60; length of carapace, 20.9; tip of rostrum to cervical groove, 22.7; breadth of carapace, 17.6; height of carapace, 15.5. Color of carapace and abdomen, brown (114) with darker mottlings (69) along the sides of both; chelae with red tips (61); lighter below (153 C). Rostrum very short and broad, decurved, no lateral teeth. Areola obliterated in the

*Through the courtesy of Mr. Norman H. Stewart the writer has recently had the opportunity to examine specimens of *C. bartoni robustus* from Toronto, Canada; this extends the known range of the species.

middle; anterior triangular space very small. Chelae very flat; dactyl with a deep notch at base. Copulatory appendages short and ending in two posteriorly recurved hooks; outer hook flattened at tip; extremity of inner hook long and slender. Annulus ventralis with anterior border depressed, a swollen ridge surrounding the other margins, a deeper deep central depression.

Habits and Life History.—This little crawfish is one of the burrowing forms and often makes mud chimneys. It frequents small ponds in the woods, and ditches. During the spring of 1909 I found females at Ann Arbor, on April 8, which were carrying eggs almost ready to hatch, and on April 14 females were observed at White Pigeon which bore newly hatched young.

Distribution.—This species has been reported only from the southern portion of the state. Previous records: (Faxon, '85) Detroit and East Saginaw. New records: Gratiot, Saginaw, St. Joseph and Washtenaw counties.

8. *Cambarus diogenes* Girard.

Diagnosis.—Size rather large; length, 104; length of carapace, 52.6; tip of rostrum to cervical groove, 30.1; breadth of carapace, 25; height of carapace, 22.2. Color of carapace and abdomen brown (104); chelae greenish (341) and brown (154), with outer border white (153 B); tips of chelae, entire margin of rostrum and posterior border of abdominal segments, red (56). Rostrum short, somewhat decurved, margins raised, no lateral spines. Areola linear, almost obliterated in the middle. Chelae heavily pitted, carpus deeply furrowed above. Hooks on third pair of legs in male. Copulatory appendages thick and short, ending in two posteriorly directed teeth; outer tooth flattened, inner tooth conical and sigmoid on dorsal margin. Annulus ventralis hemispherical; central depression small but deep, mostly on one side.

Habits and Life History.—This is the chief burrowing species of the state. Its holes and chimneys are to be found along river banks as well as in meadows and marshes, often occurring at some distance from open water. A female carrying young was taken at Ann Arbor, June 16, 1905. Two pair were observed copulating in the White Pigeon River, on April 13, 1909, and none were observed with eggs at that time.

Distribution.—This is a common species throughout its range, which is known to cover three-fourths of the southern peninsula.

Previous records: (Faxon, '85; Ortmann, :06) Detroit, (Hankinson, :08) Oakland county. New records: Huron, Livingston, St. Joseph and Washtenaw counties.

BIBLIOGRAPHY.

Adams, C. C.

- :07. The Crawfishes of the State of Pennsylvania. By Arnold E. Ortmann, Ph. D. Memoirs of the Carnegie Mus., Vol. II, No. 10. Science, N. S., Vol. 25. No. 649, pp. 897-901.

Andrews, E. A.

- '95. Conjugation in an American Crayfish. Amer. Natur., Vol. 29, pp. 867-873.
:06. The Future of the Crayfish Industry. Science, N. S., Vol. 23, No. 600, pp. 983-986.

Bundy, W. F.

- '73-79. The Crustacean Fauna of Wisconsin. Geol. of Wis., Vol. I, pp. 402-405.

Faxon, W.

- '85. A Revision of the Astacidae. Mem. Mus. Comp. Zool., Vol. 10, No. 4, 186 pp., 10 Pls.
'90. Notes on North American Crayfishes. Proc. U. S. Nat. Mus., Vol. 12, pp. 619-634.
'98. Observations on the Astacidae in the United States National Museum and in the Museum of Comparative Zoology. Proc. U. S. Nat. Mus., Vol. 20, pp. 643-694, Pls. 62-70.

Girard, C.

- '54. A Revision of North American Astaci, with Observations on their Habits and Geographical Distribution. Proc. Acad. Nat. Sci. Philadelphia, Vol. 6, pp. 87-91.

Hagen, H. A.

- '70. Monograph of North American Astacidae. Illustr. Cat. Mus. Comp. Zool., 3, pp. viii + 109, Pls. 1-11.

Hankinson, T. L.

- :08. A Biological Survey of Walnut Lake, Michigan. Mich. Geol. Surv. Rept. 1907, pp. 155-288, Pls. 13-75.

Hay, W. P.

- '96. The Crawfishes of the State of Indiana. 20th Ann. Rept. Dept. Geol. and Natur. Resources Indiana, pp. 475-507.

Kent, W. J.

- :01. The Colors of the Crayfish. Amer. Natur., Vol. 35, No. 419, pp. 933-936.

Klingsieck, P.; and Valette, T.

- :08. Code des Couleurs. Paris, 86 pp.

Ortmann, A. E.

- :05. The Mutual Affinities of the Species of the Genus *Cambarus*, and their Dispersal over the United States. Proc. Amer. Phil. Soc., Vol. 44, pp. 91-136, Pl. 3.

- :05a. *Procambarus*, a New Subgenus of the Genus *Cambarus*. Ann. Carnegie Mus., Vol. 3, No. 3, pp. 435-442.

- :06. The Crawfishes of the State of Pennsylvania. Mem. Carnegie Mus., Vol. 2, No. 10, pp. iv + 343-523, Pls. A, B, 39-43.

Osborn, R. C. and Williamson, E. B.

- '98. The Crayfish of Ohio. 6th. Ann. Rept. Ohio. Acad. Sci., p. 11.

Williamson, E. B.

- :07. Notes on the Crawfishes of Wells county, Indiana, with Description of a New Species. 31st Ann. Rept. Dept. Geol. and Natur. Resources of Indiana, 1906, pp. 749-763, Pl. 35.

EXPLANATION OF PLATES.

The arrangement of the figures is uniform in all the plates. On the lower left hand side of each plate is the first form male copulatory appendage, the left one as seen from the left side being shown in every case. The lower right hand figure is the annulus ventralis of the female, the posterior end being the lower. The upper figure is approximately three-fourths natural size.

THE INSECT GALLS OF MICHIGAN.

BY MEL. T. COOK.

The study of the insect galls presents one of the most fascinating subjects within the field of biology. However, we must acknowledge that we have scarcely more than entered upon the study of this group of most interesting problems.

The literature of American insect galls is so scattered and entwined with other phases of entomology and botany that the general student is very much inclined to give up in despair or lay the specimens aside for a future time which never comes. The author, therefore, feels justified in presenting this list with the short descriptions, hoping that it may be helpful to the students of the local flora and fauna, and that it may stimulate more extensive work. The known insect galls of North America number about 1,200. The student will readily see that this list is scarcely a beginning for the state of Michigan and that it includes only the most conspicuous species.

The following list of 59 species includes representatives from all the orders of insects which contain gall makers except the *Coleoptera*. So far as the author has been able to ascertain, numbers 1 to 6, 30, 33, and 37 to 59 inclusive have not been previously reported from the state. The other twenty-eight have been reported by Gillette.* All of those not previously reported by Gillette and also numbers 8, 10, 13, 19, 22, 25, 28, 29 were sent to me for determination from the Museum of the University of Michigan by the Curator, A. G. Ruthven. They were obtained from various parts of the state by the museum collectors, and by the expeditions of the Michigan Geological and Biological Survey.

Amphibolips coccineae O. S. and *A. spongifica* O. S., as recorded by Gillette, are synonyms of *A. confluens* Harris. *Holcaspis rugosa* Bassett of Gillette's is a synonym of *H. globosus* Fitch, and *H. duricoria* Bassett of the same list has been reduced to *H. mamma* Walsh. The insects are distributed among 22 genera of 7 families of 5 orders. The host plants on which these 59 species

*Gillette, C. P., 27th Mich. Agri. Report, 1888.

of galls occur are distributed among 14 genera of 11 families of 9 orders as follows:

Orders.	Families.	Genera.
Salicales	Salicaceae.....	{ Salix. Populus.
Juglandales.....	Juglandaceae.....	{ Hicoria. Quercus.
Urticales.....	Ulmaceae.....	Ulmus.
Rosales.....	Hamamelidaceae.....	Hamamelis.
	Rosaceae.....	{ Rosa. Rubus.
	Drupaceae.....	Prunus.
Sapindales.....	Aceraceae.....	Acer.
Rhamnales.....	Vitaceae.....	Vitis.
Malvales.....	Tiliaceae.....	Tilia.
Ericales.....	Vacciniaceae.....	Vaccinium.
Campanulales.....	Compositae.....	Solidago.

HYMENOPTERA.

Family—*Cynipidae.*

1. *Rhodites rosae*, Linn.—This is sometimes known as the “Bede-guar” gall which is said to mean rose apple. According to Osten Sacken it is the same as the European species. It is made up of a number of small galls massed around a stem and densely covered with green moss-like filaments. The entire mass is sometimes as much as two inches in diameter. It has been collected in this country from *Rosa carolina*, *R. rubiginosa*, *R. blanda*, and *Rubus villosus*. It is one of the most widely distributed galls known, having been reported from Europe, Western Asia, Canada, Massachusetts, Rhode Island, New York, New Jersey, Pennsylvania, Washington, D. C., Kansas, Colorado, and the writer has collected it in Delaware.

2. *Rhodites bicolor*, Harris.—This is a spherical monothalamous gall, about 1/4 to 1/2 inch in diameter. It is covered with a great many slender spines which vary in length on different individuals. It is hollow except when infested with guest flies, when it frequently become pithy. In summer it is yellowish-green. fre-

quently tinged with red, but becomes brown in winter. It is formed singly or in clusters from the leaves, which are frequently completely utilized in its formation. It occurs on *Rosa Carolina*, *R. blanda*, *R. humilis*, *R. pisocarpa?* and probably on other species. It has been reported from Canada, Maine, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Washington, D. C., North Carolina, Mississippi, Wisconsin, Indiana, Colorado, Washington, New Mexico, and the writer has collected it in Delaware.

3. *Rhodites arefactus*, Gillette.—An irregular, more or less spherical, sometimes oblong gall which may vary in size from 1/4 inch to 1 1/4 inch in diameter, brownish-yellow; pithy and containing many larval chambers; found on *Rosa* sp. It has been reported from Colorado, Wyoming and California.

4. *Rhodites globuloides*, Beutenmuller.—Described by Beutenmuller as follows: “Polythalamous. Smooth, rounded or oblong, arising at each end abruptly from the branch. Green and fleshy when fresh; and brown, soft and corky when dry. Measures from 10 to 22 mm. in width and 35 mm. in length.” Occurs on *Rosa carolina*. It has been reported from Rhode Island, New York, New Jersey, Connecticut, Indiana, North Carolina, Florida, Michigan, and the writer has collected it in Delaware.

5. *Rhodites dichlocerus*, Harris.—This gall is an elongated, spindle-shaped swelling of the stem of the roses. It is sometimes almost smooth, sometimes covered with a fine pubescence, and sometimes covered with rather large spines. It is comparatively rare.

6. *Diastrophus nebulosus* Osten Sacken.—This is a very large, polythalamous, stem gall with deep longitudinal groves, the stem of the plant forming a central, longitudinal axis. It varies from 1 to 3 inches in length and from 1 to 1 1/2 inches in diameter. It is of a dark green color, becoming reddish brown with the approach of the following spring, at which time the insects emerge. It is very widely distributed throughout the country and probably occurs wherever the host plant, *Rubus villosus*, occurs.

7. *Diastrophus radicum* Bassett.—This gall occurs on the smaller roots of the blackberries and raspberries (*Rubus occidentalis* and *R. villosus*). Specimens are irregular, knotty, somewhat spherical and extremely variable in size, sometimes as much as 2

inches in diameter. It is widely distributed altho, because of their location underground, not reported so often as some others which are more conspicuous.

8. *Amphibolips confluens* Harris.—This is a large, spherical, smooth, green gall which is sometimes as much as two inches in diameter. The outer wall is very thin, and it is filled with a mass of spongy substance in the center of which is a hard walled chamber with a single larva. Considerable confusion has arisen because of the two generations of insects which come from this gall; from certain galls both males and females emerge about the middle of June and were originally designated by Osten Sacken as *Cynips spongifica*; a second generation emerges in the fall or following spring was designated by Osten Sacken as *C. aciculata*. Walsh found afterwards that they were dimorphic generations of the same species. Gillette in his report on the Michigan galls refers to *A. coccineae* and *A. spongifica*, but it is probable that he had two varieties of this same species. It has a very wide distribution and has been reported from *Quercus tinctoris*, *Q. rubra*, *Q. coccineae*, and *Q. nigra*.

9. *Amphibolips sculpta* Bassett.—This is a beautiful, spherical, soft, succulent gall about $\frac{1}{2}$ to $\frac{3}{4}$ inch in diameter and has a very striking resemblance to a large white grape. There is a single larval chamber in the center, and it occurs on the leaves *Quercus rubra*, *Q. coccinea* and *Q. tinctoria*.

10. *Amphibolips inanis*, Osten Sacken.—This is a spherical gall about $\frac{1}{2}$ to 1 inch in diameter. It has a very thin outer wall and in the center is a larval chamber which is supported by radiating filaments. It is a light green in color and has a number of small black dots on the surface. It occurs on *Quercus coccinea* and *Q. rubra*.

11. *Amphibolips cookii*, Gillette.—Gillette reports this gall from *Quercus rubra*, and describes it as follows: "Galls globular, with central larval cell held in place by stout radiating fibres. When green the galls resemble very much the growing walls of *Amphibolips inanis* O. S. The gall differs from that of *A. inanis* by having a thicker outer shell, by having much stouter radiating fibres, by being somewhat drawn out into a point at either extremity and by occurring on buds instead of the leaves. The galls fall with the leaves or before them and when dried, the outer surface is much

shriveled in appearance. About a pint of these galls were gathered, some late in the fall and others early in the spring, under a large red oak."

12. *Amphibolips prunus* Walsh.—This is a rather solid, fleshy, oval, monathalamous gall which grows from the side of the acorn. It is usually bright red and frequently somewhat variegated, gradually shading into red towards the center. It varies from $\frac{1}{2}$ to 1 inch in diameter and has been reported on *Quercus rubra*, *Q. tinctoria* and *Q. nigra*.

13. *Andricus seminator* Harris.—This consists of a mass of very small monathalamous galls covered with a woolly substance which gives the whole mass a more or less spherical appearance. The mass varies from 1 to 2 inches in diameter and is either pure white or tinged with red, but late in autumn becomes rusty brown. Very common on *Quercus alba* and occasionally on *Q. bicolor* and *Q. prinus*.

14. *Andricus clavula* Bassett.—This gall occurs in the form of a club-shaped growth on the tips of the twigs of the *Quercus alba*. It is formed when the twig is very young and is green at first, but as the twig turns brown the gall does likewise and also becomes hard and woody. It is very common and probably has as wide a distribution as the host plant.

15. *Andricus futilis* Osten Sacken.—This is a small green gall, slightly flattened, and projecting from both surfaces of the leaf. They are hollow and in the center are two or three oblong bodies which are held in place by small filaments. Within each of these bodies is a single larval chamber. Very abundant in the early summer on the leaves of *Quercus alba*.

16. *Andricus scitulus* Bassett.—Woody swellings at the tips of branches of *Quercus tinctoris* and *Q. rubra*. They range from $\frac{3}{4}$ to $1\frac{1}{2}$ inches in length and about $\frac{1}{2}$ inch in diameter. They check the growth of the twig and are frequently covered with leaves.

17. *Andricus flocci* Walsh.—This gall appears as a mass of wool on the under side of the leaves of *Quercus alba* and *Q. macrocarpa*, usually along the midrib. The mass may be $\frac{3}{4}$ inch across. Within the mass is a cluster of very small bodies, each with a larval chamber. They are fairly common and sometimes very abundant.

18. *Andricus petiolicola* Bassett.—This gall usually occurs at the base of the petiole but sometimes along the midrib. It is more

or less spherical, slightly spindle-shaped, woody, green and contains a number of larval chambers. It occurs on *Quercus alba*, *Q. montana*, *Q. prinus*, *Q. macrocarpa*, *Q. bicolor*, *Q. prinoides*, *Q. obtusiloba*, and is very widely distributed.

19. *Andricus cornigerus* Osten Sacken.—This gall is formed on the branches, and often occurs in very great numbers. It is irregular, more or less spherical, woody, variable in size and has many hornlike projections thro which the flies escape. This gall occurs on *Quercus palustris*, *Q. ilicifolia* and *Q. nigra*.

20. *Andricus punctatus* Bassett.—This species is very similar to *Andricus cornigerus* but can be distinguished by the absence of the horn-like projections. It has a very wide distribution and occurs on *Quercus nigra*, *Q. coccinea*, *Q. rubus*, and *Q. ilicifolia*.

21. *Andricus foliaformis* Gillette.—Gillette describes this gall as "small wart-like projections out from the midrib on the under side of the leaves from which there grows a leafy expanse that extends on all sides like the corolla of a rotate flower." It is found on *Quercus alba*.

22. *Andricus singularis* Bassett.—This gall resembles *Amphibolips inanis* but is somewhat smaller in size, ranging from $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter. In the center is the oblong larval chamber suspended by radiating filaments. It is smooth, thin, green and succulent, turning brown and becoming brittle as it becomes old. It occurs on the *Quercus rubra*, and there is usually only one to the leaf.

23. *Cynips dimorphus* Ashmead.—Gillette describes this gall as follows; "galls red and globular, 2 or 3 mm. in diameter, and arranged in clusters of from 10 to 20 or more on the under side of the leaves of *Quercus prinus*, *Q. macrocarpa* and *Q. bicolor*."

24. *Cynips strobilana* Osten Sacken.—Those galls are borne in clusters. Each gall is somewhat pyramidal in shape and they are attached to the stem by their apices. Each gall contains a single larval chamber. When dry they are hard and corky and break off readily. Osten Sacken was probably right when he considered the entire mass as arising from a single bud and each individual from a single leaf. They are most common on *Quercus bicolor*, but also occur on *Q. macrocarpa*.

25. *Acraspis erinacci* Walsh.—This species is spherical, marked by a fine net work of fissures and covered with long spines. It

appears in June or July and matures in August or September. When young it is yellow or greenish, and the spines are reddish. It is attached to one of the veins on the upper surface by a single point. It occurs on *Quercus alba* and *Q. rubra*.

26. *Acraspis villosus* Gillette.—This gall is a very hard, globular exerescence on the under side of the leaves and always attached to the midrib. It is light yellow in color and covered with a dense growth of short hair. Very similar to the gall of *Acraspis erinacci* but differing from it by having a much heavier pubescence, by always being single celled and by being of a light yellow color. Large specimens frequently measure more than $\frac{1}{4}$ inch in diameter. It is found on *Quercus macrocarpa*.

27. *Biorhiza rubinus* Gillette.—Gillette describes these galls as follows: "When they begin to turn in October, sub-globular juicy gall about 2 or 3 mm. in diameter and rosy in color; are found attached to the under sides of the leaves." They occur on *Quercus alba*.

28. *Biorhiza forticornis* Walsh.—A gall produced in great numbers on the twigs of *Quercus alba*. They are packed close together and so vary somewhat in shape by their relation to their neighbors. Each gall is bladdery and has a small larval chamber suspended in the center.

29. *Holcaspis globulus* Fitch.—This is one of the most common galls. It is spherical and may occur singly or in clusters of variable numbers. It is yellow in color and often reddish. Hard and corky with a capsule in the center which contains the larva. It occurs on *Quercus alba*, *Q. prinus*, and *Q. prinoides*.

30. *Holcaspis mamma* Walsh.—Very similar to *H. globulus* and easily confused with it but can be readily distinguished by a point at the apex. It occurs on *Quercus plantanoides* and *Q. macrocarpa*.

31. *Holcaspis bassetti* Gillette.—This gall occurs single or in closely crowded clusters. When young it is green and soft, often tinged with red, but as it grows old it becomes woody and brown. It has a single larval chamber and a very pronounced beak. It occurs on the twigs of *Quercus plantanoides* and *Q. imbricaria*.

32. *Dryophanta papula* Bassett.—Bassett describes these as follows "Clusters of small papillose or cone like galls on the upper side of the leaves of *Q. rubra* and *Q. tinctoria*, projecting unequally and usually so crowded as to form a confluent mass of pustule like ele-

ventions. They are hard, though only transformed portions of the blade of the leaf. On the under side of the leaf they appear simply as a scar, projecting little if at all." It also occurs on *Q. coccinea*.

33. *Neuroterus batatus* Bassett.—This gall consists of a very large and uneven swelling at the tips of the young twigs. It is very hard and woody and contains a number of larval chambers. It is common on *Quercus alba*.

34. *Neuroterus noxiosus* Bassett.—This gall is very similar in shape and size to the preceding but the insects are different. It occurs on *Quercus bicolor*.

35. *Neuroterus vesiculus* Bassett.—Bassett describes this species as follows; "Gall a small, smooth, reddish brown vesicle developed from the center of the buds of *Quercus alba*, surrounded at the base by the bud scales. The color is sometimes a pale greenish brown. The walls of the gall are thin and the larva free, that is, having no larval cell." This gall has also been reported on *Q. macrocarpa*.

36. *Neuroterus niger* Gillette.—These galls are described by Gillette as "little pimples about 2 mm. in diameter on the surface of the leaves and show equally well from above and below. There are usually a large number on a single leaf. The galls appear late in August." This gall occurs on *Q. macrocarpa*.

37. *Solenozopheria vaccinii* Ashmead.—These are rounded, elongated galls which occur on the *Vaccinium corymbosum*, *V. pennsylvanicum* and *V. canadense*. They develop during the growing period of the twig and in such a manner as to cause the twig to become curved. They are green when young but become hard and woody. They contain large numbers of larval chambers.

Family—Tenthrenidae.

38. *Pontania pomum* Walsh.—This is a very common gall on several species of willows. It is almost spherical, about $\frac{1}{2}$ inch in diameter, projecting more on one side of the leaf than on the other. It is yellowish-green in color, sometimes pinkish.

DIPTERA.

Family—Cecidomyiidae.

39. *Cecidomyia strobiloides* Osten Sacken.—This is a very common gall occurring on many species of willows. It is made up of imbricated leaves which give it the appearance of a cone. It is very widely distributed.

40. *Cecidomyia rigidae* Osten Sacken.—This species also occurs on several of the willows. It is a woody, spindle shaped, hollow enlargement of the twig, usually the tip. It is the same color as the twig and contains a single larva.

41. *Cecidomyia persicoides* Osten Sacken.—These galls are more or less spherical but vary somewhat in size and shape. They are very pubescent and occur in great numbers on the under side of the leaves of the hickories. They are most abundant along the midrib, and frequently cause a deformity of the entire leaf.

42. *Cecidomyia coryloides* Walsh.—A species occurring as a mass of small galls on the stem of grapes. Each gall is about $\frac{1}{4}$ to $\frac{3}{8}$ inches in length and about $\frac{1}{8}$ to $\frac{1}{4}$ inch in diameter. It is fleshy and in the center there is an elongated cavity containing the larva. The entire mass may be two and a half inches in diameter.

43. *Cecidomyia verrucicola* Osten Sacken.—These galls occur in great numbers on the leaves of *Tilia americana*. They are circular, about $\frac{1}{5}$ inch in diameter, green, and project from both surfaces of the leaf. In the fall the gall becomes hard and woody and open on the under side by a circular trap door-like opening, the lid remaining attached at one side. This gall has a very wide distribution.

44. *Cecidomyia poculum* Osten Sacken.—These are the small saucer-like structures which frequently occur on the under side of the leaves of the oak, especially *Quercus alba* and *Q. obtusiloba*. They vary greatly in color, usually occurring in clusters and are commonly called oak sprangles.

45. *Lasioptera vitis* Osten Sacken.—This gall occurs on the stem of the wild grape, *Vitis cordifolia*. It consists of a mass of irregular, soft juicy, swellings which may be green, yellow or red in color.

Family.—*Trypetidae*.

46. *Trypeta solidaginis* Fitch.—This is a large spherical gall, frequently an inch or more in diameter, occurring on the stem of the golden rod. It is hard on the outside but somewhat pithy on the inside, and contains a single larva.

HEMIPTERA.

Family—*Aphidac*.

47. *Colopha ulmicola* Fitch.—This is the common cock's-comb gall which is so common on the upper surface of the leaves of the white elm, *Ulmus americana*. They occur early in the spring and reach maturity in June. Each gall is about $\frac{3}{8}$ inch in height and may be an inch or more in length.

48. *Pemphigus populi-caulis* Fitch.—This is a somewhat irregular spherical gall at the base of the leaf of various species of *Populus*. The opening is closed by a twisting of the leaf against the gall. It occurs on *P. deltoides*, *P. monilifera* and *P. angulata*.

49. *Pemphigus populi-transversus* Riley.—This is an oval gall formed on the petioles of the leaves of the various species of *Populus*. On the side opposite the petiole is a slit which is sometimes contracted into a circular opening. It occurs on *P. deltoides*, *P. monilifera* and *P. balsamifera*.

50. *Pemphigus vagabundus* Walsh.—This is an apical bud gall which results in the deformation of the leaves so that they lose their identity. Each part consists of a double laminae between which are the insects. Each part is also very much wrinkled. Very common on *Populus deltoides*. It has a very wide distribution.

51. *Phylloxera vastatrix* Planchon.—This is a small wart-like gall occurring in great numbers on either the upper or lower surface of the grape. Another generation of this insect produces galls on the roots of the grape. It is most common on *Vitis vulpina* and *V. bicolor*. It is widely distributed throughout North America, and has been introduced into Europe, where it has caused an enormous loss.

52. *Phylloxera caryac-caulis* Fitch.—This is one of the largest of the galls occurring on the hickories. It is hemispherical, variable in size, and occurs on stem, petioles or vein of the leaf. There is usually a small opening at the top.

53. *Phylloxera caryac-globuli* Walsh.—This is a hemispherical-shaped gall occurring on the upper surface of the leaves of the hickories. It is frequently $\frac{1}{4}$ inch in diameter and very abundant. The opening is a narrow slit on the under surface of the leaf.

54. *Phylloxera caryac-fallax* Walsh.—A cone-shaped gall occurring on the upper surface of the leaves of *Hicoria alba*. There is also a corresponding much shorter cone on the under surface of the leaf, through which the insects escape. Frequently so abundant as to cause great injury to the foliage.

55. *Hormaphis hamamelidis* Fitch.—This is a conical gall about $\frac{1}{4}$ inch in height occurring on the upper surface of the leaves of the witch hazel, *Hamamelis virginica*. They are usually at the angle formed by the midrib and one of the principal veins. The opening is on the under side. It is very common and widely distributed.

LEPIDOPTERA.

56. *Gonorimoschema gallaesolidaginis* Riley.—This is an elongated spindle-shaped enlargement of the stem of the common golden rod, *Solidago canadensis*. In the center is a single large larval chamber.

ARACHNIDA.

57. *Acarus aenigma* Walsh.—A mass of small filamentous structures occurring on the leaves or stems of the willows. Sometimes the mass represents the bud which has been entirely distorted by the action of the insect.

58. *Acarus serotinae* Beutenmuller.—A sac-like gall about $\frac{2}{5}$ inch in length, occurring on the upper surface of the leaves of the wild cherry, *Prunus serotina*. It is constricted at the point of its attachment to the leaf, and has its opening on the under surface of the leaf. It is very common and widely distributed.

59. *Eriophyes quadripes* Shimer.—This is a small wart-like gall occurring on the surface of the leaves of several species of maples. Most abundant on the upper surface but frequently on both surfaces. The opening is on the under side. Sometimes so abundant as to distort the leaf.

THE BIRDS OF SCHOOL GIRL'S GLEN, ANN ARBOR, MICHIGAN: A STUDY IN LOCAL ORNITHOLOGY.

BY A. D. TINKER.

The following series of notes is not offered as an exhaustive discussion of the ornithology of the designated territory but rather as a less pretentious report upon the different species of birds which have actually been found to occur within the limits of the region indicated, and of the influence of the physical conditions that make up the environment of the bird-life. It is hoped that the paper will serve as an incentive to the study of similar local areas and as a method of work for those who, desiring to obtain at least a speaking acquaintance with the birds of their region, are forced to confine their field-work to city parks and localities of a similar character.

Ornithologists in general have come to recognize the value of local studies, even though they may apply to restricted areas, as they bring before the student in a forcible and easily comprehensible way the relations existing between the topographical features of a country and its ornithology.

With these ideas in mind the writer has attempted to bring together here all of the available material on the bird-life of a small area near Ann Arbor, Michigan. The data are the results of the field-work done by himself during the spring and fall of 1903, spring of 1904, fall and winter of 1905 and 1906, the spring, fall and winter season of 1906 and 1907, the winter of 1907 and 1908 and the spring of 1908; also such records of other observers as seem to throw additional light upon the subject. A few records have been taken from the migration lists of the University of Michigan Museum where the identification seemed to warrant acceptance. Due acknowledgment of all such acquisitions has been made within the body of the paper. Especial thanks are due Dr. A. G. Ruthven, Curator of the Museum, for his kindness in procuring the map and photographs which accompany this paper and which convey a much better idea of the environmental conditions than would have been possible with written descriptions only, and to Mr. Nor-

man Wood for his kind assistance in looking up records and for the use of his personal notes. The map was traced from a copy furnished by Prof. G. P. Burns, University of Michigan.

In the general discussion of the results of the survey the subject matter has been grouped under three headings in the belief that such an arrangement would give a clearer idea of the results of the study than any other method. The three sections are as follows:

I. A general description of the topography of the region; the intention being to give a fair conception of the physical conditions existing there.

II. The distribution of the species, embracing a general discussion of the association of some of the more characteristic members of the ornithology and the different forms of environment.

III. A seasonal and annotated list of species found within the region. In the seasonal list an attempt has been made to convey as accurate an idea of the seasonal occurrence of the more prominent species as the data at hand would permit, and in the annotated list will be found more extensive statements on each species occurring within the region, the various species being arranged in accordance with the A. O. U. Check-List.

GENERAL TOPOGRAPHY OF THE REGION.

By the School Girl's Glen Region is meant, not only the Glen proper, but also the University of Michigan Botanical Gardens to the south of the Glen, Forest Hill Cemetery and a small area lying between the Cemetery and the Glen, the entire area comprising about 320 acres. A small part of this area is devoted to cultivation or pasturage, but the larger part is given over to the usages of a public park and the Cemetery. (Plate IX.)

Entering the region from Geddes avenue on the south, where the elevation above the Huron river is about 185 feet, by means of the park drive, one is at once impressed by the general hilly character of the country. To the east especially, there is a succession of hills and depressions, the highest of the former being 180 feet above the river. The whole formation shows a general tendency to slope toward the river bed and into an elongated and irregular basin, extending about northeast and southwest, whose greatest elevation, 105 feet above the river, is at the southern end. The

length of this basin can be roughly estimated at about 2,400 feet, and it is for the greater part, comparatively free from shrubbery or other cover than grass, except for a small area at its north western end where there is a fair growth of hazel, brier and other shrubs with some few ash, elm and hickory trees. At the upper end of the basin there is a small plum orchard of perhaps a dozen trees, and the northern slope of the hill rising from the basin toward Geddes avenue is the site of a moderate sized apple-orchard and a fair planting of grape-vines to the west and a small cultivated field to the east. One or two residences with their accompanying out-buildings and fruit trees stand on the tops of the slopes to the south of the basin.

Near its center the basin is marked by a bit of semi-swampy ground, furnishing the water supply for a small brook that winds its way down the western edge of the basin to the Huron river. At the southern edge of this swamp is a row of willows that formerly, in the summer, furnished shade to a number of cattle that fed over the surrounding hills. The slopes of the hills on the eastern side of the basin are covered with green sward and in some places with a thin, scattering growth of thorn and hazel bushes averaging about three feet in height.

The land to the west of the basin rises in an abrupt ascent to an elevation of about 160 feet above the river, and from thence stretches west-ward in a more or less rolling surface, forming a plateau, the southern part of which is given over to the Cemetery. Along the face of the bluff the park-drive winds in a gradual descent to the river. On its southern third the bluff is free from any decided forest growth, but for the last two-thirds it is covered with a fair stand of second-growth oak and hickory with some brier at its base. (Plate XVI.)

The northern half of the plateau, stretching from the Cemetery to the Glen proper, is free from trees and was formerly the site of an extensive peach orchard; this has recently been plowed over, sections of it being used for the cultivation of corn and other grains. At its south-western edge, bordering the Cemetery, there is a small orchard of quince and apples. Near its center the plateau is broken by a ravine running nearly north and south from the Cemetery. This ravine is about 1,000 feet long, and its elevation is 115 feet above the river at its highest point, and 20 feet

at its entrance into the Glen. A small rill, the result of a spring and drainage from the Cemetery, finds its way down the ravine into the river. The sides of the ravine are clothed with a mixed growth of oak, poplars and willows with thickets of sumach and briers along the upper edge. (Plate XI.)

The north-eastern end of the plateau is continued to the north-east in the form of a ridge about 500 feet long and varying in width from 10 to 50 or 75 feet. It is covered with grass and is crossed by a path leading down into the northern end of the basin. Just at the junction of the plateau with this ridge there is an extensive patch of weeds, clover and grass-land. (Plate XII.)

As to the Glen proper it presents peculiarly inviting features to both migratory and breeding birds. The Huron river, here about 75 feet in width, runs the whole length of the Glen and at its entrance maintains a course nearly due north and south, but almost immediately becomes curved so that at its exit from the Glen it flows to the northeast. The river, of moderate depth for its entire length through the region, maintains a fair current. Near the eastern end it is divided into two channels, a north and south, by the presence there of a small wooded island. A roadway runs the entire length of the Glen and joins at its eastern extremity with the park-drive and on the west with one of the city drives. From the river to the road-way there is rather a sudden rise of about 15 feet, making in some places a more or less steep embankment. For its eastern third this embankment is inclined to be wet, owing to the presence of springs, and formerly supported a dense growth of alders, willows and other shrubs but these have been removed of late leaving only a scattered growth of these plants. The rest of the bank is covered with thickets of willow, alder and hornbeam, with an occasional poplar, thorn-apple or elm tree. From the road-way to the plateau there is an ascent, rather steep in places, of from 80 to 100 feet, forming a bluff with north and northeast exposures. This bluff for the greater part of its extent is covered by a mixed growth of poplars, white-oak, shrubs of various species, and willows along the base where a number of springs furnish considerable moisture. Near the western end of the Glen a spring, having its origin in a miniature grotto on the side of the bluff, discharges its waters in the form of a swiftly flowing rill into the river. (Plates X, XIV, XV and XVII.)

The north bank of the river on the contrary is low and inclined toward marshiness near its center. The western half was formerly the site of a grove of stately elms and a tangle of hornbeam, thorn-apple and sumach, but much of this has been removed of late, leaving a fringing thicket of willows along the bank of the river, which grow wider at either end. Back of the marshy tract is a small field under cultivation and having for its northern boundary the Michigan Central railroad. (Plate XIII.)

Of Forest Hill Cemetery little need be said, as it closely resembles the majority of similar places in its mixed growth of coniferous and deciduous trees and freedom from shrubbery or other undergrowth. A small artificial pond on the southern edge of the grounds furnishes a drainage basin for the surrounding lots. In area the Cemetery occupies about one-fourth of the entire district.

A casual survey of the region at once establishes the fact that there are but few points of attraction for either waders, water-birds, hawks or owls. But for passerin birds it is peculiarly attractive, as demonstrated by the number of species belonging to that order found within its boundaries. Nearly every member of the order known to occur within the confines of Ann Arbor township has at some time or other been noted, either as a breeding or as a transient species, within this region.

The number of individuals, if not of species, found breeding here is really surprising. It is not uncommon to find as many as a dozen Robin or Catbird nests about the Glen alone, and in one morning's walk I once found ten or twelve nests of the Yellow Warbler on the north and south banks of the river.

In many respects this gathering together of so great a number of individuals of a species within a limited area like the present for the purposes of breeding is a strong demonstration of the disturbing influence of man's methods. These isolated spots throughout the country where nature is allowed to hold forth in something of her normal state form havens of retreat for the birds and if unmolested will in the future be a powerful factor in the preservation of our feathered friends.

DISTRIBUTION OF SPECIES IN RELATION TO ENVIRONMENT.

A close study of the various species in the field at once showed the impossibility of making any hard and fast distinctions regarding their distribution over the territory under consideration, for many species were found encroaching upon territory foreign to their usual habitat, as was to be expected from the small size of the area. But, in a general survey of the region, it was observed that there were four forms of environment which exert sufficient influence upon the bird-life to bring about some segregation of species. These four sets of environments were more or less separate and distinct from one another not only in regard to physical conditions but also in respect to the flora. I have grouped these under the following headings:

- I. The Huron River.
- II. The lowlands, embracing the immediate banks of the river and the basin.
- III. The hillsides, including both those of a wooded and those of an open or grassy character.
- IV. The plateau, including the northern, open half and the southern, wooded half known as Forest Hill Cemetery.

As might also be expected from so limited an area, some species were found ranging over the entire region. Of these the American Crow, Blue Jay, American Goldfinch, Baltimore Oriole, Robin, Cowbirds, Song Sparrows, Swifts and Swallows were the most conspicuous. The majority of the species, however, appeared to exhibit a marked preference for one of the four habitats above mentioned, and the groups thus formed will now be discussed.

I. *The Birds of the Huron River.*—Owing to the limited area occupied by the river in proportion to the entire region, one would naturally expect to find but few species of aquatic habits and such was found to be the case. The following have at various times and seasons been noted either upon the surface of the water in quest of food or pursuing a course overhead parallel to that of the river: American Herring Gull, both Lesser and American Scaup Ducks, Canada Goose, Black Tern, American Merganser, American Osprey and Wood Duck. No doubt other species pass up or down the river during the migrations but these are all that have been recorded.

II. *Birds of the Lowlands.*—The banks of the river and the territory forming the basin have been grouped and designated as the lowlands. Of the river banks, the Spotted Sandpiper, American Bittern, Belted Kingfisher and Savanna and Swamp Sparrows appeared to be characteristic while the Song Sparrow and Northern Yellow-throat ranged over all the lowlands and even upon the plateau. In those portions of both districts that were overgrown with shrubbery the American Woodcock, Yellow Warbler, Catbird, Canadian and Connecticut Warblers and in the winter Tree Sparrows, Purple Finches and Chickadees find either a congenial home or suitable foraging grounds.

III. *Birds of the Hillsides.*—As remarked in the first statement regarding the grouping of the environments, the hillsides were found to be of two kinds, namely, the wooded and the open, grassy slopes. The two were of nearly equal extent, the open habitats being perhaps slightly more extensive. As was shown in the general topographical description of the region none of the hills were covered with heavy forest growths but rather with second-growth trees and shrubbery, and of the two habitats the greater number of species of birds were noted on the wooded slopes.

On the wooded slopes the most constant forms were the Thrushes, Warblers, Fox Sparrows, Brown Thrasher, Towhee, Vireos and Flycatchers. Problems in the distribution of migrating warblers developed in making a study of that portion of the plateau which ran out into the basin in the form of a ridge both slopes of which were wooded, the one having a southern exposure being covered with second-growth oak and hickory while the north slope, especially at its eastern end, supported a rather dense growth of poplars and shrubbery. With the exception of a few species, such as the Golden-winged, Palm and Black-throated Green, the greater number of warblers were confined to the northern slope, not even the cold air of the early morning hours influencing their choice of environment sufficient to cause them to resort to the warmer southern slopes. Then again, on the northern slope, certain species were found to be very restricted in their selection of habitats, for instance, the Canadian Warbler ranged along the base of the slope and even to the water's edge but was seldom noted at or near the top of the ridge. Connecticut, Black-poll and Wilson's Warblers selected about the same areas as the preceding, but the Magnolias,

Yellow, Black-throated Green and Black-throated Blue Warblers fed over the entire face of the bluff. Golden-winged Warblers were also noted at the base of the slope as well as in the brier patches on the south side of the ridge.

No such variety of birds were noted on the open, grassy slopes as on the wooded hillsides, but the Field and Vesper Sparrows, and Prairie Horned Lark, as well as the Flicker, were fairly abundant in their seasons. During the winter months, however, these sections were almost completely abandoned, being visited now and then by an occasional Junco or Tree Sparrow.

IV. *Birds of the Plateau.*—Conditions on the northern half of the plateau, although somewhat similar to those of the open hillsides, were quite the reverse of those on the southern half of the plateau, (cemetery) or on the wooded slopes. A small apple and quince orchard at the southwestern end of this area attracted numerous species that otherwise would not have appeared here, for example the warblers of various species. In this locality the most constant forms of bird-life during the late fall and winter months were the Junco, Goldfinch and Song Sparrows while in the spring and summer the Meadowlarks, Field and Vesper Sparrows, Goldfinch and Indigo Bunting were almost always to be found in varying numbers. The only place where the Snowflake has ever been noted within the Glen region was on the eastern end of this part of the plateau.

Forest Hill Cemetery with its mixed growth of coniferous and deciduous trees presented features particularly attractive to birds of arboreal habits, and for this reason a greater number of species were found congregating here than in any other part of the entire district. Warblers, Thrushes and Flycatchers were found to be especially abundant during the migrations, and in fact the Cemetery is one of the best fields in the environs of Ann Arbor for the student of Warblers. The proximity of the Huron river accounts in a measure for the presence here of such species as the Black-crowned Night Heron, Mourning Warbler, and others of similar habits, that have been found here.

SEASONAL AND ANNOTATED LISTS OF SPECIES.

In endeavoring to compile the data on individual species of birds noted within the confines of the Glen region it was found that this could best be done by first arranging the more common and characteristic forms in groups according to the season of their occurrence as follows: Permanent Residents, Winter Residents and Visitants, Summer Residents and Visitants and Transient Visitants, and, second, by supplementing the above by a complete annotated list of all species. Throughout the following discussion the above plan has been adhered to, as far as circumstances would permit, in the belief that such a treatment of the subject would convey a better idea of the standing of each species within the region than any other method.

SEASONAL LIST.

1. Permanent Residents.—By permanent residents is meant all of those species which were found represented in the region throughout every season of the year, and this group includes the following six species:

Northern Downy Woodpecker.	Cardinal.
Hairy Woodpecker.	White-breasted Nuthatch.
Blue Jay.	Black-capped Chickadee.

2. Winter Residents and Visitants.—This group embraces all such species, breeding to the north, as occur constantly in the region during the winter months or as occasional visitants from the far north. Five species are recorded.

Pine Grosbeak.	Tree Sparrow.
Purple Finch.	Slate-colored Junco.
Snowflake.	

Of these the Tree Sparrow and Junco are the constant forms (winter residents) while the others can be considered only as occasional visitants.

3. Summer Residents and Visitants.—Within this group fall all of those species which either nest within the prescribed territory or, breeding in the surrounding country, seek this region as a convenient foraging ground. The group embraces 67 of the birds found occurring here, the more characteristic forms being as follows:

Killdeer.	Song Sparrow.
Mourning Dove.	Towhee.
Yellow-billed Cuckoo.	Rose-breasted Grosbeak.
Black-billed Cuckoo.	Barn Swallow.
Belted Kingfisher.	Bank Swallow.
Northern Flicker.	Tree Swallow.
Chimney Swift.	Cedar Waxwing.
Ruby-throated Hummingbird.	Red-eyed Vireo.
Kingbird.	Warbling Vireo.
Wood Pewee.	Yellow Warbler.
American Crow.	American Redstart.
Cowbird.	Northern Yellow-throat.
Bronzed Grackle.	Catbird.
Meadowlark.	Brown Thrasher.
Baltimore Oriole.	Wood Thrush.
Vesper Sparrow.	Robin.
Field Sparrow.	Bluebird.

4. Transient Visitants.—By the term transient visitants is meant all of those species which, breeding at a distance, pass through the region during the migrations either to or from their breeding grounds. About fifty of the species found within the territory come under this group, some of these being regular visitants, while others, such, for instance, as the Blue-headed Vireo, Prairie, Pine, Parula, Black-poll, Hooded and Kirtland's Warblers, are of very irregular and infrequent occurrence.

At the present time only the more characteristic species can be given; among these are the:

Yellow-bellied Woodpecker.	Black-throated Blue Warbler.
Black Tern.	Myrtle Warbler.
Lark Sparrow.	Magnolia Warbler.
White-crowned Sparrow.	Black-throated Green Warbler.
White-throated Sparrow.	Palm and several other species
Fox Sparrow.	of Warblers.
Black and White Warbler.	Winter Wren.
Golden-winged Warbler.	Olive-backed Thrush.
Nashville Warbler.	Grey-cheeked Thrush.
Tennessee Warbler.	Hermit Thrush.

ANNOTATED LIST.

In the following list an attempt has been made to give a detailed account of each species found to occur within the School Girl's Glen Region. The total list comprises 138 species, and of these about 100 are of regular occurrence, the others being only accidental or occasional visitants. It will be seen that but few aquatic birds are included within the list, the majority of the species belonging to the order Passeres. This is easily accounted for by the character of the physical conditions prevailing within the territory.

In regard to dates of arrivals and departures, etc., only general conclusions, deduced from the data, are given, the intention being to convey as accurate an idea as possible of the standing of each species within the region without entering upon a detailed discussion of migration tables. The arrangement of species is that adopted by the American Ornithologist's Union, the A. O. U. numbers being those in parentheses.

1. (6) **Pied-billed Grebe** (*Podilymbus podiceps*).—Although breeding commonly about the various lakes and ponds throughout Washtenaw county, this species was found to be of irregular occurrence at the Glen. It generally arrived during the spring migration, between the 7th and 18th of April, the individuals remaining only a few moments to rest or forage.

2. (51) **American Herring Gull** (*Larus argentatus*).—Rather an uncommon visitant (along the Huron river), having been noted but three times,—on March 28, 1906 by C. K. Kauffman, April 7, 1907 and February 2, 1908. The individual seen on the latter date was, in all probability, on a foraging trip up the Huron from Lake Erie.

3. (77) **Black Tern** (*Hydrochelidon nigra surinamensis*).—A rare and accidental visitant at the Glen, the only record being the one secured on May 19, 1907, when an adult bird was observed flying swiftly up the river—apparently migrating to some more northern point.

4. (129) **American Merganser** (*Mergus americanus*).—Most frequently noted about the river during the winter and early spring months. A small flock of three birds was observed on several occasions, during the winter of 1903 and 1904.

5. (148) **American Scaup Duck** (*Marila marila*).—A rare visitant at the Glen, being occasionally noted during the spring and fall migrations, but only as solitary individuals or more rarely a single pair.
6. (149) **Lesser Scaup Duck** (*Marila affinis*).—Like the preceding, the Lesser Scaup is of irregular occurrence here, only stopping during the migrations for a few moments foraging or security from the persistent gunning lower down the river.
7. (172) **Canada Goose** (*Branta canadensis*).—Although the species may frequently pass up or down the Huron through the Glen, but one record was obtained—on March 28, 1908. Upon that occasion a fine male was observed flying in an easterly direction, following the course of the river.
8. (190) **American Bittern** (*Botaurus lentiginosus*).—Observed but once, along the banks of the river, by R. A. Brown on May 9, 1903.
9. (194) **Great Blue Heron** (*Ardea herodias*).—A rare visitant at the Glen, having been noted but once. In September, 1903, one was observed at the head of the island.
10. (202) **Black-crowned Night Heron** (*Nycticorax nycticorax naccius*).—Of rare occurrence throughout Washtenaw County, this species can be looked upon as only an accidental visitant at the Glen. But one record is known, that having been obtained by the writer on May 3, 1908, when an immature male was noted among the pines in the Cemetery. N. A. Wood also saw the bird and verified the identification. (Auk vol. 25, page 314.)
11. (228) **American Woodcock** (*Philohela minor*).—A rare summer visitant, frequenting the hazel-pasture at the northwestern end of the basin and the north bank of the river: noted on the following dates, March 27, 1904, April 29, 1906 and in the early part of September 1903.
12. (263) **Spotted Sandpiper** (*Actitis macularia*).—From the last of April to the middle of September the species is rather common along the banks of the river. No breeding records were obtained. The earliest record for the spring migration is April 24, 1906 (in 1907 it was not observed until April 28); the latest fall record is September 22, 1907.
13. (273) **Killdeer** (*Oxyechus vociferus*).—Commonly noted from about the middle of March to the last of September. It is generally

observed flying overhead, although a few have been noted in the basin, and feeding along the banks of the river during the period of low water. No nests were found. The date of the earliest spring arrival is March 15, 1908, and the latest fall record, October 8, 1904.

14. (289) **Bob-white** (*Colinus virginianus*).—A rare visitant at the Glen, having been noted but twice from 1903 to 1908. In September, 1904, a small flock of 8 was flushed from the dense thickets on the north bank of the river, and on April 27, 1906, O. McCreary met with the species in the same place.

15. (316) **Mourning Dove** (*Zenaidura macroura carolinensis*).—A common summer resident, arriving about the second or third week in March and remaining until about the first week in November. The earliest date of arrival is March 17, 1907; the latest fall record, November 6, 1907. The species ranges over the entire territory but appears to be most abundant on the plateau and along the banks of the river, where it frequently nests in the willows at varying heights of from two to ten feet from the ground. On May 19, 1907, a nest was located on the ground in the ravine. It was placed at the base of a tree and contained two eggs.

16. (331) **Marsh Hawk** (*Circus hudsonius*).—A rare summer visitant at the Glen, having been noted but a few times about the region,—once on the north bank of the river on June 1, 1903, and again flying over the plateau on May 3 and 17, 1908.

17. (332) **Sharp-shinned Hawk** (*Accipiter velox*).—This must be considered a rare and irregular visitant: I have never noted it here myself, but it has been reported by other observers. Exact dates not available.

18. (333) **Cooper Hawk** (*Accipiter cooperii*).—A rare visitant within the region. An immature bird was observed feeding on the carcass of some small bird on January 24, 1904; O. McCreary noted one on April 3, 1906, and others were observed on May 1, and 11, 1907.

19. (339) **Red-shouldered Hawk** (*Buteo lineatus*).—But one record was obtained October 16, 1903.

20. (343) **Broad-winged Hawk** (*Buteo platypterus*).—An accidental visitant, noted on May 1, 2 and 8, 1907.

21. (360) **American Sparrow Hawk** (*Falco sparverius*).—Occasionally noted about the hills and plateau of the region but not common; a summer visitant noted in 1908, on March 21 and April 9.

22. (364) **American Osprey** (*Pandion haliaetus carolinensis*).—Observed but once—in the latter part of August, 1906.

23. (366) **American Long Eared Owl** (*Asio wilsonianus*).—An irregular visitant from the surrounding territory; one noted on September 29, 1907.

24. (373) **Screech Owl** (*Otus asio*).—An irregular permanent resident, occurring mostly in the Cemetery, where they find shelter in the pines. It was noted a few times at the Glen, and was frequently heard at dusk during the spring, but it cannot be considered common. Noted on March 15 and 22, 1907, and on March 27, 1906, Donald Young took one in the red phase at the Glen.

25. (387) **Yellow-billed Cuckoo** (*Coccyzus americanus*).—A fairly common summer resident, frequenting the wooded slopes and thickets along the river banks. It has also been noted in the Cemetery and in the orchards of the region. Although no nests have been found it undoubtedly breeds, as the species is present nearly the entire summer. The earliest record for 1903 is May 14, for 1906, May 17, for 1907, May 13 and for 1908, May 24. The latest record for 1905 is September 10, and for 1907, September 8.

26. (388) **Black-billed Cuckoo** (*Coccyzus erythrophthalmus*).—A common summer resident; observed much more frequently than the preceding and nearly always in the trees and thickets along the river. R. A. Brown took a nest with eggs in the spring of 1903, but I have never located any nests about the Glen. The earliest record for 1906 is May 14, for 1907, May 14, and for 1908, May 19. The last observations made on the species in 1907 were on September 29.

27. (390) **Belted Kingfisher** (*Ceryle alcyon*).—Common summer resident along the banks of the river, and found nesting in both gravel-pits. Nests were located on April 13, 1907, and April 22, 1908. The earliest record for 1906 is March 14, for 1907, March 14 and for 1908, March 22. The latest record for 1907 is September 29.

28. (393) **Hairy Woodpecker** (*Dryobates villosus*).—An irregular permanent resident, occurring as an occasional visitant from the surrounding country; not known to breed.

29. (394a) **Northern Downy Woodpecker** (*Dryobates pubescens medianus*).—A fairly common permanent resident, ranging over

all the wooded sections, even down to the shrubbery along the banks of the river, and on one occasion observed feeding from the seed-pods of the mullen on the open hillsides. It is most noticeable during the winter months, and but one nest is recorded—in April, 1903. The species undoubtedly breeds regularly, as old nests are frequently found in the winter.

30. (402) **Yellow-bellied Woodpecker** (*Sphyrapicus varius*).—A regular transient visitant, passing through the region during migration: most often observed in the Cemetery, where they nearly girdle the pines with circular bands of punctures in the bark. It was first recorded in 1903, on April 7, in 1904, on April 17, in 1906, on April 5 (remaining up to May 10), in 1907, on March 29 (remaining until May 11), and in 1908, on March 28.

31. (406) **Red-headed Woodpecker** (*Melanerpes erythrocephalus*).—Common as a summer resident in the Cemetery, but seldom observed about the Glen. It has been known to winter, as in January and February of 1907, when single birds were noted in the vicinity of the Cemetery. The species generally makes its appearance about the last week in April or the first week in May, for example, April 28, 1906, April 20, 1907, and April 26, 1908, were first records for the respective years.

32. (412) **Northern Flicker** (*Colaptes auratus luteus*).—A common summer resident, appearing about the first or second week in March (March 22, 1903, March 4, 1906, March 17, 1907, March 22, 1908) and remaining well into October (October 28, 1906, and October 6, 1907). A common breeder in the Cemetery, where nidification begins about the first or second week in April. It was frequently observed feeding on the open hillsides as well as on the plateau.

33. (417) **Whip-poor-will** (*Antrostomus vociferus*).—An accidental summer visitant within the region, only one record being secured—May 19, 1907.

34. (420) **Nighthawk** (*Chordeiles virginianus*).—Frequently observed flying over the river and hills at dusk, during the latter part of May and the month of June. In 1908 it was first recorded on May 18.

35. (423) **Chimney Swift** (*Chaetura pelagica*).—A common summer visitant, noted especially in the early morning and evening flying low over the river in quest of insects. It arrives about the

second or third week in April, and from that time to the middle of September is quite abundant; in 1907 it was observed between April 29 and September 8. The first record for 1908 is April 23.

36. (428) **Ruby-throated Hummingbird** (*Trochilus colubris*).—A common summer resident at the Glen and Cemetery, arriving about the middle of May and remaining until the middle of September. My records are: May 17, 1906, and May 13 to September 15, 1907. In the fall, numbers of them congregate about the beds of jewel-weed that adorn the banks of the river, and, darting back and forth from blossom to blossom, form an animated picture of bird-life. I have never found them breeding here.

37. (444) **Kingbird** (*Tyrannus tyrannus*).—A common summer resident within the region, arriving about the last week in April and remaining until about the first week in September. The earliest record for 1906 is April 29, for 1907, April 28, and for 1908, May 8, the latest record for the fall of 1907 is September 3.

38. (452) **Crested Flycatcher** (*Myiarchus crinitus*).—A fairly abundant summer resident at the Cemetery and Glen, undoubtedly breeding in the former place. It was recorded by N. A. Wood on May 4, 1904, and by myself on May 6, 1906, and quite frequently from May 12 to September 15, 1907. It was first recorded in 1908 on May 12.

39. (456) **Phoebe** (*Sayornis phoebe*).—A common summer resident at the Glen, and occasionally noted in the Cemetery and about the basin. It arrives about the last week in March or the first of April, the earliest record for 1906 being April 8, for 1907, March 22, for 1908, March 15. It remains until the last week of September (September 22, 1907), nidification begins about the first week in April. In the spring of 1908, I observed a pair attempting to construct a nest underneath some projecting sod and roots in the gravel-pit at the Glen, but they failed to complete it.

40. (459) **Olive-sided Flycatcher** (*Nuttallornis borealis*).—A rare transient visitant within the region, having been recorded only on the following dates: June 6, 1907, May 18 and 29, 1908.

41. (461) **Wood Pewee** (*Myiochanes virens*).—Common summer resident, frequenting the wooded sections of the region. Arriving about the second week in May, it remains until about the first of October. The earliest record for 1906 is May 15, for 1907, May

13, and for 1908, May 16. The latest fall record is September 22, 1907.

42. (463) **Yellow-bellied Flycatcher** (*Empidonax flaviventris*).—A rare transient visitant, having been recorded but once—June 2, 1907.

43. (466a) **Alder Flycatcher** (*Empidonax trailli alnorum*).—A rare transient visitant, recorded but once—May 9, 1907.

44. (467) **Least Flycatcher** (*Empidonax minimus*).—Not an uncommon summer resident, breeding in the orchards of the region. It arrives about the fourth week in April (April 29, 1906, May 5, 1907, and April 26, 1908). It is occasionally observed along the river, especially just after its arrival from the south in the spring.

45. (474b) **Prairie Horned Lark** (*Otocoris alpestris praticola*).—An irregular visitant at the Glen, during the spring, summer and fall. I have observed it here but twice during the winter. It was first recorded in 1907, on March 3, in 1908, on January 9 and 26. No breeding records have been obtained.

46. (477) **Blue Jay** (*Cyanocitta cristata*).—Common permanent resident, breeding in the Cemetery about the first week in May. During the winter months it roams over the entire region in bands of from six to a dozen.

47. (488) **American Crow** (*Corvus brachyrhynchos*).—Fairly common summer resident, breeding in the Cemetery. It arrives about the fourth week in February or the first week in March, as, e. g., March 6, 1904, March 4, 1906, February 24, 1907, and March 6, 1908.

48. (494) **Bobolink** (*Dolichonyx oryzivorus*).—Summer visitant and possibly breeds within the region. It arrives about the first week in May and remains until the middle of September. The earliest record for 1906 is April 29, for 1907, May 2, and for 1908, April 26. The latest fall record for 1907 is September 15. During the spring and summer of 1908 the species was unusually abundant in the fields about the Glen.

49. (495) **Cowbird** (*Molothrus ater*).—An only too common summer resident, arriving about the first week in April and remaining until the latter part of September. Of a roving disposition its range is restricted to no one part of the Glen region, but rather covers the entire territory. The earliest record for 1906 is April 5, for 1907, March 22, for 1908, March 22. The latest fall

record of 1907 is September 8. Its eggs have been found in the nests of the Wood Thrush, Field Sparrow, Song Sparrow, Redstart and Yellow Warbler.

50. (498) **Red-winged Blackbird** (*Agelaius phoeniceus*).—Frequent summer visitant along the river, but no breeding records obtained. It arrives about the first week in March and remains until the middle of September, the earliest record for 1906 being April 1, for 1907, March 17 and for 1908, March 8. The latest fall record for 1907 was September 1.

51. (501) **Meadowlark** (*Sturnella magna*).—A common summer resident, frequenting the plateau and open slopes, and breeding in the neighboring hay fields. It arrives about the first week in April and remains until the middle or last week in November. The earliest record for 1906 is April 1, for 1907, March 17 and for 1908, March 8. The latest fall record for 1907 is November 13.

52. (506) **Orchard Oriole** (*Icterus spurius*).—A rare summer resident or rather visitant, having been recorded but once within the region—May 10, 1903—when a male and female were noted in the apple orchard at the head of the basin.

53. (507) **Baltimore Oriole** (*Icterus galbula*).—A common summer resident, most frequently noted at the Cemetery or along the banks of the river, breeding in both places. Arriving about the fourth week in April, it remains until the middle of September. The earliest record for 1906 being April 26, for 1907, May 9, and for 1908, April 26. The latest record for 1907 was September 8.

54. (509) **Rusty Blackbird** (*Euphagus carolinus*).—An irregular transient visitant at the Glen, having been recorded on the following dates, during the spring migrations; April 7, April 21, and May 5, 1907, and March 29, April 5 and April 26, 1908.

55. (511b) **Bronzed Grackle** (*Quiscalus quiscula aeneus*).—A common summer resident, frequenting the river banks and the Cemetery, where they breed in the conifers. The earliest record for 1906 is March 26, for 1907, March 15, and for 1908, March 11. The latest fall record is October 21, and for 1907, September 22.

56. (515) **Pine Grosbeak** (*Pinicola enucleator leucura*).—A rare winter straggler from the north, having been recorded within the region but once, on January 24, 1904. This individual, in company with a Purple Finch, was observed feeding on the berries of a bitter-sweet vine in the ravine at the Glen.

57. (517) **Purple Finch** (*Carpodacus purpureus*).—Very irregular in its occurrence during the winter months, more abundant in the spring migrations. It was most abundant during the winter of 1903-1904 when the species was first recorded on November 15 and last seen on January 24, 1904. The earliest record of its appearance in the fall was September 24, 1905, and the latest date noted for their stay in the spring was May 19, 1907 and May 10, 1908, at which dates the birds were fairly abundant.

58. (529) **American Goldfinch** (*Astragalinus tristis*).—Abundant permanent resident, breeding in the orchards of the region, in the Cemetery and along the edges of the woodland.

59. (533) **Pine Finch** (*Spinus pinus*).—This species cannot be considered as a regular migrant within the region but must be looked upon rather as a transient visitant of the most erratic occurrence. It has been recorded on the following dates: May 19, 21 and 24, 1907, and May 9 and 10, 1908. It is generally found in small flocks of from half a dozen to 18 or 20 individuals, and most often about the pines in the Cemetery.

60. (534) **Snowflake** (*Plectorophenax nivalis*).—Noted but once during four or five years of observation—February 2, 1908,—when a flock of about 70 was discovered on the crest of a hill at the eastern end of the plateau.

61. ——— **English Sparrow** (*Passer domesticus*).—Common permanent resident, ranging over the entire district, and a constant menace to the less aggressive native species. It breeds in abandoned woodpecker's nests and hollow limbs in the orchards, thus appropriating nesting sites that under other circumstances would be adopted by the more useful Bluebirds.

62. (540) **Vesper Sparrow** (*Pooecetes gramineus*).—A common summer resident, frequenting the plateau and the open slopes as well as the upper end of the basin, and breeding abundantly. The earliest records are: for 1903, March 22, for 1904, March 27, for 1906, April 15, for 1907, March 24 and for 1908, March 28. The latest fall record of 1906 is November 28 and of 1907, November 6.

63. (542a) **Savanna Sparrow** (*Passerculus sandwichensis savanna*).—To be classed as an irregular and rare transient visitant at the Glen. It was noted here by Otto McCreary on April 3, 1906, two birds being seen at that date and again on April 7 and 8 of the same year.

64. (522) **Lark Sparrow** (*Chondestes grammacus*).—A rare transient visitant within the region. On May 3, 1903, one was observed at the southern end of the basin, and on May 1, 1907 one was found on the plateau. On May 2, 1907, Max M. Peet took a specimen on the plateau, and on May 3, 1907, O. McCreary found three birds in the same locality.

65. (554) **White-Crowned Sparrow** (*Zonotrichia leucophrys*).—A rare transient visitant. It was noted on April 24, 1904, by R. A. Brown and W. Grant, and on May 14 and 24, 1907, by the writer.

66. (558) **White-Throated Sparrow** (*Zonotrichia albicollis*).—A regular transient visitant in the wooded sections of the region, occurring in flocks of varying sizes. In the spring of 1903, it was first recorded on April 19 and in the fall on October 15. In the spring of 1906 it was first noted on April 28 and remained until May 15. The earliest record for the fall migration of 1906 is September 30 and the latest November 28. In the spring of 1907, White-throats were first observed on April 3 and remained until May 21. The first and last record for the fall migration of 1907 are October 6 and November 3 respectively. In 1908 it was observed between April 15 and May 18.

67. (559) **Tree Sparrow** (*Spizella monticola*).—A very welcome addition to the winter bird-life of the Glen, arriving from the north about the first week in October and remaining until the latter part of April (e. g., October 7, 1906, to April 28, 1907, and October 20, 1907, to April 19, 1908). It was generally found associated in flocks of from 15 to 20 individuals, and frequenting the thickets along the river and on the hillsides.

68. (560) **Chipping Sparrow** (*Spizella passerina*).—A common summer resident, breeding in the Cemetery, and frequenting that locality as well as the orchards of the region. It arrives about the first week in April (e. g., April 5, 1906, March 26, 1907, April 12, 1908). The latest fall record obtained is that of September 15, 1907.

69. (563) **Field Sparrow** (*Spizella pusilla*).—An abundant summer resident, frequenting the plateau and edges of thickets and woodland, and breeding in the less dense thickets. It arrives about the last week of March or the first week in April, e. g., April 3, 1906, March 26, 1907, and March 28, 1908, and remains well into October (October 14, 1906, and October 13, 1907).

70. (567) **Slate-Colored Junco** (*Junco hyemalis*).—A common winter resident, of general range but preferring the more open sections where some cover is close at hand. It makes its appearance in the fall about the last of September or the first of October—September 24, 1905, October 4, 1906, and October 6, 1907. It remains in the spring until about the last of April or the first week in May, April 27, 1906, May 12, 1907, and May 9, 1908, being the latest spring records for the respective years.

71. (581) **Song Sparrow** (*Melospiza melodia*).—A common summer resident, occasionally wintering. It generally frequents the banks of the river and other lowlands of the region, but is quite often observed on the plateau. The individuals remaining through the winter begin to receive accessions to their ranks from the south about the first week in March (March 6, 1904, March 18, 1906, March 17, 1907, and March 15, 1908). The greater proportion remain until the last of October, as shown by the following latest fall records: October 22, 1905, October 28, 1906, and October 20, 1907. Nidification begins about the third week in April, first records being April 22, 1906, and May 1, 1907.

72. (583) **Lincoln Sparrow** (*Melospiza lincolni*).—A rare transient visitant recorded but once in the Glen. On May 9, 1908, one specimen was taken here by R. A. Brown.

73. (584) **Swamp Sparrow** (*Melospiza georgiana*).—An irregular summer visitant found only along the banks of the river; breeding in the territory outside of the Glen but within a radius of four miles. It arrives about the first of April and departs by the middle of September. The earliest record for 1906 is February 23, for 1907, March 31, and for 1908, March 29. The latest fall record for 1907 is September 8.

74. (585) **Fox Sparrow** (*Passerella iliaca*).—An abundant and regular transient visitant, occurring wherever the shrubbery abounds and occasionally observed foraging on the plateau. In 1903 the species was first observed on March 22 and in the fall on November 15. In 1904 the earliest spring record was made on March 27. In 1906 the earliest spring record was April 5, the birds remaining until the 15th; for the same year the earliest fall record was October 21, the birds remaining until November 4. During the spring migration of 1907 the species was first recorded on March 22 and last on April 27: in the fall it was first recorded on

October 13 and last on October 20. In the spring of 1908 I found the species here between the 22nd of March and the 14th of April.

75. (587) **Towhee** (*Pipilo erythrophthalmus*).—A common summer resident, breeding in the thickets on the wooded slopes. It arrives about the last week in March and leaves by the middle of November. The earliest record for the spring of 1903 is March 22, for 1904, March 27, for 1906, April 5, for 1907, March 17, and for 1908, March 15. The latest fall record in 1906 was November 28, in 1907, November 10.

76. (593) **Cardinal** (*Cardinalis cardinalis*).—A rare permanent resident in this locality. It was first noted at the Glen on the 11th of January, 1903, when a male and female were observed in the thickets along the edge of the river. From that date to the last of June of the same year the pair was frequently noted along the river, but never on the south side of the ridge. On May 24, 1903, a nest with one egg was located in a dense thicket on the north bank of the river. The species was again observed at the Glen in 1908, on May 4 and 5.

77. (595) **Rose-breasted Grosbeak** (*Zamelodia ludoviciana*).—A common summer resident, frequenting the thickets along the bank of the river, where its nests can readily be found in season, and occasionally noted in the Cemetery. The dates of earliest arrivals are as follows: for 1903, May 3, for 1906, April 27, for 1907, May 5, and for 1908, May 3. The latest fall record for 1905 is August 27, for 1907, September 15. Nidification in 1906 began on May 15 and in 1907 on May 19.

78. (598) **Indigo Bunting** (*Passerina cyanea*).—Common summer resident, frequenting the Cemetery, orchards and wooded hillsides. Arrives about the first week in May (May 10, 1903, May 17, 1906, May 14, 1907, and May 16, 1908). It remains until about the middle of September, and probably breeds, although no nests were found.

79. (608) **Scarlet Tanager** (*Piranga erythromelas*).—A rare summer visitant at the Glen and Cemetery; possibly breeds. In 1903 a pair was noted on May 10; in 1906 one was noted on May 20, and in 1907 (May 13) a pair was found at the base of the ravine. In 1908 the species was first recorded on May 13.

80. (611) **Purple Martin** (*Progne subis*).—An occasional visit-

ant at the Glen during the summer, when it is observed flying in company with Swifts over the Cemetery and river.

81. (612) **Cliff Swallow** (*Petrochelidon lunifrons*).—A rare summer visitant along the Huron river, having been recorded but once (May 5, 1907), when a single individual was noted flying up the river in company with Barn Swallows.

82. (613) **Barn Swallow** (*Hirundo erythrogaster*).—A common summer resident, breeding in the barns in the vicinity. The dates of earliest arrivals are as follows: April 26, 1903, May 15, 1906, May 5, 1907, and April 19, 1908.

83. (614) **Tree Swallow** (*Iridoprocne bicolor*).—Occasionally noted during the spring and summer months along the river; not known to breed. The earliest record for 1906 is May 15, for 1907, March 31, and for 1908, April 19.

84. (616) **Bank Sparrow** (*Riparia riparia*).—An abundant summer resident, breeding in a large gravel-pit just west of the Glen. Can be noted at almost any time during the late spring and summer, flying over the river or perched in rows of a dozen or more on the telephone wires. It was first recorded in 1906 on April 22, in 1907 on April 28, and in 1908 on April 19.

85. (617) **Rough-winged Swallow** (*Stelgidopteryx serripennis*).—Rare summer resident. O. McCreary noted the species here on April 23, 1906, and I observed it in the following year, May 17, 19 and 24, and found it breeding in the gravel pits, on May 10. In 1908 the species was first recorded on May 5, was found breeding on May 12, and was frequently noted from the 5th to the 19th of May.

86. (619) **Cedar Waxwing** (*Bombycilla cedrorum*).—Common summer resident, breeding in the orchards of the region. This species has been occasionally observed during the winter months, but it cannot be looked upon as a regular winter resident. First records: In 1903 it was first recorded on March 22, when small flocks were observed feeding on dried apples. In 1904 it was observed first on April 17, and in 1906 on March 4. 1907 furnished no records for the spring migration but in the fall it was recorded in considerable numbers on September 8, 15, 22 and 29. The first record in 1908 was on March 8, and from then on it was observed in varying frequency and abundance. It was nearly always found in roving bands of from 6 to 20 or 25 individuals.

87. (624) **Red-eyed Vireo** (*Vireosylva olivaceus*).—Regular summer resident, breeding in the second growth hickory, etc. The earliest record for 1903 is May 10, for 1906, May 6, for 1907, May 13 and for 1908, May 13. The latest fall record was September 15, 1907.

88. (626) **Philadelphia Vireo** (*Vireosylva philadelphicus*).—A rare visitant within the region, but one record known. M. Y. Marshall collected one at the Glen on May 30, 1907.

89. (627) **Warbling Vireo** (*Vireo gilvus*).—A common summer resident, noted most frequently along the banks of the river and on the northern exposures of the Glen ridge. It breeds in the elms along the river, where a nest was located in May, 1903. It was first recorded in 1903, on May 3, in 1906, on April 29, in 1907, on May 11, and in 1908, on April 26. The latest fall record is September 22, 1907.

90. (628) **Yellow-throated Vireo** (*Lanivireo flavifrons*).—Not as abundant as the preceding species, and most often noted during the spring; may possibly breed at the Cemetery, although no breeding records were obtained. The earliest records are as follows: for 1903, May 10, for 1906, May 2, for 1907, May 12, and for 1908, May 5.

91. (629) **Blue-headed Vireo** (*Lanivireo solitarius*).—A rare transient visitant at the Glen, where it has been occasionally observed in the thickets in the vicinity of the river. On May 10, 1903, one was noted on the south side of the Glen ridge, another was recorded by R. A. Brown, on May 30, 1903, a third was taken by N. A. Wood, on May 18, 1903, and a fourth was noted on the bluff facing the river, on May 14, 1907.

92. (636) **Black and White Warbler** (*Mniotilta varia*).—A common transient visitant, most abundant during the migrations, in the Cemetery, where they can be found creeping about the trunks and larger limbs of both deciduous and coniferous trees. The dates of earliest arrivals for the spring migration are May 10, 1903; April 29, 1906 (remaining until May 10); May 9, 1907 (remaining until May 28); April 23, 1908 (remaining until May 19). In the fall of 1907 it was first noted on September 8 and last on September 15.

93. (642) **Golden-Winged Warbler** (*Helminthophila chrysop-tera*).—An irregular transient visitant, frequenting the thickets

and shrubbery on both slopes of the Glen ridge, and most often noted near their bases. It has been recorded as follows: on May 10, 1903, two females were noted on the south side of the ridge, on May 2, 1906, one male was observed feeding in the brier patch at the southwestern end of the basin; in 1907 the species appeared to be more abundant, as records were obtained on May 12 (two males) and May 13 (one); on May 15, 1908, one was seen at the Glen by Frederick Gaige.

94. (645) **Nashville Warbler** (*Helminthophila rubricapilla*).—A fairly common transient visitant, frequenting the Cemetery, orchards and wooded sections of the region. It was first recorded as follows: in 1903, on May 10, in 1906, on May 3, in 1907, on May 9. On the last date 8 were observed, and from then on to the 30th of May the species was frequently noted. In 1908 it was first recorded on May 12, and from that date to the 16th of May.

95. (647) **Tennessee Warbler** (*Helminthophila peregrina*).—Fairly abundant transient visitant in the spring, frequenting the Cemetery and the shrubbery along the banks of the river. No fall records have been obtained. The earliest spring records are as follows: May 17, 1903, April 29, 1906, May 12 to June 6, 1907, and May 12 to 22, 1908.

96. (648a) **Northern Parula Warbler** (*Compsothlypis americana usneae*).—A rare transient visitant, noted both in the Cemetery and at the Glen. A fine male was observed feeding in the poplars along the bluff by the river on May 16, 1907, and single birds were noted at the Cemetery on May 16 and 18, 1908.

97. (650) **Cape May Warbler** (*Dendroica tigrina*).—A rare transient visitant recorded but a very few times—September 12, 1903, and May 16 and 17, 1908. On the last date three birds were observed about the maples in the Cemetery.

98. (652) **Yellow Warbler** (*Dendroica aestiva*).—Common summer resident, frequenting all of the lowlands wherever shrubbery predominates, and breeding abundantly along the banks of the river and in other parts of the Glen. The dates of earliest arrivals are as follows: May 3, 1903, April 20, 1906, April 27, 1907, and April 22, 1908. Nests were found as early as May 5 (1906) and May 16, (1907).

99. (654) **Black-throated Blue Warbler** (*Dendroica caerulescens*).—Common transient visitant, frequenting the Cemetery and

the shrubbery about the Glen proper, also occasionally observed in the orchards of the region. It was first recorded in 1903, on May 17, in 1906, on May 5, in 1907, on May 12 and in 1908, on May 10.

100. (655) **Myrtle Warbler** (*Dendroica coronata*).—The most common transient visitant of all the warblers; found chiefly in the shrubbery along the banks of the river and in the Cemetery. It was observed in 1906 between April 15, and May 6, in 1907 between April 27 and May 28, and in 1908 between April 19 and May 17. In the fall of 1906 the species was found from November 14 to 21, and in 1907 from October 6 to 13.

101. (657) **Magnolia Warbler** (*Dendroica maculosa*).—Common transient visitant, frequenting the Cemetery, where the species seems to show a marked preference for the pines, also noted in the orchards and along the bluff by the river. The earliest records are as follows: May 17, 1903, May 5 to 17, 1906, May 13 to June 4, 1908, and May 12 to 19, 1908. It was noted in the fall of 1907 on September 8 to 29 and on October 13.

102. (658) **Cerulean Warbler** (*Dendroica caerulea*).—A rare visitant at the Glen, having been recorded but once, May 16, 1908—when a fine male was noted in the poplars on the north side of the Glen ridge.

103. (659) **Chestnut-sided Warbler** (*Dendroica pensylvanica*).—A fairly abundant transient visitant, occurring in the orchards and wooded sections of the region. It was first recorded in 1903, on May 10, in 1906, on May 6, in 1907, from May 9 to June 6, and in 1908, from May 12 to 20.

104. (660) **Bay-breasted Warbler** (*Dendroica castanea*).—Transient visitant, not as common as the preceding species, most frequently observed about the larger deciduous trees in the Cemetery. In 1903 it was first noted on May 10; in 1906 no records were obtained; in 1907 it was observed from May 16 to June 6 and in 1908 from May 13 to May 22. It was unusually abundant during the spring migrations of 1907 and 1908.

105. (661) **Black-poll Warbler** (*Dendroica striata*).—Not a common transient visitant; frequents the Cemetery and the bluff along the river. It was first recorded in 1903, on May 17, in 1907, on May 30 (other records were secured on June 4 and 6), in 1908, on May 16 and from that time on to May 25 (especially abundant on the 18th).

106. (662) **Blackburnian Warbler** (*Dendroica blackburniae*).—Rather a common transient species; noted principally in the pines at the Cemetery, although also found in the orchards and along the bluff by the river. The earliest dates of arrival for the spring migrations are as follows: 1903, May 17, 1906, April 29 (staying until May 10), 1907, May 1 (remaining until May 30), and in 1908, May 12, lingering until May 20.

107. (667) **Black-throated Green Warbler** (*Dendroica virens*).—An abundant transient visitant, frequenting the Cemetery, orchards and wooded slopes along the river. It was first recorded in 1903, on May 17, in 1906, April 29 to May 1, in 1907, May 1 to 30, and in 1908 from April 23 to May 20.

108. (670) **Kirtland Warbler** (*Dendroica kirtlandi*).—Very rare transient visitant, having been recorded but twice between 1903 and 1908. It was first observed on the morning of May 13, 1907, in the pine hedge along the north-western edge of the Cemetery, and again on May 16, 1907, along the bluff at the Glen (Bird-Lore, Vol. X, page 81).

109. (671) **Pine Warbler** (*Dendroica vigorsii*).—Rare transient visitant. N. A. Wood took a fine specimen at the base of a willow tree on the banks of the river, on April 26, 1907. On May 2 of the same year a male and female were observed in a pine tree at the Cemetery, and in 1908 the species was recorded first on April 23—when 3 birds were noted among the pines in the Cemetery—and last on April 24.

110. (672) **Palm Warbler** (*Dendroica palmarum*).—A common transient species, frequenting the wooded slopes along the river, and the Cemetery. This species was especially abundant in the spring of 1907, when great numbers were observed nearly every day, from May 1 to 17, associated with the Myrtle Warbler. First records are: in 1906, on May 2, in 1907, on May 1, and in 1908, April 26 to May 17.

111. (673) **Prairie Warbler** (*Dendroica discolor*).—A rare transient visitant, found along the ridge and bluff at the Glen. The species was recorded but four times from 1903-1908 as follows: on May 2, 1905, N. A. Wood took two males in the dense hazel thickets at the eastern end of the ridge, and on May 13, 1907, secured a fine adult male; while on the 14th I observed another, near the central part of the bluff facing the river. M. Y. Marshall also

secured a specimen in this locality on May 15, 1907. The species appeared to be unusually abundant during the spring of 1907.

112. (674) **Oven-bird** (*Seiurus aurocapillus*).—A common summer visitant (probably does not breed), frequenting the Cemetery and wooded slopes. The earliest dates of arrival in the spring are as follows: May 3, 1903, May 6, 1906, May 5, 1907, and May 10, 1908. The latest fall record obtained was November 13, 1907.

113. (675) **Water-thrush** (*Seiurus noveboracensis*).—A rare transient visitant at the Glen, having been observed but once—May 6, 1903.

114. (676) **Louisiana Water-thrush** (*Seiurus motacilla*).—Irregular transient (possibly summer visitant), frequenting the dense thickets along the banks of the river. On May 15, 1895, N. A. Wood secured a specimen near the railroad bridge, and on May 6, 1907, C. K. Kauffman noted one in song in the Glen. It was not recorded in 1908.

115. (678) **Connecticut Warbler** (*Oporornis agilis*).—(Rather a rare transient visitant at the Glen, frequenting the dense shrubbery at the base of the bluff and along the banks of the river. In 1903 the species was recorded on May 2, and in 1907 on May 18, by Miss Harriet Wright. On May 30, 1907, N. A. Wood saw two at the east end of the Glen and secured one, a female. Others were noted on June 2 and 6, 1907, and in 1908 it was recorded on May 17.

116. (679) **Mourning Warbler** (*Oporornis philadelphia*).—A very rare transient in this locality, having been noted but once, May 28, 1907, when a single male was observed near the pond in the Cemetery.

117. (681d) **Northern Yellow-throat** (*Geothlypis trichas brachidactyla*).—Common summer resident, breeding in the lowlands near the river, and occasionally noted on the plateau. First records are as follows: in 1903, on May 10, in 1906, on May 5, in 1907, on April 28, and in 1908 on April 26. In 1907 the species was recorded as late as the 13th of November.

118. (684) **Hooded Warbler** (*Wilsonia mitrata*).—A rare transient visitant, having been recorded but once within the region. On May 13, 1907, a single individual was found in the pine hedge along the northwestern border of the Cemetery. It was exceedingly restless and confined its foraging mainly to the lower growths about the hedge.

119. (685) **Wilson's Warbler** (*Wilsonia citrina*).—Not an abundant transient, occurring principally in the willow thickets along the river, although also observed in the Cemetery. In 1906 it was noted on May 17. In 1907 the species was unusually abundant, making its appearance on May 28 and remaining until June 9. In 1908 it was recorded only on May 17 and 19.

120. (686) **Canadian Warbler** (*Wilsonia canadensis*).—A fairly common transient species, frequenting the shrubbery along the banks of the river, the Cemetery, and the orchards of the region. It was not recorded before 1907, when it came on May 13 and remained until June 2. In 1908 it was first recorded on May 13 and remained until May 18.

121. (687) **American Redstart** (*Setophaga ruticilla*).—Common summer resident, frequenting the wooded slopes and the Cemetery, and breeding in the thickets along the river. In 1903 it was first recorded on May 10, in 1906, on April 29, in 1907, on May 9, and in 1908, on May 12. The latest fall record is September 15, 1907.

122. (704) **Catbird** (*Dumetella carolinensis*).—Common summer resident, frequenting the wooded slopes, especially along the river, where it breeds abundantly in the dense thickets. It generally arrives from the South in the spring about the first week in May, e. g., May 3, 1903, April 27, 1906, May 1, 1907, and April 26, 1908. It remains until the middle of October (October 14, 1906, and October 6, 1907). Nidification begins about the second or third week in May, e. g., May 24, 1906, and May 10, 1907.

123. (705) **Brown Thrasher** (*Toxostoma rufum*).—Common summer resident, frequenting and breeding in much the same localities as the preceding species. The earliest record for 1903 is April 12, for 1906, April 15, for 1907, April 3, and for 1908, April 9. The latest fall records are September 30, 1906, and September 22, 1907.

124. (721) **House Wren** (*Troglodytes aedon*).—Common summer resident: breeds about the residences on the outskirts of the district. The earliest yearly records are for 1903, May 3, for 1906, April 26, for 1907, April 7, and for 1908, April 22. The latest fall record is September 29, 1907.

125. (722) **Winter Wren** (*Nannus hiemalis*).—Transient visitant, occasionally noted at the Glen. In 1906 it was observed on April 15, 29 and September 30. In 1907 it was first recorded on March 22 and last on April 28, and in the fall of the same year

October 6 was the first record and October 13 the last. In the spring of 1908 it was observed from March 28 to April 1.

126. (726) **Brown Creeper** (*Certhia familiaris americana*).—A fairly abundant transient species, frequenting all of the wooded sections of the region. In the spring of 1906 it was first observed on March 18 and last on April 15; in the fall of the same year October 7 was the first record and November 18 the last. Records for 1907 as follows: first spring observation on March 10, the last on May 11; the first fall arrival September 30, the last fall date November 24. In 1908 the species was first recorded on March 28 and last on April 23.

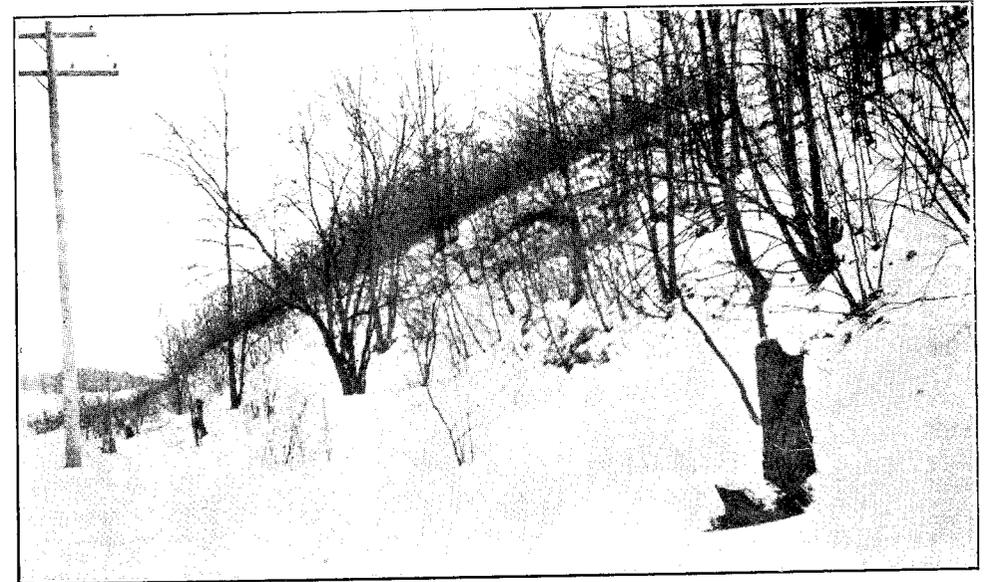
127. (727) **White-breasted Nuthatch** (*Sitta carolinensis*).—Common permanent resident, frequenting the Cemetery and all wooded sections of the region. It probably breeds in the former place but no breeding records were obtained.

128. (735) **Black-capped Chickadee** (*Penthestes atricapillus*).—Common permanent resident, found in much the same localities as the preceding, most often noted during the winter months when they frequent the thickets along the river. Only one nest has been located—in May, 1903—but it probably breeds regularly.

129. (748) **Golden-crowned Kinglet** (*Regulus satrapa*).—Common transient visitant, sometimes remaining through the winter; roams through the wooded sections in bands of a dozen or more, rarely as individuals. The earliest dates for the spring migration are as follows; March 6, 1903, January 21, 1906, March 22, 1907, and March 22, 1908. The earliest fall records are: September 3, 1905, September 27, 1906, and October 6, 1907. It generally departs for the south by the last of November.

130. (749) **Ruby-crowned Kinglet** (*Regulus calendula*).—Not as common as the preceding species, but a few recorded each spring and fall; frequents much the same localities as the Golden-crowned. The earliest spring arrivals were on the following dates; April 15, 1906, March 29, 1907 (very abundant this year), and April 14, 1908. The earliest fall records are: October 8, 1903, September 30, 1906, and October 13, 1907.

131. (751) **Blue-gray Gnatcatcher** (*Poliptila caerulea*).—Although an abundant summer resident throughout Washtenaw county this species was found to be only an occasional visitant within the region. It was recorded on April 19, 1903, May 1, 2 and 5, 1907, and April 22 and 26, 1908.

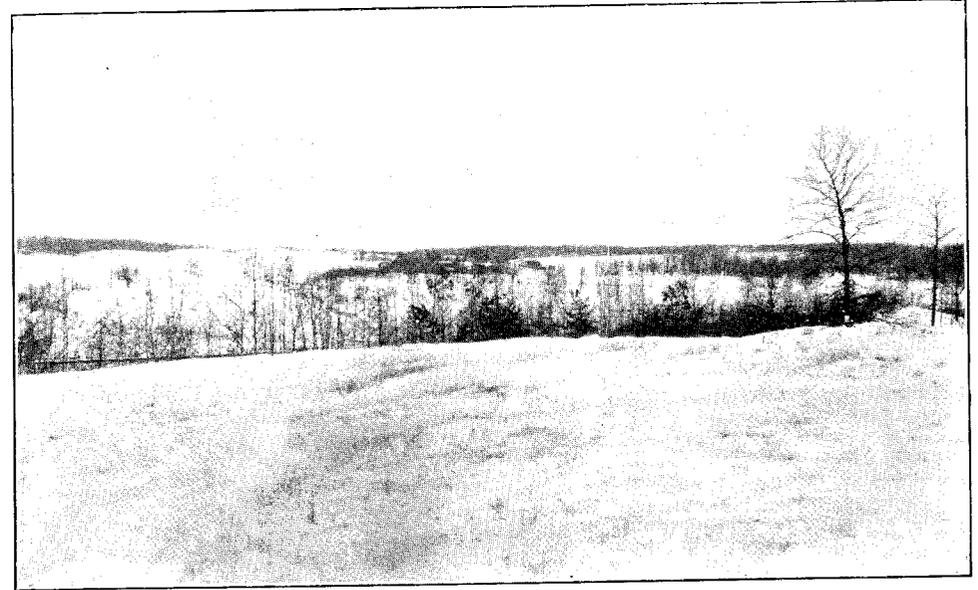


GLEN DRIVE IN THE WINTER.

Plate XI.

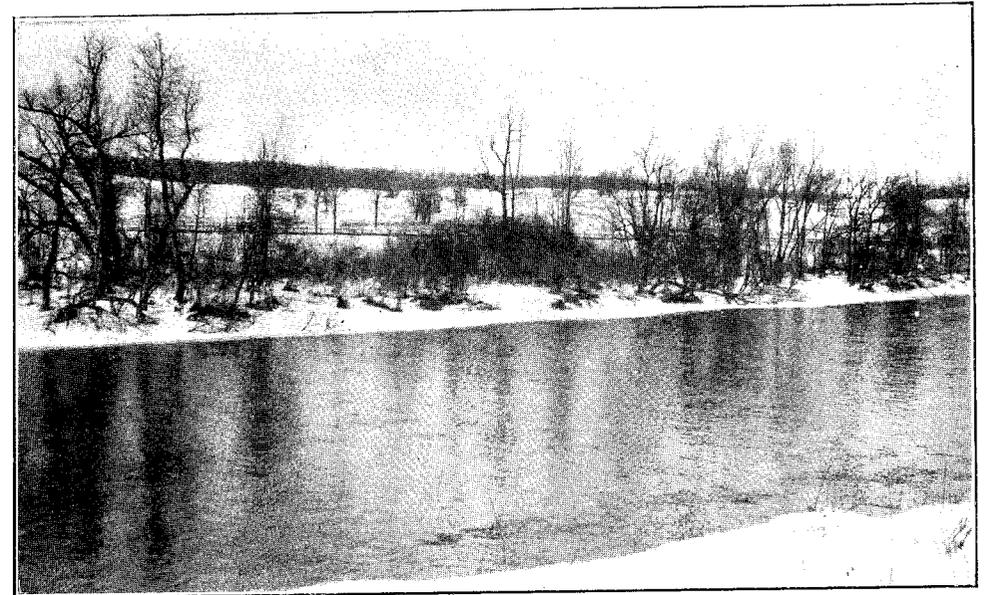


MOUTH OF RAVINE.



PLATEAU LOOKING NORTHEAST TOWARD THE RIVER.

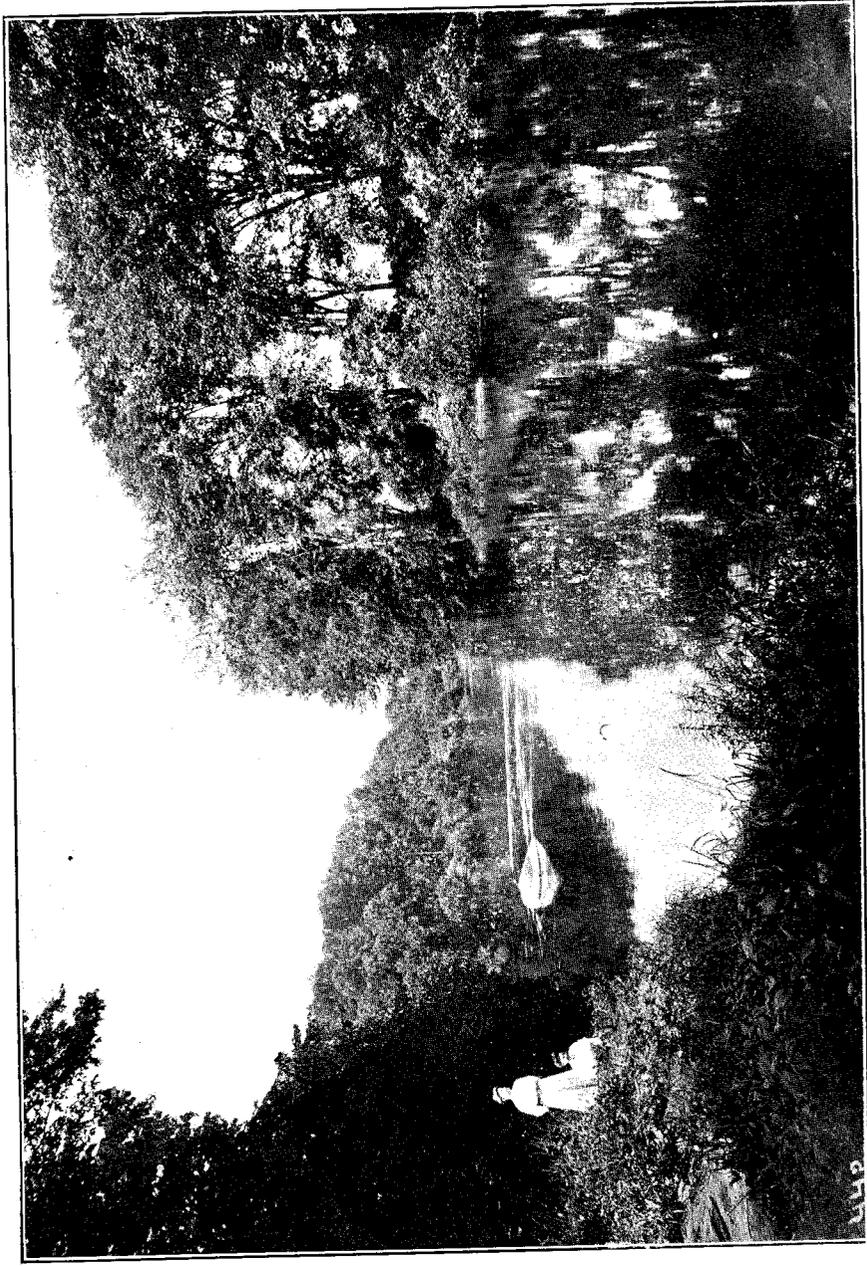
Plate XIII.



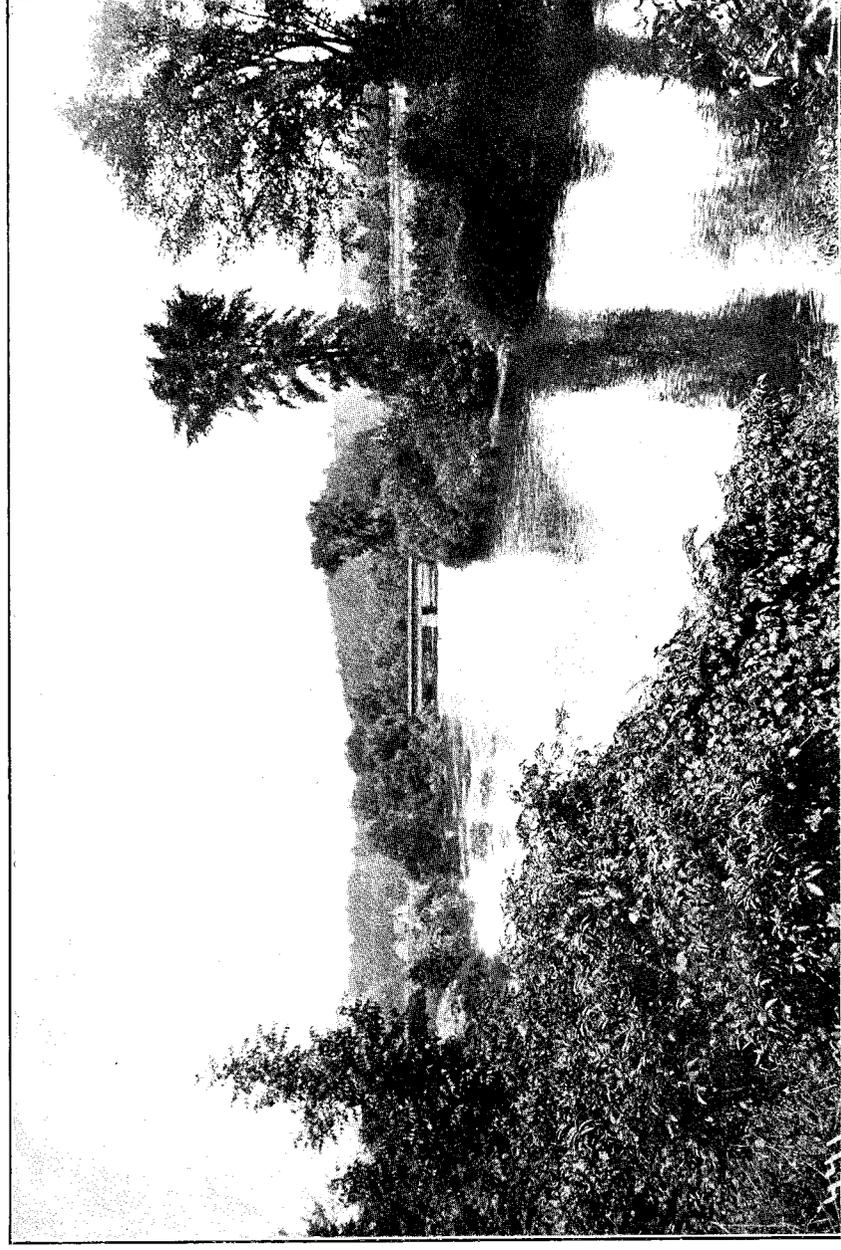
NORTH BANK OF THE HURON RIVER AT THE GLEN—WINTER VIEW.

Michigan Geological and
Biological Survey.

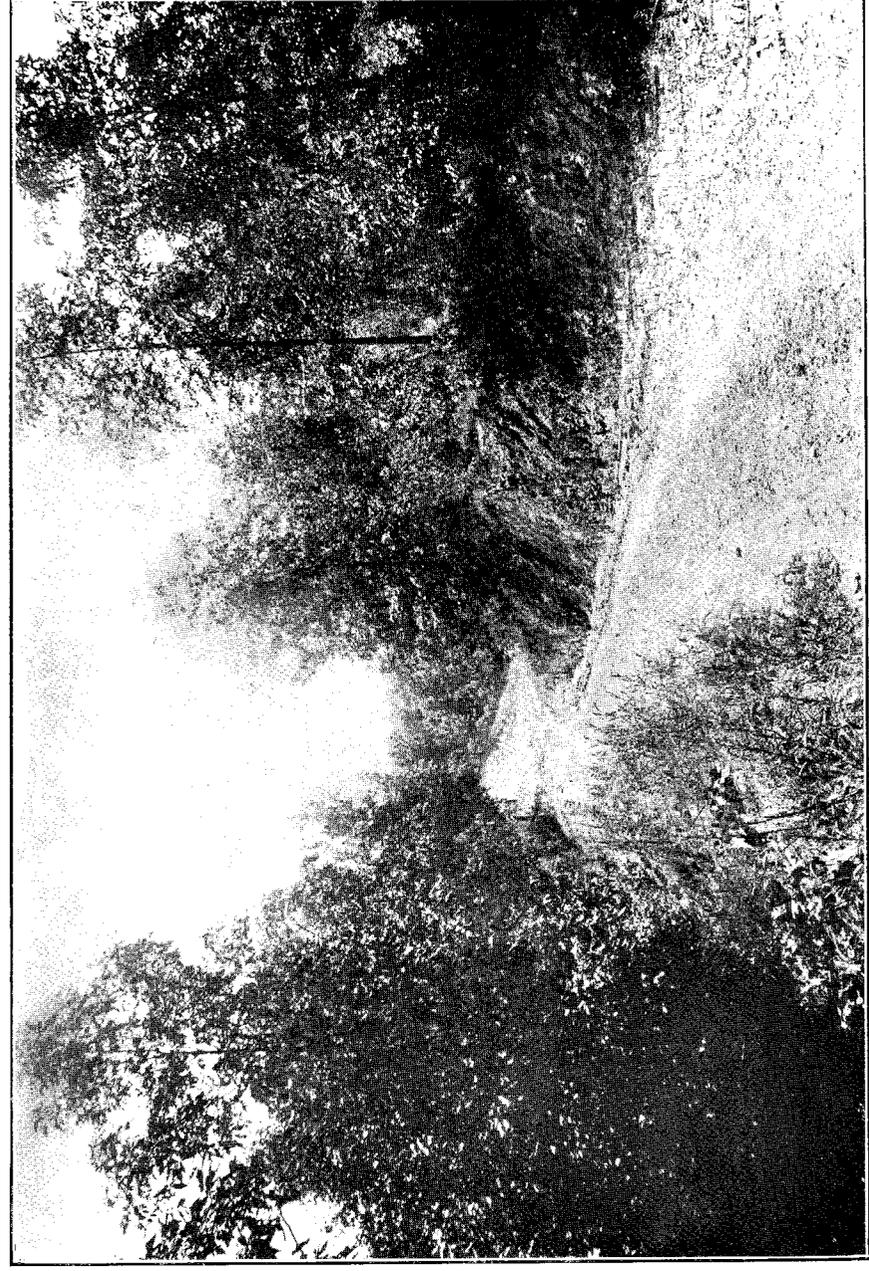
Publication 1: Biology 1.
Plate XIV.



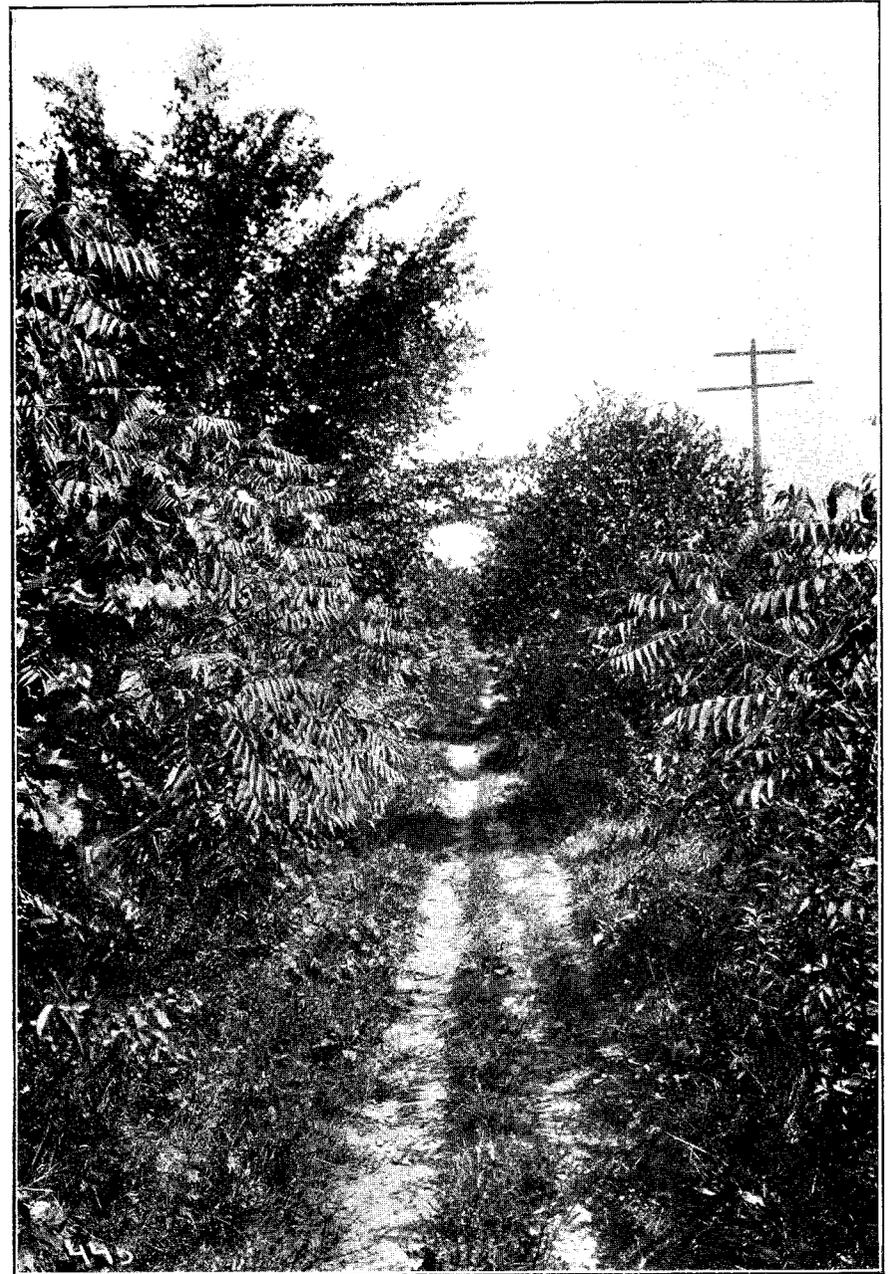
HURON RIVER AT THE GLEN—SUMMER VIEW.



HURON RIVER LOOKING UP STREAM FROM THE GLEN.



PARK DRIVE.



GLEN DRIVE IN SUMMER.

132. (755) **Wood Thrush** (*Hylocichla mustelina*).—Rather a common summer resident, breeding in the thickets along the river and in the ravine at the Glen. The earliest record for 1903 was May 10, for 1906, April 27, for 1907, May 3, and for 1908, April 29. In 1906 nidification began May 10 and in 1907 on May 24.

133. (756) **Wilson Thrush** (*Hylocichla fuscescens*).—Not as common or as regular a visitant at the Glen as some of the other Thrushes; recorded on May 3, 1903, May 3, 1907, May 17, 1906, and April 29, 1908.

134. (757) **Gray-cheeked Thrush** (*Hylocichla aliciae*).—A regular but not abundant transient visitant, frequenting the Cemetery and wooded sections of the Glen. The first record for 1907 is May 14, and for 1908, April 29. In the fall of 1907 it was noted on September 19.

135. (758a) **Olive-backed Thrush** (*Hylocichla ustulata swainsonii*).—A fairly common transient visitant but not appearing as regularly as the Hermit Thrush. It frequents much the same localities as the preceding. Regarding spring migrations the species was first noted in 1906 on May 17, in 1907 on May 12 and in 1908 on May 13. The earliest fall record was September 15, 1907.

136. (759b) **Hermit Thrush** (*Hylocichla guttata pallasii*).—A regular transient visitant, occurring in the Cemetery and all wooded sections of the region. The earliest record for 1903 is April 5, for 1904, April 17, for 1906, April 5, for 1907, March 24, and for 1908, March 24. In the fall the species was first recorded in 1905 on September 24 and last on October 22, in 1906 first on November 12 and last on November 21 and in 1907 first on November 6 and last on November 20.

137. (761) **American Robin** (*Planesticus migratorus*).—A common summer resident, frequenting nearly every part of the region and breeding wherever suitable nesting-sites can be had, even going so far as to place its nest in low bushes within two feet of the ground. The earliest record for 1903 is March 1, for 1904, March 6, for 1906, March 3, for 1907, March 10, and for 1908, January 19. The latest fall records are November 25, 1906, and November 3, 1907. In 1906 the species began nidification April 15 and in 1907 on April 4.

138. (766) **Bluebird** (*Sialia sialis*).—Common summer resident, breeding in the orchards and Cemetery. The earliest spring arrivals

came on the following dates: March 8, 1903, March 13, 1904, March 3, 1906, March 17, 1907, and March 8, 1908. It remains until the latter part of October—October 28, 1906, and October 20, 1907. Nests have been found as early as March 26 (1907).

In conclusion the writer hopes that the foregoing will have proven the possibilities for bird-study offered by so seemingly an unfavorable field as that of a city park. And to those who have hitherto held back from the delights of field-work in this direction, because of the lack of time, he wishes to extend a word of encouragement in the belief that no matter where the place of residence may be there can be found some such locality as the present one, which is readily accessible to the student and which will well repay careful investigation.

Ann Arbor, Michigan, August 18, 1908.

PRELIMINARY LIST OF THE SITES OF ABORIGINAL REMAINS IN MICHIGAN.*

BY HARLAN I. SMITH.

American Museum of Natural History, New York, N. Y.

I. *Alphabetical List.*

Alabaster Mounds, Iosco County.
 Albee Workshop, Saginaw County.
 Amadore Mound, Sanilac County.
 Amadore Quadrangle, Sanilac County.
 Anderson Grand River Mounds, Ottawa County.
 Andrews Graves, Saginaw County.
 Andrews Village Site, Saginaw County.
 Andrews Workshop, Saginaw County.
 Andross Cache, Saginaw County.
 Andross Graves, Saginaw County.
 Andross Village Site, Saginaw County.
 Ann Arbor Camp Site, Washtenaw County.
 Ann Arbor Mound, Washtenaw County.
 Ayres Camp Site, Saginaw County.
 Ayres Graves, Saginaw County.
 Ayres Mound, Saginaw County.
 Bad Axe Earthwork, Huron County.
 Barnard Graves, Saginaw County.
 Battle Creek Mounds, Calhoun County.
 Bay Port Cache, Huron County.
 Bay Port Village Site, Huron County.
 Bear Lake Mounds, Manistee County.
 Beaver Harbor Mounds, Manitou County.
 Beaver Meadows Garden Beds, Sanilac County.
 Belle Fontaine Earthwork, Wayne County.
 Belle Fontaine Mounds, Wayne County.
 Belle River Mounds, Lapeer County.

*This list includes all the Michigan sites mentioned in Thomas' catalogue, together with those added from my arranged notes and such others as it has been convenient to list from the mass of unarranged memoranda. The groups given by Professor Thomas have been separated into individual sites so far as seemed advisable at present and all the sites have been named for convenient reference.

Bellevue Mounds, Eaton County.
 Berrien Cache, Berrien County.
 Berrien Mounds, Berrien County.
 Big Gulley Earthworks, Sanilac County.
 Big Rock, Saginaw County.
 Birney Mound, Bay County.
 Black Creek Mounds, Sanilac County.
 Black River Mound, St. Clair County.
 Boone Earthworks, Wexford County.
 Bow Village Site, Saginaw County.
 Branch County Mounds, Branch County.
 Brant Mounds, Saginaw County.
 Bridgeport Earthwork, Saginaw County.
 Bridgeport Mounds, Saginaw County.
 Bridgeton Mound, Newaygo County.
 Brix Graves, Saginaw County.
 Bronson Park Mound, Kalamazoo County.
 Brooks Graves, Saginaw County.
 Bruce Embankments, Macomb County.
 Bruce Mound, Macomb County.
 Burr Oak Mound, St. Joseph County.
 Cadillac Earthworks, Wexford County.
 Caledonia Effigy Mounds, Shiawassee County.
 Caledonia Graves, Shiawassee County.
 Caledonia Mounds, Shiawassee County.
 Calhoun Earthwork, Calhoun County.
 Cambridge Burial Ground, Lenawee County.
 Carrollton Graves, Saginaw County.
 Caseville Mounds, Huron County.
 Cass Cache No. 1, Saginaw County.
 Cass Cache No. 2, Saginaw County.
 Cass City Natural Wall, Sanilac County.
 Cass River Mounds, Sanilac County.
 Cass Village Site, Saginaw County.
 Cedar Lake Mounds, Alcona County.
 Champaign Pits, Cass County.
 Charlevoix Parmelee Graves, Charlevoix County.
 Cheboygan Camp Site, Cheboygan County.
 Cheboyganine Creek, Bay County.

Chesaning Fields, Saginaw County.
 Chesaning Garden Beds, Saginaw County.
 Chesaning Graves, Saginaw County.
 Chesaning Mounds, Saginaw County.
 Chesaning Orchard, Saginaw County.
 Churchill Enclosure No. 1, Ogemaw County.
 Churchill Enclosure No. 2, Ogemaw County.
 Churchill Enclosure No. 3, Ogemaw County.
 Clam River Earthworks, Missaukee County.
 Clarion Graves, Charlevoix County.
 Clarion Mounds, Charlevoix County.
 Clear Water Mounds, Kalkaska County.
 Climax Earthwork, Kalamazoo County.
 Climax Prairie Mound, Kalamazoo County.
 Clinton River Enclosures, Macomb County.
 Clinton River Mounds, Macomb County.
 Coast Mounds, Huron County.
 Cocoose Village Site, Clinton County.
 Cognac Lake Mound, Calhoun County.
 Coldwater Mound, Branch County.
 Colon Mounds, St. Joseph County.
 Colon Farrand Mounds, St. Joseph County.
 Colon (see Section 21).
 Columbus Camp Site, Cheboygan County.
 Comstock Earthwork, Kalamazoo County.
 Comstock Mound, Kalamazoo County.
 Cook Mound, Saginaw County.
 Cook Village Site, Saginaw County.
 Cooper Enclosure No. 1, Kalamazoo County.
 Cooper Enclosure No. 2, Kalamazoo County.
 Cooper Enclosure No. 3, Kalamazoo County.
 Cooper Mound, Kalamazoo County.
 Custar Mound, Antrim County.
 Dent Camp Site, Saginaw County.
 Detroit Copper Smelter Mound, Wayne County.
 Detroit Farmer Mound, Wayne County.
 Devil Lake Mounds, Alpena County.
 Devil River Graves, Alpena County.
 Dexter Camp Site, Washtenaw County.

Howard Mound, Cass County.
 Howell Mound, Livingston County.
 Howell Woodward Mound, Livingston County.
 Howell Woodward Graves, Livingston County.
 Hoyt Camp Site, Saginaw County.
 Hoyt Mounds, Saginaw County.
 Huron River Earthwork, Wayne County.
 Huron River Hinsdale Mound No. 1, Washtenaw County.
 Huron River Hinsdale Mound 2, Washtenaw County.
 Huron River Hinsdale Mound No. 3, Washtenaw County.
 Huron River Mounds, Wayne County.
 Indian Creek Mounds, Lapeer County.
 Indian River Camp Site, Cheboygan County.
 Kalamazoo County Circular Earthwork, Kalamazoo County.
 Kalamazoo Earthworks, Calhoun County.
 Kalamazoo Garden Beds, Kalamazoo County.
 Ka-pay-shaw-wink Village Site, Saginaw County.
 Kechrewondaugoneng Village Site, Shiawassee County.
 L'Arbre Croche Village Site, Emmet County.
 Lee Graves, Saginaw County.
 Leonidas Earthwork, St. Joseph County.
 Leonidas Circular Enclosure, St. Joseph County.
 Leonidas Garden Beds, St. Joseph County.
 Leonidas Mounds, St. Joseph County.
 Linden Mound, Genesee County.
 Little Camp Site, Saginaw County.
 Lower Flushing Mounds, Genesee County.
 Lull Earthwork, Saginaw County.
 Lynn Graves, Bay County.
 Mackinac Mounds, Emmet County.
 Macomb Enclosure, Macomb County.
 Macomb Mounds, Macomb County.
 Mai-sou Island Mounds, Huron County.
 Maketoquets Village Site, Clinton County.
 Manistee Mounds, Manistee County.
 Manistee Shell-heaps, Manistee County.
 Manlius Circle, Allegan County.
 Manlius Mounds, Allegan County.
 Maple Mounds, Clinton County.

Marathon Mounds, Lapeer County.
 Marion Mounds, Sanilac County.
 Marshall Square, Calhoun County.
 Marshall Rectangle, Calhoun County.
 McCormick Mound, Bay County.
 McCoskry Camp Site, Saginaw County.
 Medeberry Graves, Shiawassee County.
 Medeberry Mounds, Shiawassee County.
 Melbourne Fields, Saginaw County.
 Merrill Cache, Saginaw County.
 Middlebury Mounds, Shiawassee County.
 Minden Mound, Sanilac County.
 Minong Mines, Keweenaw County.
 Minor Graves, Saginaw County.
 Mobray Camp Site, Saginaw County.
 Mobray Graves, Saginaw County.
 More Mound, Bay County.
 Morgan Camp Site, Saginaw County.
 Morse Cache No. 1, Saginaw County.
 Morse Cache No. 2, Saginaw County.
 Muir Earthwork, Ionia County.
 Muskegon County Mounds, Muskegon County.
 Muskegon River Mounds, Newaygo County.
 Nesh-ko-ta-younk Village Site, Bay County.
 Newfield Mound, Oceana County.
 Newfield Scott Mound, Oceana County.
 North Branch Mounds, Lapeer County.
 North Hubbard Lake Mounds, Alcona County.
 North Island Workshops, Huron County.
 Ontonagon County Mounds, Ontonagon County.
 Ontonagon River Mound, Ontonagon County.
 Oqueoc Mound, Presque Isle County.
 Oshtemo Price Garden Beds, Kalamazoo County.
 Oshtemo Glynn Garden Beds, Kalamazoo County.
 Ovid Township Mounds, Clinton County.
 Ovid Village Mounds, Clinton County.
 Ovid Shiawassee Mound, Shiawassee County.
 Owosso Garden Beds, Shiawassee County.
 Owosso Graves, Shiawassee County.

Owosso Mounds, Shiawassee County.
 Pavilion Mound, Kalamazoo County.
 Pentwater Camp Site, Oceana County.
 Peonagowink Mound No. 1, Saginaw County.
 Peonagowink Mound No. 2, Saginaw County.
 Peonagowink Village Site, Saginaw County.
 Pigeon Cheboygan Mounds, Cheboygan County.
 Pigeon River Mounds, Huron County.
 Point La Barbe Mound, Mackinac County.
 Pokagon Garden Bed, Cass County.
 Pokagon Mounds, Cass County.
 Pokagon Trench, Cass County.
 Pokagon Works, Cass County.
 Porter Mounds, Cass County.
 Portsmouth Village Site, Bay County.
 Post Mound, Allegan County.
 Pottersville Mounds, Sanilac County.
 Prairie Rond Earthworks, Kalamazoo County.
 Prairie Rond Garden Beds, Kalamazoo County.
 Quanicassee Creek, Tuscola County.
 Quanicassee Earthworks, Tuscola County.
 Quanicassee Trail, Tuscola County.
 Rabbit River Embankment, Allegan County.
 Rabbit River Mound, Allegan County.
 Rapid River Earthworks, Kalkaska County.
 Raisin Mounds, Lenawee County.
 Red Sty Embankment, Cass County.
 Red Sty Mounds, Cass County.
 Rifle River Earthwork No. 1, Ogemaw County.
 Rifle River Earthwork No. 2, Ogemaw County.
 Rifle River Mounds, Ogemaw County.
 Roe Lake Mounds, Alcona County.
 Round Lake Mounds, Antrim County.
 Russell Graves, Saginaw County.
 Sagenong Village Site, Bay County.
 Saginaw Grave, Saginaw County.
 Saginaw River, Bay County.
 Sauble River Mound, Mason County (see also Manistee County).
 Sault Cache, Chippewa County.

Schoolcraft Garden Beds, Kalamazoo County.
 Sebewaing Burial Place, Huron County.
 Sebewaing Village Site, Huron County.
 Section 2 Owosso Graves, Shiawassee County.
 Section 2 Owosso Mounds, Shiawassee County.
 Section 11 Greenbush Mound, Alcona County.
 Section 12 Owosso Graves, Shiawassee County.
 Section 12 Owosso Mounds, Shiawassee County.
 Section 13 Owosso Graves, Shiawassee County.
 Section 13 Owosso Mounds, Shiawassee County.
 Section 15 Gull Prairie Mounds, Kalamazoo County.
 Section 15 Mine, Ontonagon County.
 Section 21 Colon Mound, St. Joseph County.
 Section 23 Essex Mounds, Clinton County.
 Section 23 Middleberry Graves, Shiawassee County.
 Section 23 Middleberry Mounds, Shiawassee County.
 Section 26 Middleberry Graves, Shiawassee County.
 Section 26 Middleberry Mounds, Shiawassee County.
 Section 27 Duplain Mound, Clinton County.
 Section 30 Mine, Ontonagon County.
 Section 32 Duplain Mounds, Clinton County.
 Section 33 Duplain Mounds, Clinton County.
 Section 35 Mine, Ontonagon County.
 Sharpsteen Village Site, Huron County.
 Shepardsville Mounds, Clinton County.
 Shiawassee Fields, Saginaw County.
 Simons Prehistoric Cemetery, Saginaw County.
 Sixteen Lakes Mounds, Oceana County.
 Skull Island Graves, Bay County.
 South Hubbard Lake Mounds, Alcona County.
 Spencer Cache No. 1, Saginaw County.
 Spencer Cache No. 2, Saginaw County.
 Springwells Earthwork, Wayne County.
 Springwells Mound, Wayne County.
 Squaw Creek Earthworks, Tuscola County.
 St. Charles Graves, Saginaw County.
 St. Charles Mounds, Saginaw County.
 St. Clair County Mounds, St. Clair County.
 St. Clair Macomb Mounds, Macomb County.

St. Clair River Mounds, St. Clair County.
 Stewart Cache, Saginaw County.
 St. Joseph Earthwork No. 1, St. Joseph County.
 St. Joseph Earthwork No. 2, St. Joseph County.
 St. Joseph Earthwork No. 3, St. Joseph County.
 St. Joseph Earthwork No. 4, St. Joseph County.
 St. Joseph Earthwork No. 5, St. Joseph County.
 St. Joseph Earthwork No. 6, St. Joseph County.
 St. Joseph River Mounds, Calhoun County.
 Stony Lake Mounds, Oceana County.
 Sturgeon Lake Mound, St. Joseph County.
 Sturgeon Point Mounds, Alcona County.
 Syuaconning Creek, Bay County.
 Tawas Iosco Mounds, Iosco County.
 Tawas Point Mound, Iosco County.
 Taymouth Mounds, Genesee County.
 Tchigainibewin Village Site, Bay County.
 Thomas Cache, Saginaw County.
 Thread Camp Site, Genesee County.
 Three Rivers Embankment, St. Joseph County.
 Three Rivers Garden Beds, St. Joseph County.
 Throop's Mound, Kalamazoo County.
 Thunder Bay River Mounds, Alpena County.
 Tik-wak-baw-bawning, Saginaw County.
 Tittabawassee Mounds, Saginaw County.
 Tittabawassee Village Site, Saginaw County.
 Toland's Garden Beds, Kalamazoo County.
 Torch Lake Earthworks, Antrim County.
 Torch River Mounds, Kalkaska County.
 Triangle Island Pits, Keweenaw County.
 Unionville Mounds, Tuscola County.
 Vassar Mound, Tuscola County.
 Vernon Garden Beds, Shiawassee County.
 Vernon Graves, Shiawassee County.
 Vernon Mounds, Shiawassee County.
 Volinia Mounds, Cass County.
 Wabwahnahseepee Village Site, Clinton County.
 Walton Mounds, Eaton County.
 Warner Grave, Saginaw County.

Water Street Mounds, Bay County.
 Watertown Enclosure, Sanilac County.
 Wequagamaw Mounds, Antrim County.
 West Bay City Graves, Bay County.
 West Bay City Mound, Bay County.
 West Bay City Village Site, Bay County.
 West Harrisville Mounds, Alcona County.
 Wexford Shell-heaps, Wexford County.
 Wille Cache, Saginaw County.
 Wright Graves, Saginaw County.
 Ypsilanti Burial Ground, Washtenaw County.

II. *Geographical List.*

By Counties.

ALCONA COUNTY.

West Harrisville Mounds.
 Sturgeon Point Mounds.
 Henry Mounds.
 North Hubbard Lake Mounds.
 East Hubbard Lake Mounds.
 South Hubbard Lake Mounds.
 Section 11 Greenbush Mound.
 Cedar Lake Mounds.
 Roe Lake Mounds.

ALLEGAN COUNTY.

Rabbit River Embankment.
 Rabbit River Mound.
 Filmore Bestwick Earthwork No. 1.
 Filmore Bestwick Mound No. 1.
 Filmore Helmer Earthwork No. 1.
 Filmore Helmer Mound No. 1.
 Filmore Helmer Earthwork No. 2.
 Filmore Helmer Mound No. 2.
 Manlius Circle.
 Manlius Mounds.
 Post Circle.

Heath Post Mound.
Heath Post Cache Pits.

ALPENA COUNTY.

Devil River Graves.
Devil Lake Mounds.
Thunder Bay River Mounds.

ANTRIM COUNTY.

Torch Lake Earthworks.
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