FOOD CHART OF SNAPPING TURTLE (*C. serpentina*).*

(Number with food, 19).

	No.	Per cent.
Vegetation	5	26
Algae (low water plants)	2	10.5
Seeds, undetermined	1	5 2
Leaves, undetermined	2	10.5
Apple seeds	1	5.2
Skunk Cabbage (*Symplocarpus foetida*) leaves	1	5.2
Grass	3	15.7
Animal Matter	19	100
Mollusca (Snails and Slugs)	7	36.8
Snails (*Helix*)	4	21.1
Pond Snails	2	10.5
Slugs	1	5.2
Crustacea, *Cambarus* sp. (Crayfish)	12	63.1
Insecta	9	47.3
Undetermined Insects	2	10.5
Hemiptera (Bugs)	1	5.2
Corisidae, *Corisa* sp. (Water Bugs)	1	5.2
Pentatomidae (Stink Bugs)	1	5.2
Diptera (Flies)	3	15.7
Larvae	2	10.5
Stratiomyiid (Fly) Larva	1	5.2
Coleoptera (Beetles)	7	36.8
Undetermined	5	26.3
Water Beetle larva	1	5.2
Hydrophilidae, Water Scavengers	1	5.2
Dytiscidae, Diving beetles	1	5.2
Gyrinidiae, Whirligig Beetles	1	5.2
Vertebrata (Vertebrates)	7	36.8
Undetermined species (Fish)	2	10 5
Pisces (fishes)	2	10.5
Undetermined fish	1	5.2
Catostomidae (Suckers)	1	5.2
Batrachia (Frogs, etc.), *Rana* sp.	1	5.2
Ophidia (Serpents)	2	10.5
Aves (Birds)	1	5.2
Mammalia (Mammals)	4	21.1
Undetermined	1	5.2
Muridae (Mice)	2	10.5
Leporidae (Rabbits), *Lepus* sp	1	5.2

*From Surface (1908, 128-129.)

Captive specimens will feed upon pieces of meat or the bodies of mammals and birds. They grasp the food, pull it under the water, and swallow it, or, if too large, tear it to pieces by seizing it firmly in the mouth and clawing it with the forefeet.

On land a snapping turtle is a curious sight, as it walks with the body well elevated on the legs. If brought to bay at this time they do not retire into their shells, but, raising themselves still higher on their limbs, open their jaws and lunge forward at the offender with a force that often destroys their equilibrium and causes them to fall forward.

Newman (1906, 150-151) records the following notes on the breeding habits: "Only in one instance have I observed the female Chelydra during the nesting process. On this occasion the nest was more than half completed when I first caught sight of her. Although she stopped work and showed signs of preparing for a retreat, she concluded the filling-in process in a somewhat slovenly manner and then retreated. The filling-in process was the same as that observed for Graptemys and Aspidonectes.

"The nest was in gravelly sand on the side of a railway embankment, separating the lake from a swamp. An examination of the nest revealed a broad funnel shaped depression, about a foot in diameter, at the apex of which a tunnel, about four inches in diameter, led diagonally into a wider expansion of irregular shape and about a foot beneath the general ground surface. The tunnel was obstructed by a stout stick and was consequently turned somewhat to one side. In the expansion and communicating tunnel were thirty-three eggs scattered irregularly in a double layer. On the whole it was a decidedly untidy and primitive sort of nest.

Figure 46. Distribution of *Chelydra serpentina*. Horizontal ruling, specimens examined; vertical ruling, reports only.

"At about the same time of the month (June 15) several half-finished nests were found in the same railway embankment and all had the same general characteristics as the one described. I am told by the engineers on the railroad that the females are often seen at work and that they leave precipitately on the approach of the early train.

"The eggs are spherical with one hemisphere white and the other pinkish. The shell is very tough, so that the eggs, if thrown on hard ground, will rebound several inches without breaking. The eggs laid on June fifteenth hatched during the last week in August."

The flesh of the snapping turtle is usually esteemed as food by the people in localities where the species is found. True (1893,154) states that "The snapping turtle is regularly seen in spring in the markets of Washington, dressed for cooking, that is, having the under part of the shell and the entrails removed." The eggs are also often eaten.

Range: The species has been reported from: Michigan (Sager, 1839, 301; Miles, 1861, 232), Ann Arbor (Smith, 1879, 7), Hudson and St. Joseph River (Kirsch, 1895, 333), Eaton County (Clark, 1902, 193), Ann Arbor, Olivet, and Barry, Kalamazoo, Kent, Montcalm, Ottawa, St. Joseph and Van Buren Counties (Clark, 1905, 110), Walnut Lake, Oakland County (Hankinson, 1908, 236), Huron County (Ruthven, 1911a, 271), and Cass County (Thompson, 1911, 107).

Specimens have been examined from Washtenaw County, Oakland County, Brown Lake and the falls of the Sturgeon, Dickinson County, Alma, Gratiot County,

Charity Islands, Saginaw Bay, Cass County, in Turtle Bay (Sand Point) and in lower part of Pigeon River in Huron County, and Kalamazoo County.

KINOSTERNON ODORATUM (Daudin).

MUSK TURTLE.

(Pl. VII.)

Emys pennsylvanica, Sager, 1859, 301.

Aromochelys odoratus, Smith, 1879, 7. Clark, 1902, 193, 1905, 110. Miles, 1861, 232. Hankinson, 1908, 236. Thompson, 1911, 107.

Description: Carapace rigid, covered with horny plates, rather narrowly oval in outline, and consider ably arched. Young specimens have a prominent keel, but this becomes obscure with age. Plastron very narrow and short, not nearly filling the opening of the carapace, rounded anteriorly, emarginate posteriorly, the anterior part slightly movable on a transverse hinge between the pectoral and abdominal scutes. All of the plastral scutes in the adults separated by areas of skin. Head large; snout tapering and conical. Skin soft and everywhere provided with fleshy papillae, those on the neck in rows, and two to four elongated ones on the chin and two on the anterior part of the throat. Several long curved scales on the anterior side of the foreleg near the foot, and several on the heel.

The color of the carapace in young specimens is dull olive or brown; in old specimens it is blackish brown. The plastron varies from dark yellow to brownish black. Skin dark greenish olive to dark olive brown, marbled with light olive or yellowish olive. Two yellowish lines extend backward from the snout, one passing below and the other above the eye and ear.

Habits and Habitat: The musk turtle is quite aquatic in habits, being found most commonly on the bottom in ponds and lakes. The carapace is very often covered with a thick growth of algae, so that it is difficult to detect when lying in a patch of aquatic vegetation.

Hay (1892a, 562) states that "They lay their eggs on shores in holes that they have dug in the sand with their hind feet. The eggs are from three to five in number, of an elongated elliptical shape, a little more than an inch long, and have a hard, smooth shell." Newman (1906, 147-148) records the following notes on the breeding habits: "On only one occasion did I have the good fortune to observe Aromochelys in the process of nesting. When I first encountered the little tortoise she was digging in some soft soil, using all four feet and her snout. On my approach she abandoned her work and wandered about for fully an hour trying different places. Finally she selected for nesting a decayed stump that had rotted down level with the ground. She dug with fore-feet and hind-feet a shallow hole about two inches wide and of about the same depth, and deposited two eggs therein. After covering these eggs with the excavated debris, she went her way. The form and workmanship of this little nest were of an inferior order as compared with those of other species of tortoise I have observed.

"Specimens were captured on land with eggs in the oviducts, ready to be laid, on the following dates: June 11, 16, 20, 22, 23, and 25. In no case did I find more than three eggs in the oviducts. These were elliptical in form and nearly as large as the eggs of Chrysemys. The shell is hard and of a china-like consistency, brittle but capable of withstanding considerable pressure."

The same writer (1906, 146-147) records the following notes on the food habits: "I have caught them at dusk, crawling about in the grass and have seen them catching and eating slugs" (p. 147); "They are the scavengers of the lake, feeding on all sorts of material, from, dead molluscs to kitchen refuse. They refuse nothing that could be construed as edible. If food is placed in the midst of a group, they fight over it like so many puppies over a rag, pulling and jerking to the best of their ability." "Their appetite is insatiable and indiscriminate. On one occasion I put a living rat in an aquarium containing several musk tortoises. Almost immediately three of them seized it by the feet and pulled it under, thus drowning it. Before it had ceased to struggle they proceeded to disembowl it and succeeded in making a fairly good skeleton of it in a few hours" (p. 147).

Figure 47. Distribution of *Kinosternon odoratum*. Horizontal ruling, specimens examined; vertical ruling, reports only.

Surface (1908, 138) has tabulated the food found in the stomachs of a number of specimens as follows:

	No.	Per cent.
Mollusca	2	50
Snails	2	50
Insecta	3	75
Orthoptera (Crickets, Grasshoppers)	1	25
Gryllus pennsylvanicus	1	25
Lepidoptera, (Moths, etc.)	2	50
Larvae	2	50
Coleoptera, (Beetles)	2	50
Undetermined fragments	1	25
Carabidae—Undet., (Ground Beetles)	1	25

When captured the musk turtles emit a strong odor (not especially disagreeable), open their jaws widely, and hiss, but they seldom bite and then with little effect.

Range: The species has been reported from: Michigan (Sager, 1839, 301; Miles, 1861, 232; Smith, 1879, 7), Eaton County (Clark, 1902, 193), Ann Arbor, Olivet, and Barry, Kalamazoo, Montcalm, and Van Buren Counties (Clark, 1905, 110), Cass County (Thompson, 1911, 107). and Walnut Lake, Oakland County (Hankinson, 1908, 236). The writer has seen specimens from the following localities: Washtenaw County, Walnut Lake, Oakland County, Cass County, and Miss Crystal Thompson saw one in the Kalamazoo River, Calhoun County, in September, 1911.

CHRYSEMYS CINEREA (Bonnaterre).

WESTERN PAINTED TURTLE.

(PI. VII.)

Emys picta, Sager, 1839, 301.

Chrysemys marginata, Agassiz, 1857, 439. Smith, 1879, 7. Clark, 1902, 193; 1905, 110. Miles, 1861, 233. Hankinson, 1908, 236-237.

Chrysemys cinerea, Ruthven, 1911, 115; 1911a, 271. Thompson, 1911, 101

Description: Carapace rigid, covered with horny plates, broad and depressed, flaring considerably posteriorly, and without trace of keel. Plastron broad and flat, immovably attached to the carapace and not hinged. Head moderate in size; upper jaw with a distinct notch in front, and a sharp tooth on either side of the notch.

Carapace dark olive, brown or black. The scutes narrowly margined with dull yellow. Marginal plates prominently marked with red as follows: on the upper surface narrow cresentric bands often surrounding (especially anteriorly) a wider vertical band that is median in position and an extension of a similarly situated band on the lower surface. The last named band is the principal mark on the lower surface and is there surrounded, on the inner end and on the sides, by the black ground color. There may be other light marks on the lower surface, but these are rarely prominent; the most conspicuous and perhaps frequent one is a spot or short band in the black areas between the central bands. (Cf. description of *C. bellii*.) Plastron yellowish with a large central patch of dusky, which is, however, never as large as in *C. bellii* (Figs, 50-51). Head black striped with yellow; neck and limbs striped with red.

Habits and Habitat: This is the common turtle of southern Michigan. It may be seen along most of the streams or about the borders of ponds and lakes. If the habitat is approached cautiously they may be seen basking on logs, muskrat houses, etc., but they are easily alarmed, and quickly scramble off into the water and bury themselves in the mud and vegetation of the bottom. If undisturbed they soon come to the surface again and thrust their pointed black snouts out of the water.

Hay (1892a, 572) states that the food "probably consists of insects, tadpoles and other feeble small animals." Newman (1906, 144) writes that he has observed individuals "feeding on dead fish, dead clams, decaying tortoises, worms, meat, and aquatic insects. They even capture the soft and defenseless young of *Aspidonectes* [*Platypeltis*]." The same writer describes the egg-laying as follows: "The method of nest-making is essentially like that described for Graptemys, but the flask-like enlargement is much less pronounced. This may be due to the smaller number of eggs laid and the consequent economy of space. The nesting season is about the same as for Graptemys and the choice of nesting places about the same. They lay only four to eight eggs that are strikingly like those of Graptemys in color, shape and character of shell. In size, however, they are somewhat smaller.

Figure 48. Distribution of *Chrysemys cinerea*. Horizontal ruling, specimens examined; vertical ruling, reports only.

"Like Graptemys, the broods are sometimes belated in hatching, so that a forced hibernation of embryos results. Many just-hatched young were found during the months of May and June."

Range: The species has been reported from: Michigan (Sager, 1839, 301; Agassiz, 1857, 439; Miles, 1861,

233), Ann Arbor (Smith, 1879, 7), Eaton County (Clark, 1902, 193), Porcupine Mountains, Ontonagon County (Ruthven, 1904, 191), Ann Arbor, Marquette, Olivet, Porcupine Mountains (Clark, 1905, 110), Stony and North Islands and Sand Point, Pigeon River, Rush Lake, Huron County (Ruthven, 1911a, 271), Marquette, Porcupine Mountains, Ontonagon County (Ruthven, 1906, 112), Douglas Lake, Cheboygan County (Ruthven, 1911, 115), Cass County (Thompson, 1911, 107), Walnut Lake, Oakland County (Hankinson, 1908, 236-237). The northern peninsula records probably all refer to *C. bellii* and are not recorded on the map. The writer has seen specimens from Washtenaw Oceana County, St. Joseph County, Monroe and Douglas Lakes, Cheboygan County, Cass County, Alma, Gratiot County, Stony and North Islands, Sand Point, Pigeon River at Caseville, and Rush Lake, Huron County, Allegan County, Kalamazoo County, Calhoun County, and Mr. N. A. Wood observed specimens on Charity Island in 1910.

CHRYSEMYS BELLII Gray.

BELL'S TURTLE.

Chrysemys bellii, Ruthven, 1909, 117.

Chrysemys marginata bellii, Ruthven, 1910, 59.

Chrysemys marginata, Ruthven, 1904a, 191; 1906, 34-112.

Description: Structural characters as in *C. cinerea* from which it differs in attaining a somewhat larger size (large individuals reaching a length of six to eight inches as compared with five to six inches in cinerea) and in color markings. The yellow borders to the dorsal shields are generally narrow or wanting but are occasionally as wide as in cinerea. Costal and vertebral scutes marked with faint, irregular light lines. The prominent markings on the marginals are: above; a median and two lateral pale vertical bands, the median continued on the lower surface and there extended on the outer and inner margins to restrict the intervening black area to a spot with a pale center. These markings may be yellow or red. The dusky markings on the plastron always form a much larger blotch than in *C. cinerea* (Figs. 50-51). This blotch covers a large part of the plastral surface and send out extensions along the sutures.

Habits and Habitat: The habits of this species are probably very similar to those of *C. cinera*. It is found in similar habitats.

Range. *C. bellii* has been found thus far only in the western part of the northern peninsula. It is a western form that ranges westward to Oregon. The Michigan localities are: Porcupine Mountains, Ontonagon County, Brown Lake, Norway and Iron Mountain, Dickinson County (Ruthven, 1909, 117; 1910, 59). The Marquette record for *cinerea* (Ruthven, 1906, 112) is probably this form and is so indicated on the map.

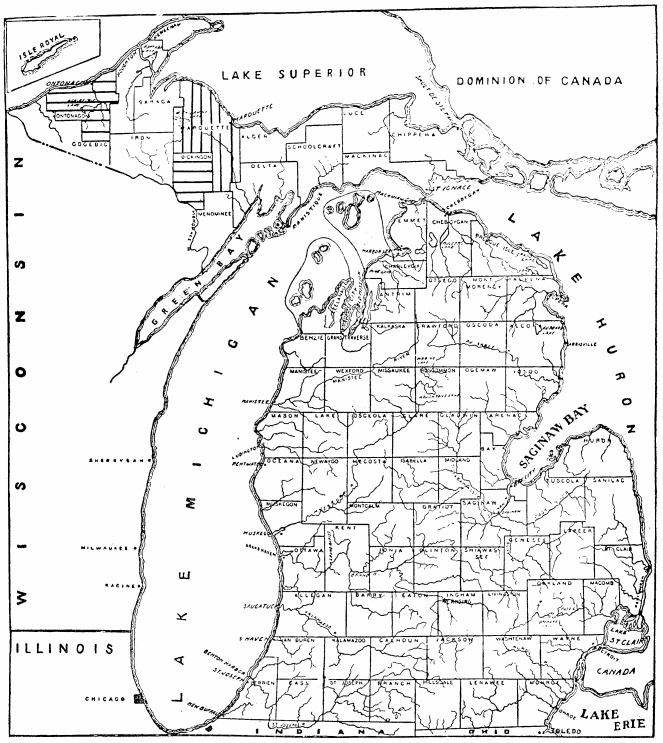

Figure 49. Distribution of *Chrysemys bellii*. Horizontal ruling, specimens examined; vertical ruling, reports only.

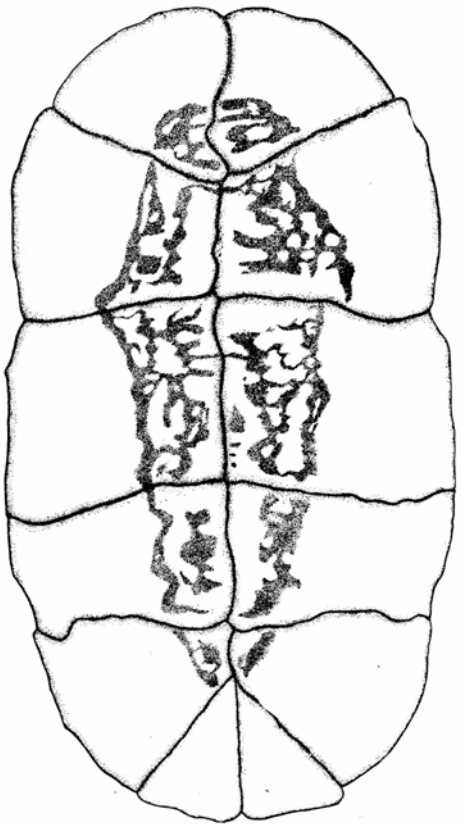

Figure 50. Plastron of *Chrysemys cinerea*.

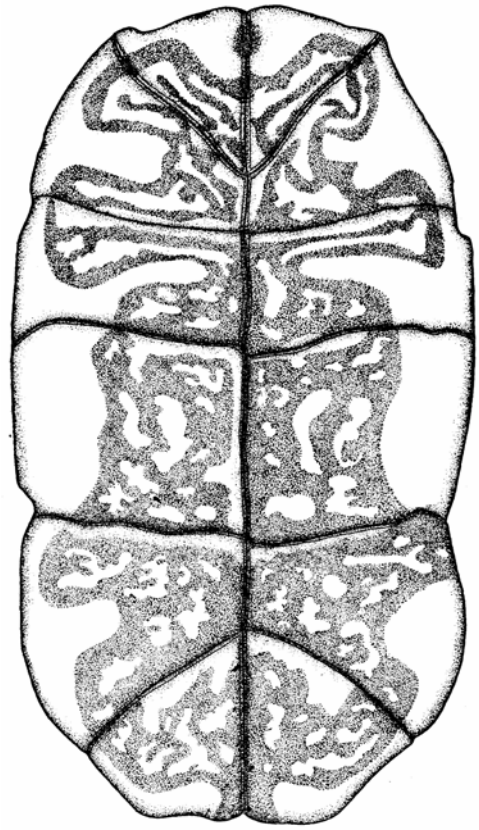

Figure 51. Plastron of *Chrysemys bellii*.

CLEMMYS GUTTATA (Schneider).

SPECKLED TORTOISE.

(Pl. VII.)

Emys guttata, Sager, 1839, 301.

Nanemys guttatus, Smith, 1879, 7. Miles, 1861, 233.

Clemmys guttatus, Clark, 1902, 193; 1905, 110. Thompson, 1911, 107.

Description: Carapace rigid, covered with horny plates, oval in outline and widest behind the middle. Carapace without a keel. Plastron large, without a transverse hinge, and immovably joined to the carapace. Head of moderate size; snout not projecting; upper jaw notched in front.

Carapace black or dark reddish brown with one to several round, bright orange spots on each scute. The plastron is reddish orange and black, the black being limited to large blotches on the ends of the scutes. The head and the upper surface of neck and limbs are black (often washed with red) with orange spots, the under surfaces orange yellow, the throat marbled with darker.

Habits and Habitat: We have no notes on the habits of this turtle in Michigan. Ditmars (1907, 51) has recorded the following observations: "The writer has found many specimens along brooks that here and there spread into thick, grassy spots. It is in this water-grass that the turtles delight to hide, after feeding. The species always feeds under water and, in fact, appears to be unable to swallow unless the head is submerged. The food consists largely of dead fish and the larvae of aquatic insects. Captive specimens will eat the tender leaves of lettuce if these be thrown upon the surface of their tank. It therefore appears probable that they feed upon various water plants as well, while in a wild condition." Holbrook's account differs in some respects from the above. He says (1842, I, 83). "It lives in ponds, brooks and rivers, feeding on such animals as it can seize, as tadpoles, young frogs, etc. It takes to the land frequently in search of food, devouring earthworms, crickets, grasshoppers, etc." Hay (1892a, 577) states that it is less aquatic than most of our turtles but "seems to delight in being in the neighborhood of swamps and sluggish streams, and probably spends the greater part of its time in the water."

The same writer also says "Their food is said to consist of tadpoles, young frogs and other weak animals. On land they devour earthworms, crickets and grasshoppers." Surface (1908, 166-167) has summarized his examination of the stomachs of 27 specimens as follows:

	No.	Per cent.
Vegetation	3	11.1
Undetermined leaves	1	3.7
Undetermined seeds	1	3.7
Gramineae—Grass	2	7.4
Animal matter	27	100
Annulata, (Worms)	1	3.7
Mollusca	3	11.1
Snails	2	7.4
Slugs	1	3.7
Crustacea	8	29.6
Undetermined spp	6	22.6
Gammarus sp., (Fresh Water Shrimps)	1	3.7
Cambarus sp., (Crayfish)	1	3.7
Myriapoda, (Millipedes, etc.)	1	3.7
Arachnida, (Spiders)	2	7.4
Insecta, (Insects)	27	100
Undetermined fragments	11	40.8
Ephemerida, (Mayflies)	2	7.4
Plecoptera—Perlidae, (Stone Flies)	3	11.1
Odonata, (Dragon Flies)	9	33.3
Nymphs	8	29.6
Agrionidae, (Damsel Flies)	1	3.7
Hemiptera, (Bugs)	3	11.1
Capsidae, (Water Bugs)	1	3.7
Notonectidae, (Back Swimmers)	1	3.7
Belostomidae	1	3.7
Zaitha fuminea	1	3.7
Neuroptera—Sialidae	2	7.4
Lepidoptera	3	11.1
Undetermined Moth larvae	2	7.4
Noctuidae, (Cutworms)	1	3.7
Coleoptera	20	74.0
Undetermined Beetle fragments	13	48.1
Carabidae, (Ground Beetles)	2	7.4
Dytiscidae, (Diving Beetles)	2	7.4
Chrysomelidae, (Leaf Beetles)	3	11.1
Undetermined	2	7.4
Donacia sp	1	3.7
Scarabaeidae.		
Lachnosterna, (June Bugs)	1	3.7
Euphoria inda, (Flower Beetles)	1	3.7
Macrodactylus subspinosus, (Rose Bugs)	2	7.4
Rhynchophora, (Snout Beetles)	1	3.7
Diptera, (Flies).		
Undetermined flies	10	37
Tipulidae, (Crane Flies)	2	7.4
Chironomidae, (Midges)	1	3.7
Scatophagidae	1	3.7
Hymenoptera, (Ants, etc.)		
Tenthredinidae	1	3.7
Ichneumonidae	1	3.7
Brachonidae	1	3.7
Ants	1	3.7

"Their eggs are few in number; never according to Agassiz, exceeding three or four. They are about an inch and a quarter long, and three-quarters in the shorter diameter. The eggs are laid about the 20th of June, in a perpendicular hole dug by the use of the hind legs. After the eggs are deposited the dirt is pushed back over the opening so as to conceal it entirely." (Hay, 1892a, 577-578).

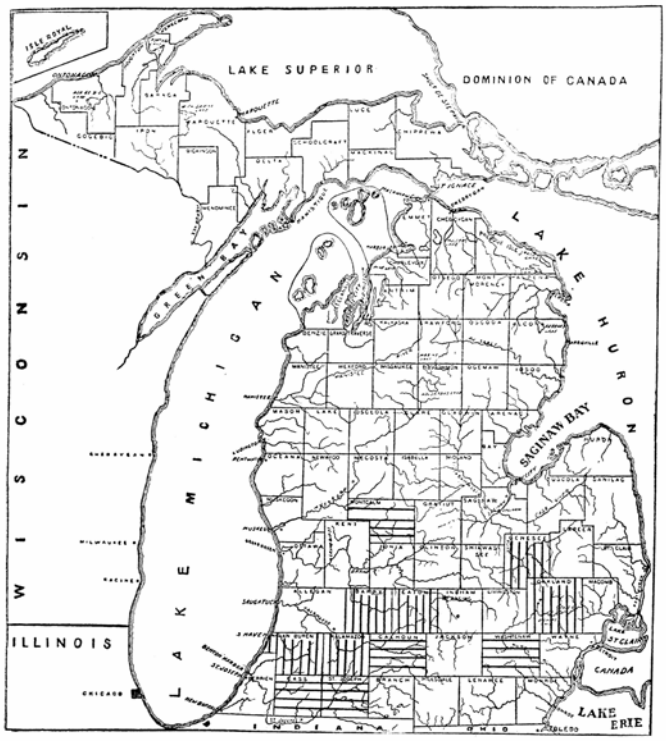

Figure 52. Distribution of *Clemmys guttata*. Horizontal ruling, specimens examined; vertical ruling, reports only.

Range: The species has been reported from: Michigan (Sager, 1839, 301), Genesee Comity, Oakland County, Saginaw Bay (Miles, 1861, 233), Ann Arbor (Smith, 1879, 7), Eaton County (Clark, 1902, 193), Ann Arbor, Olivet, and Barry, Kalamazoo and Van Buren Counties (Clark, 1905, 110), and Cass County (Thompson, 1911, 107). The specimens the writer has seen are from the following localities: Ann Arbor and Manchester, Washtenaw County; Cass County, Calhoun County, St. Joseph County and Montcalm County.

GRAPTEMYS GEOGRAPHICA (LaSueur).

MAP TURTLE.

(PI. VI.)

Emys geographica, Sager, 1839, 301.

Graptemys geographica, Agassiz, 1857, 436. Clark, 1902, 193, 1905, 110. Smith, 1879, 7. Miles, 1861, 232.

Description: Carapace rigid, covered with horny plates, depressed and with a distinct, slightly tuberculated keel (much more distinct in the young). Carapace feebly serrated behind. Plastron large, nearly filling the opening of the carapace, immovably united to it, not hinged, and distinctly notched behind. Snout not projecting. Cutting edge of upper jaw somewhat sinuous.

Color of carapace dark olive, covered with a network of greenish-yellow lines (occasionally uniformly dark brown above). Head, neck, limbs and tail dark green to black with numerous longitudinal lines of greenish yellow. A triangular yellow spot behind each eye. Under side of marginal plates pale greenish or yellowish with large blotches consisting of concentric lines of olive and black or brown. Plastron yellow, with brownish bands (frequently absent in old individuals) along the sutures of the scutes.

Habits and Habitat: The map turtle is markedly aquatic, seldom, except during the breeding season, being found on land. In southern Michigan it occurs both in lakes and rivers, but is much more common in the former. According to the observations of Garmen (1891, 237), Hay (1892a, 576), and Newman (1906, 140) its food consists principally of molluscs, and very largely of the heavy shelled forms of the family Viviparidae. The young feed on the thiner shelled ones. Newman writes as follows: "Two methods of feeding prevail. The favorite method seems to be to capture the mollusc when the foot and gills are well out of the shell, to bite off the soft parts and leave the hard shell. To do this the final closure of the jaws must be quite sudden. If they fail to secure the body of the snail in this way they adopt the crushing method. The hard shell is easily crushed between the broad flat jaws and the broken pieces of shell are picked out with the aid of the claws. When in search of food they prowl about the bottom, often underneath the dense vegetation. The heavy growth of Chara or Nitella is tunneled in every direction with the passageways made by foraging Graptemys."

Hay (1892a, 576) states that "After a number had been kept for a few days in a tub there were found in it a large number of the opercles of such molluscs; and in the intestines of one were the remains of a crayfish, some fish scales, and what appeared to be the cases of some kind of caddisworm. Its broad masticatory surfaces are well fitted for crushing the shells of molluscs." In captivity Ditmars (1907, 44) found that it would eat "chopped fish, meat and mealworms, also earthworms and various softbodied grubs, dragging all its food into the water and devouring it beneath the surface."

A specimen examined by Surface (1908. 141) had only crawfish remains in the stomach.

The breeding habits of Indiana specimens have been rather fully reported by Newman (1906, 140-142): "Graptemys begins to lay very early in June, somewhat earlier than other species observed. The females are apt to wander some distance from the water for nesting, seeming to prefer soft, plowed soil or clear, dry sand away from the beaches. They wander about for hours in search of a suitable place for nesting. One specimen started five nests before she was satisfied with the condition of the soil. Two were rejected on account of the presence of stones and one because the sand caved in too readily. The other two appeared to me to be suitable in every way and I was unable to explain why she abandoned them.

"If one expects to see the first stages of nest-making it behooves him to be astir before sunrise. Over half of the females found nesting were encountered before eight o'clock. They work slowly and seem to prefer the quiet

hours of the day, probably because they are less likely to be disturbed.

"Apart from the slowness and deliberateness of their movements, they work much after the fashion adopted by Aspidonectes, except that they never work the fore-feet so as to secure foothold.

"The nests are of somewhat smaller dimensions and the flask-shaped expansion is more symmetrically placed, scarcely more bulged on one side than the other. Two layers of eggs are deposited in the flasklike expansion but the last two or three eggs are placed in the narrow neck, the uppermost egg being sometimes only about two inches from the surface.

"It is difficult to frighten them away after they have once decided upon a nesting place. When surprised they stop work but soon resume it and continue it to the end, even while the observer is in plain view. The nest of Graptemys is a finished product, all traces of nest-making being obliterated. This is accomplished by dragging the smooth plastron back and forth across the small area that had been disturbed by nesting.

"The eggs are ellipsoidal in shape, of a dull white color, and have a rather soft easily indented shell. The number laid by one female at one time varies from eleven to fourteen.

"The eggs hatch, as a rule, late in August or early in September, the young burrowing to the surface through the sand. When they emerge they are covered with sand that adheres for some time. Their instinct directs them unerringly toward the water and they frequently have to travel almost incredible distances before reaching the lake or a tributary stream. On two occasions I have found recently hatched Graptemys, at a distance of about a quarter of a mile from the water, traveling steadily and in an approximately correct direction toward the lake. At the observed rate of progress they would reach the lake in about two days.

"For some time I was greatly puzzled by the frequent discovery of newly hatched Graptemys during the months of May and June. Farmers in the vicinity frequently plowed up nests of eggs that were nearly ready to hatch.

"These facts have been explained by the observation of occasional specimens nesting during the latter part of July. Eggs laid at that time would have only about five or six weeks of steadily warm weather, in which to develop, and would be retarded by the chilling of the ground in October. Thus the well advanced embryos must pass the winter in a condition of dormancy analogous to that observed in hibernating adults.

"On no occasion have I caught a female nesting whose carapace length was less than nineteen centimeters and whose age was less than fourteen years—according to the age record afforded by the annual growth ring on the scutes."

Figure 53. Distribution of *Graptemys geographica*. Horizontal ruling, specimens examined; vertical ruling, reports only.

Hay (1892a, 576) has found sixteen eggs in a large female.

Range: The species has been reported from: Michigan (Sager, 1839, 301; Agassiz, 1857, 436; Miles, 1861, 232), Ann Arbor (Smith, 1879, 7), Eaton County (Clark, 1904, 193), Olivet, and Barry, Kalamazoo, Kent, Montcalm, Ottawa and Van Buren Counties (Clark, 1905, 110). The specimens examined are from: Washtenaw County, Brighton, Livingston County, Pawpaw, Van Buren County, St. Joseph County, Allegan County, Calhoun County, and Kalamazoo County.

EMYDOIDEA BLANDINGII (Holbrook).

BLANDING'S TURTLE.

(Pl. VII.)

Emys meleagris, Agassiz, 1857, 442. Smith, 1879, 7. Miles, 1861, 233.

Emydoidea blandingi, Clark, 1902, 193, 1905, 110. Hankinson, 1908, 236. Ruthven, 1911a, 271.

Emys blandingii; Thompson, 1911, 107.

Description: Carapace rigid, covered with horny plates; elongated oval in outline, and rather high and convex but not as much so as in the box turtle (*Terrapene carolina*). Plastron large, closing the opening of the carapace and attached to it by a ligament. Plastron divided into two movable lobes, the hinge line between the abdominal and pectoral scutes. Head broad, snout not projecting and the upper jaw notched in front. The lower jaw with a hooked tip.

The ground color of the carapace is usually black with numerous round or irregularly elongated, pale yellow or light brown spots.

In old individuals the lighter markings may predominate toward the margins of the carapace restricting the black to small irregular blotches. Plastron pale yellow to light brown, the outer end of each scute occupied by a large black or brown blotch. Head and neck black or brown above with numerous small yellowish or olive spots; the muzzle and sides of the head predominatingly olive. Chin and throat immaculate yellow. Legs olive or light brown with mottlings of black or dark brown.

Figure 54. Distribution of *Emydoidea blandingii*. Horizontal ruling, specimens examined; vertical ruling, reports only.

Habits and Habitat: Little has been recorded on the habits of the Blanding turtle. Ditmars (1907, 57) writes on the subject as follows: "Although fully as agile in the water—in swimming, diving and remaining a considerable time beneath the surface—as the typical pond and river turtles and terrapin, this species often evinces a desire to wander about on land, and while it seldom ventures from wet, marshy areas, prowls about through the undergrowth in search of tender shoots, berries and insect larvae, a character quite in opposition to the feeding habits of the strictly aquatic turtles and terrapins, which are unable to feed unless under the water. Blanding's Turtle feeds with equal readiness upon the ground, or under water. Captive specimens are very fond of lettuce; they also feed voraciously upon earthworms, small fishes, tadpoles and young frogs, actively pursuing these creatures in the water and seizing them by a sudden dart of the head. Well fattened specimens are unable to employ the hinged plastron to but a slight extent and with such individuals the rear lobe is quite useless in covering the hind limbs which bulge from the shell in helpless fashion."

Range: The species has been reported from: Michigan (Agassiz, 1857, 442; Miles, 1861, 233), Ann Arbor (Smith, 1879, 7), Eaton County (Clark, 1902, 193), Ann Arbor, Olivet, and Kalamazoo and Van Buren Counties (Clark, 1905, 110), Sand Point and Stony Island, Huron County (Ruthven, 1911a, 271), Walnut Lake, Oakland County (Hankinson, 1908, 236), and Cass County (Thompson, 1911, 107). The writer has seen specimens from: Washtenaw County, Au Sable River, Oscoda County, Brighton, Livingston County, Walnut Lake, Oakland County, Cass County, Alma, Gratiot County, Sand Point and Stony Island, Huron County, and Mr. N. A. Wood reports seeing one in the pond on Charity Island.

TERRAPENE CAROLINA (Linnaeus).

BOX TURTLE.

(Pl. VII.)

Cistudo clausa, Sager, 1839, 301. Smith, 1879, 7.

Cistuda virginea, Agassiz, 1857, 445.

Terrapene carolina, Clark, 1902, 193; 1905, 110. Thompson, 1911, 107.

Description: Carapace rigid and covered with horny plates, broadly oval in outline, high, very convex, and solid. Plastron, large, closing the opening of the carapace with which it is united by a ligament. Plastron divided into two movable lobes, the hinge line between the abdominal and pectoral scutes. Snout not projecting; the upper jaw drawn down in front to form a beak, the lower jaw turned upward at the tip.

The colors of the carapace are yellow and brown or black. The arrangement is very variable and either the lighter or darker colors may predominate. The head, neck, limbs and tail are brown, spotted with yellow. The plastron is also very variable in coloration. It may be uniformly brown or black, and the brown or black may be spotted with yellow, or the yellow may be the predominating color and the brown or black reduced to irregular blotches.

Habits and Habitat: The box turtle differs from other Michigan turtles in being strictly terrestial. No notes are available on the habitats preferred by the species in Michigan, but Ditmars (1907, 61) makes the general statement that it is "most abundant in situations where open, grassy spots alternate in sparse thickets. The food consists largely of vegetable matter and berries, though the larvae of insects are eaten as well as earthworms and slugs. During the periods when blackberries ripen many specimens show unmistakable evidence of feasting by their stained mandibles and forefeet"

Holbrook (1842, I, 34) states that it feeds on "insects, crickets, etc., and according to Leconte, on fungous plants, as the Clavaria, etc. When in confinement and it

can easily be domesticated, it eats readily whatever is offered, as bread, potatoes, apples, etc." Surface (1908, 175-176) has examined stomachs of 40 specimens and tabulated the results as follows:

	No.	Per cent.
Vegetation	25	62.5
Cryptogams, (Flowerless Plants)	7	17.5
Fungi.		
Undetermined fungi	1	2.5
Basidiomycetes	1	2.5
Mushrooms	4	10
Bryophyta, Moss	1	2.5
Phanerogams, (Flowering Plants).		
Undet.	4	10
Roots	2	5
Buds	1	2.5
Leaves	5	12.5
Berries	3	7.5
Seeds	1	2.5
Podophyllum peltatum (May Apple)	1	2.5
Vitis labrusca (Grapes)	1	2.5
Prunus sp. (Cherry) seeds	1	2.5
Rubus sp. (Blackberry)	3	7.5
Pyrus sp. (Apple)	2	5
Osmorhiza sp.	1	2.5
Pyrola rotundifolia	1	2.5
Physalis sp. (Ground Cherry)	3	7.5
Gramineae, grass	8	20
Bird's Wheat Moss	1	2.5
Animal matter	32	80
Annulata (Earthworms)	2	5
Mollusca (Mollusks)	15	37.5
Snails	14	35
Slugs	2	5
Crustacea (*Cambarus* sp.)	1	2.5
Myriapoda (Millipedes)	8	20
Insects (Insecta)	24	60
Undetermined insects	7	17.5
Orthoptera (Grasshoppers, etc.)	7	17.5
Acridiidae	1	2.5
Melanoplus femur-rubrum (Red-legged G)	2	5
Gryllidae (Crickets)	1	2.5
Gryllus pennsylvanicus (Cricket)	2	5
Locustidae (Long Horned Grasshoppers)	1	2.5
Hemiptera Pentatomidae (Stink Bugs)	1	2.5
Lepidoptera (Moths)	9	22.5
Larvae (Caterpillars)	7	17.5
Pupae (Chrysalids)	1	2.5
Notodontidae—*Datana ministra*	1	2.5
Noctuidae, larvae (Cut worms)	3	7.5
Diptera (Flies)	1	2.5
Coleoptera (Beetles, etc.)	10	25
Undetermined beetles	7	17.5
Larvae of Beetles	2	5
Carabidae (Ground Beetles).		
Undetermined ground beetles	2	5
Carabus limbatus	1	2.5
Pterostichus lucublandus	1	2.5
Harpalus caliginosus	1	2.5
Hymenoptera (Ants, etc.)	1	2.5
Vertebrata (Back-boned Animals).		
Mammalia, Muridae (Mice)	1	2.5

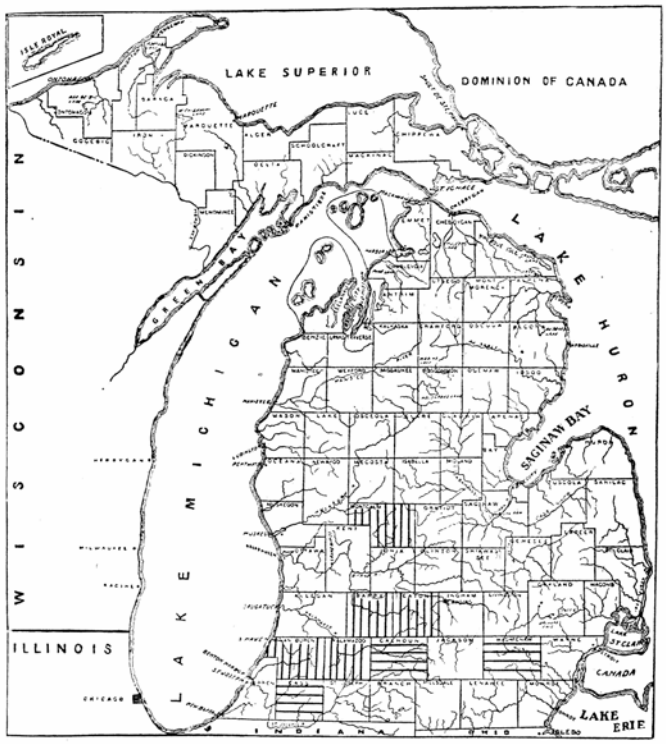

Figure 55. Distribution of *Terrapene carolina*. Horizontal ruling, specimens examined; vertical ruling, reports only.

The eggs are covered by a thin shell, and are deposited in loose soil. According to Hay (1892a, 581), they number from four to six and are laid about the latter part of June or after.

In winter they burrow into the soil to hibernate, and Ditmars (1907, 62) records one that was found in January, buried to a depth of about two feet.

Range: The species has been reported from: Michigan (Sager, 1839, 301; Agassiz, 1857, 445), Ann Arbor (Smith, 1879, 7), Eaton and Montcalm Counties (Clark, 1902, 193), Barry, Kalamazoo, Montcalm and Van Buren Counties (Clark, 1905, 110), and Cass County (Thompson, 1911, 107). The writer has examined specimens from Battle Creek, Calhoun County, Manchester, Washtenaw County, and Cass County.

GLOSSARY.

Abdominal plates. The antepenultimate pair of large scales on the plastron in turtles. (See Fig. 25.)

Alveolar surface. The masticatory surface of the jaws in turtles.

Anal plate. The large scale just in front of the anus in snakes. (See Fig. 23.) The posterior plates on the plastron of a turtle. (Fig. 25.)

Azygous scale. Occurring singly, i. e., unpaired. Applied to the small plate on the median line of the snout in *Heterodon platyrhinus*.

Bridge. The part of the shell which joins the carapace and plastron in turtles.

Canthus rostralis. The ridge from the eye to the tip of the snout that separates the top of the muzzle from the side.

Carapace. The upper shell in turtles. (See Fig. 24.)

Cephalic plates. The large scales on the top of the head in snakes. (See Fig. 22.)

Costal plates. The row of large scales between the marginal and vertebral series on the carapace in turtles. (See Fig. 24.)

Dorsal scales. The scales on the upper surface of the body in snakes. (See Fig. 23.)

Emarginate. Obtusely notched.

Femoral plates. The penultimate pair of scales on the plastron in turtles. (See Fig. 25.)

Frontal. The single large scale on the top of the head, and between the supraoculars, in snakes. (See Fig. 22.)

Gular plate. In turtles, the first plate or pair of plates on the plastron. (See Fig. 25.)

Hinge. A transverse joint in the plastron in some turtles.

Humeral plates. The second pair of scales on the plastron in turtles. (See Fig. 25.)

Internasal plates. The two large scales on top of the head, and between the nasals, in snakes. (See Fig. 22.)

Keel. A ridge.

Labial plates. See upper labials and lower labials.

Loreal plate. The scale on the side of the head, between the nasals and preocular, in snakes. (See Fig. 21.)

Lower labial plates. The row of scales along the margin of the lower jaw in snakes. (See Fig. 21.)

Marginal plates. The scales about the margin of the carapace in turtles. (See Fig. 24.)

Nasal plate or plates. The first one or two plates on the side of the head in snakes. (See Fig. 21.) See also prenasal and postnasal.

Nuchal plate. The small plate in the marginal series at the anterior end of the carapace in turtles. (See Fig. 24.)

Ocular plates. See preocular and postocular plates.

Parietal plates. The pair of large scales on the top of the head, back of the frontal and supraocular plates, in snakes. (See Fig. 22.)

Pectoral plates. The third pair of scutes on the plastron in turtles.

Pit. The opening on the side of the head, between the eye and nostril, in the rattlesnake.

Plastron. The lower shell in turtles. (See Fig. 25.)

Plate. A large scale. Synonymous with scute.

Postnasal plate. The posterior nasal scale, when there are two, in snakes. (See Fig. 21.)

Postocular plates. The series of scales just behind the orbit in snakes. (See Fig. 21.)

Prefrontal plates. The pair of large scales on the top of the head, just in front of the frontal and supraoculars, in snakes. (See Fig. 22.)

Prenasal plate. The anterior nasal scale, when there are two, in snakes. (See Fig. 21.)

Preocular plate or plates. The scale or scales just in front of the orbit in snakes. (See Fig. 21.)

Rattle. The dermal structure on the tail in rattlesnakes.

Rostral plate. The large scale on the end of the snout in snakes.

Scales. Thin horny outgrowths of the skin which overlap to form a more or less complete investment in reptiles. When large known also as plates and scutes.

Scale pits. Tiny pores at the apex of the scales in some snakes.

Scute. A large scale. Synonymous with plate.

Subcaudal plates. The large scales on the ventral surface of the tail in snakes. (See Fig. 23.)

Supraocular plate. The large scale above each eye in snakes. (See Fig. 22.)

Temporal plates. The scales on the side of the head, behind the postoculars, in snakes. (See Fig. 21.)

Upper labials. The series of scales along the margin of the upper jaw in snakes. (See Fig. 21.)

Ventral plates. The large scales on the ventral surface of the body in snakes. (See Fig. 23.)

Vertebral plates. The median dorsal series of scutes on the carapace in turtles. (See Fig. 24.)

GENERAL BIBLIOGRAPHY.

1857. Agassiz. Louis. Contributions to the Natural History of the United States, I.

1901. Atkinson, E. A. The Reptiles of Allegheny County, Pennsylvania. Annals Carnegie Museum, I, pp. 145-157.

1853. Baird, S. F. and Girard, C. Catalogue of North American Reptiles. Smithsonian Miscellaneous Collections, 49.

1891. Blatchley, W. S. Jour. Cincinnati Soc. Nat. Hist., 1891.

1903. Brimley, C. F. Notes on the Reproduction of Certain Reptiles. American Naturalist, XXXVII, pp. 261-266.

1902. Clark, H. L. Notes on the Reptiles and Batrachians of Eaton County. Fourth Annual Report Michigan Academy of Science, pp. 192-194.

1903. Clark, H. L. Notes on the Michigan Snakes. Fifth Annual Report Michigan Academy of Science, pp. 172-174.

1903a. Clark, H. L. The Short-mouthed Snake (Eutainia brachystoma Cope) in Southern Michigan. Proceedings Biological Society Washington, 1903, pp. 83-87.

1903b. Clark, H. L. The Water Snakes of Southern Michigan. Amer. Nat., XXXVII, pp. 1-23.

1905. Clark, H. L. A Preliminary List of the Amphibia and Reptilia of Michigan. Seventh Annual Report Michigan Academy of Science, pp. 109-110.

1911. Cochran, Ethel M. The Biology of the Red-backed Salamander. Biol. Bull., XX, pp. 332-350.

1900. Cope, E. D. Crocodilians, Lizards and Snakes of North America. Report U. S. National Museum, 1898 (1900), pp. 153-1270.

1889. Cope, E. D. Batrachia of North America. Bull. U. S. National Museum, 34.

1878. Coues, E and Yarrow, H. C. Notes on the Herpetology of Dakota and Montana. Bull. U. S. Geog. and Geol. Surv. Terr., IV, pp. 259-291.

1878. Cragin, F. W. Amer. Nat., XII, 820-821.

1842. DeKay, J. E. Reptiles and Amphibia. New York Fauna.

1906. Dickerson, Mary C. The Frog Book. New York.

1907. Ditmars, R. L. The Reptile Book. New York.

1906. Eycleshymer, Albert C. The Habits of Necturus maculosus. Amer. Nat., XL, pp. 123-137.

1901. Gadow, Hans. Amphibia and Reptiles. The Cambridge Natural History.

1891. Gage, Simon Henry. Life-History of the Vermillion-Spotted Newt. Amer. Nat., XXV, pp. 1084-1110.

1892. Garman, H. A Synopsis of the Reptiles and Amphibians of Illinois. Bull. Ill. State Lab. Nat. Hist., 1891, pp. 215- 388.

1892. Gibbs, M. Forest and Stream, XXXIX, p. 7.

1900. Gibbs, M. Herpetology of Kalamazoo County, Michigan. Wolverine Nat., February, 1900, pp. 12-13.

1905. Gibbs, Notestein and Clark. See Clark, H. L., 1905.

1908. Hahn, Walter H. Notes on the Mammals and Cold-Blooded Vertebrates of the Indiana University Farm, Mitchell, Indiana. Proc. U. S. Nat. Mus., XXXV, pp. 545-581.

1856. Hallowell, E. H. Proc. Acad. Nat. Sci. Phila., 1856, p. 310.

1908. Hankinson, T. L. Biological Survey of Walnut Lake, Michigan. Ann Rept. Geol. Surv. Mich. for 1907, pp. 153-288.

1887. Hay, O. P. The Massasauga and Its Habits. Amer. Nat., XXI, pp. 211-218.

1892. Hay, O. P. On the Breeding Habits, Eggs, and Young of Certain Snakes. Proc. U. S. Nat. Mus., XV, pp. 385-397.

1892a. Hay, O. P. The Batrachians and the Reptiles of Indiana. Rept. Ind. Dept. of Geology and Nat. Resources, XVII, (1891) pp. 409-610.

1898. Hodge, C. F. The Common Toad. Nature Study Leaflet, Biology Series, No. 1.

1842. Holbrook, E. North American Herpetology. Philadelphia.

1911. Hurter, Julius. Herpetology of Missouri. Transactions of the Acad. of Science of St. Louis, XX.

1899. Jordan, David Starr. A Manual of the Vertebrate Animals of the Northern United States.

1893. Jordan, Edwin O. The Habits and Development of the Newt (Diemictylus viridescens). Jour, of Morphology, VIII, pp. 269-366.

1895. Kirsch, Phillip H. A Report upon Investigations in the Maumee River Basin during the Summer of 1893. Bull. U. S. Fish Comm., XIV, p. 333.

1878. Merriam, C. H. Science News.

1861. Miles, Manly. A Catalogue of the Mammals, Birds, Reptiles and Mollusks of Michigan. 1st Bien. Rept. Geol. Surv. Mich., pp. 219-241.

1874. Milner, J. W. Report on the Fisheries of the Great Lakes: the Result of Inquiries Prosecuted in 1871 and 1872. Rept U. S. Fish Comm., 1872-73, pp. 1-75.

1904. Morse, Max. Batrachians and Reptiles of Ohio. Proc. Ohio State Acad. of Science, IV, pp. 91-144.

1906. Newman, H. The Habits of certain Tortoises. Jour. Comp. Neur. and Psyco., XVI, pp. 126-152.

1905. Notestein, F. N. The Ophidia of Michigan. Seventh Ann. Rept. Mich. Acad. Science, pp. 112-125.

1906. Ortmann, A. E. The Crawfishes of the State of Pennsylvania. Mem. Carnegie Mus., II, pp. 343-533.

1910. Piersol, W. H. Spawn and Larvae of Ambystoma jeffersonianum. Amer. Nat, XLIV, pp. 732-738.

1868. Putnam, F. W. Do Snakes Swallow Their Young. Amer. Nat., II, p. 136.

1895. Reddick, G. Snakes of Turkey Lake. Proc. Ind. Acad. Sci., 1895, pp. 261-262,

1904. Ruthven, Alexander G. Butler's Garter Snake. Biol. Bull., VII, pp. 289-299.

1904a. Ruthven, Alexander G. Notes on the Molluscs, Reptiles and Amphibians of Ontonagon County, Michigan. Sixth Ann. Rept. Mich. Acad. Sci., pp. 188-192.

1906. Ruthven, Alexander G. The Cold-Blooded Vertebrates of the Porcupine Mountains and Isle Royale, Michigan. Rept. Geol. Surv. Mich., 1905 (1906), pp. 107-112.

1908. Ruthven, Alexander G. Variations and Genetic Relationships of the Garter Snakes. Bull. U. S. Nat. Mus., 61.

1909. Ruthven, Alexander G. The Cold-Blooded Vertebrates of Isle Royale. Rept Geol. Surv. Mich., 1908 (1909), pp. 116-117.

1909a. Ruthven, Alexander G. Notes on Michigan Reptiles and Amphibians. Eleventh Ann. Rept. Mich. Acad. of Sci., pp. 116-117.

1910. Ruthven, Alexander G. Notes on Michigan Reptiles and Amphibians, II. Twelfth Ann. Rept. Mich. Acad. of Sci., p. 59.

1911. Ruthven, Alexander G. Notes on Michigan Reptiles and Amphibians, III. Thirteenth Ann. Rept. Mich. Acad. of Sci., pp. 114-115.

1911a. Ruthven, Alexander G. Amphibians and Reptiles in A Biological Survey of the Sand Dune Region on the South Shore of Saginaw Bay, Michigan. Geol. and Biol. Surv. Mich., Pub. 4, Biol. Ser. 2, pp. 257-272.

1839. Sager, Abraham. Catalogue of Mammals, Birds, Reptiles, Amphibians, Fishes, and Molluscs of Michigan. Senate Doc. State of Mich., 1839, pp. 294-305.

1909. Siebenroek, F. Synopsis der rezenten Schildkroten, mit Berucksichtigung der historischer Zeit ausgestorbenen Arten. Zool. Jahrb., Supp. 10, Heft 3.

1907. Smith, Bertram G. The Breeding Habits of Ambystoma punctatum Linn. Amer. Nat., XLI, pp. 381-390.

1910. Smith, Bertram G. The Structure of the Spermataphores of Ambystoma punctatum. Biol. Bull., XVIII, pp. 204-211.

1911. Smith, Bertram G. The Nest and Larvae of Necturus. Biol. Bull., XX, pp. 191-201.

1911a. Smith, Bertram G. Notes on the Natural History of Ambystoma jeffersonianum, A. punctatum and A. tigrinum. Bull. of the Wisconsin Nat. Hist. Soc., IX, pp. 14-28.

1877. Smith, W. H. The Tailed Amphibians, including the Caecilians. A Thesis presented to the Faculty of Michigan University.

1879. Smith, W. H. Catalogue of the Reptilia and Amphibia of Michigan. Supp. to Science News, 1879.

1882. Smith, W. H. Report on the Amphibians and Reptiles of Ohio. Rept. of the Geol. Surv. of Ohio, IV, pp. 633-735.

1903. Sperry, W. L. Variation in the Common Garter Snake (Thamnophis sirtalis). Fifth Ann. Rept. Mich. Acad. Of Sci., pp. 175-179.

1893. Stejneger, L. The Poisonous Snakes of North America. Rept. U. S. Nat. Mus., 1893, pp. 339-487.

1892. Stejneger, L. apud Hay, 1892, p. 396.

1908. Strecker, John K. Notes on the Breeding Habits of Phrynosoma cornutum and other Texas Lizards. Proc. Biol. Soc. Wash., XXI, pp. 165-170.

1906. Surface, H. A. The Serpents of Pennsylvania. Zool. Bull. Penn. Dept. of Agri., IV, pp. 113-202.

1908. Surface, H. A. First Report on the Economic Features of the Turtles of Pennsylvania. Zool. Bull. Penn. Dept. of Agri., VI, pp. 105-195.

1908a. Surface, H. A. The Lizards of Pennsylvania. Zool. Bull. Penn. Dept. of Agri., V, pp. 234-258.

1892. Taylor, W. E. The Ophidia of Nebraska. Ann. Rept. Neb. St. Board Agri., 1891, pp. 310-357.

1911. Thompson, Crystal. Notes on the Amphibians and Reptiles of Cass County, Michigan. Thirteenth Ann. Rept. Mich. Acad. Sci., pp. 105-107.

1893. True, F. W. Useful Aquatic Reptiles and Batrachians of the United States. Fisheries & Fishery Industries of the U. S., Sec. I, pp. 141-162.

1905. Whittaker, C. C. The Status of Eutaenia brachystoma. Seventh Ann. Rept. Mich. Acad. Sci., pp. 88-92.

1905a. Whittaker, C. C. Variation in the Blue Racer. Seventh Ann Rept. Mich. Acad. Sci., pp. 100-102.

1908. Wright, Albert H. Notes on the Breeding Habits of Ambystoma punctatum. Biol. Bull., XIV, pp. 284-290.

1909. Wright and Allen. The Early Breeding Habits of Ambystoma punctatum. Amer. Nat., XLIII, pp. 687-693.

1869. Verrill, A. E. Amer. Nat., Ill, pp. 158-159.

MEMORANDA TOWARDS A BIBLIOGRAPHY OF THE ARCHAEOLOGY OF MICHIGAN.

HARLAN I. SMITH.

Victoria Memorial Museum, Ottawa, Canada.

ABBOTT, (CHAS. C.). *Primitive Industry*, pp. 270-325.

American Antiquarian, Vol. 1, 1878, p. 8, mentions an embankment in Branch County.

American Antiquarian, Vol. XI, No. 4, 1889, p. 249, refers to Saginaw Grave.

American Association for the Advancement of Science, Proceedings, Vol. XXIV, 1875, pp. 311, 316-322, mentions mound in Wayne County.

American Association for the Advancement of Science, Proceedings, Vol. XXV, 1876, p. 324, mentions mound in Wayne County.

American Association for the Advancement of Science, Proceedings, Vol. XXVI, 1877, pp. 336-337, mentions mound in Wayne County.

ANDERSON, (ABEL). Smithsonian Report for 1879, p. 434, reports mounds in Newaygo County; p. 434, reports mounds in Ottawa County.

ARMSTRONG, (BENJ. G.). *Early Life among the Indians*. Press of A. W. Bowron, Ashland, Wisconsin, 1892, p. 150.

BALDWIN. *Ancient America*, p. 43-45, mentions copper mines in Ontonagon County.

BARNES, (CHAS. E.). Smithsonian Report, 1879, p. 434.

BEAUCHAMP, (WM. M.). *A History of the New York Iroquois*, Bulletin 78 (Archaeology 9) of the New York State Museum, p. 396, refers to Sansond's map of 1656; p. 398, refers to Crenoxins? map of 1660, and, p. 400, refers to Caronellis' map of 1688.

_____ *Indian Nations of the Great Lakes*, American Antiquarian, Nov. 1895, Vol. XVII, No. 6.

Berrien County. See United States National Museum Report, 1886, p. 107.

BLOIS, (JOHN T.). Gazetteer of the State of Michigan, 1838-1840 (copyrighted 1838), p. 165, mentions mounds in Lenawee County; p. 168, mentions sites in Calhoun County; pp. 168-170, mentions sites in Macomb County; pp. 173-177, mentions garden beds.

BOYLE, (DAVID). Archaeological Report, Ontario, 1901, pp. 32-35, mentions matter for comparison with Ogemaw County enclosures.

_____ Archaeological Report, Ontario, 1903, Toronto, 1904, p. 91, mentions perforated skulls from Canada similar to those of Michigan.

BRADY, (SAMUEL). Smithsonian Report for 1879, p. 434, reports that he is exploring copper mines on Isle Royale.

Branch County. See United States National Museum Report 1889, p. 118.

BROWER, (J. V.). *Kathio, Memoir of Explorations in the Basin of the Mississippi*, St. Paul, Minn., 1901, page opposite Plate II mentions copper.

CANFIELD, (——). *Sketches of Sauk County, Wisconsin*, American Antiquarian, 1890, refers to garden beds.

CARSON, (H. H.). American Antiquarian, Vol. IX, No. 4, July 1887, p. 237, mentions village sites in Clinton County; p. 238, mentions mounds, effigy mounds and garden beds in Saginaw County, and, pp. 237 and 238, mentions sites in Shiawassee County.

CATHERWOOD, (MARY HARTWELL). *The White Islander* (Indians), Century Magazine, Sept. 1893.

CHARLEVOIX, (SAGARD). *Voyage au grand pays des Hurons*.

COFFINBERRY, (W. L.) and STRONG, (E. A.). Proceedings of the American Association for the Advancement of Science, Vol. XXIV, 1875, pp. 293-297, describes mounds in Kent County.

CONANT, (A. J.). *Foot Prints of Vanished Races in the Mississippi Valley*, p. 65, refers to garden beds. Barnes, says p. 181, of Nadaillac.

Copper Mine in Michigan, Records of the Past, Vol. II, Part 7, July 1903, p. 223.

Copper. See Brower, Detroit, Moore, Palmer, Short, Whittlesey, Wisconsin Archaeologist, Vol. II, No. 1, Oct. 1902, p. 23.

COPWAY, (G.). *The Traditional History and Characteristic Sketches of the Ojibway Nation*, London, 1850.

Courier, see Saginaw.

DAN, (JOHN E.). Smithsonian Report 1879, p. 434, reports that he has in preparation a manuscript on forts and mounds of Macomb County.

DAVIS, (A. C.) *Antiquities of Isle Royale*, Smithsonian Report 1874.

DODGE, (BYRON E.). American Archaeologist, Nov. 1898, Vol. II, Part 11, p. 299, refers to shell-heap on Flint River near Richfield, Genesee County.

_____ American Archaeologist, March 1898, Vol. I, Part 3, p. 78, refers to supposed bridge across Flint River, Sec. 15, Genesee Tp., Genesee County.

Detroit Evening News.

Detroit Free Press, August 2, 1903, mentions copper.

Detroit Free Press, July 8, 1900, mentions Bert Marsh's Collection.

Detroit Free Press, May 1, 1901, refers to grave in Wayne County.

ELSWORTH, Epworth Assembly Quarterly, IV, 1897, p. 7, refers to a site in Mason County.

EVERTS, (L. H.). *History of Calhoun County*, 1877, p. 11, mentions sites in Calhoun County.

_____ *History of St. Joseph County*, Michigan, 1877, p. 11, mentions sites in St. Joseph County.

EVERTS and ABBOTT. *History of Kalamazoo County*, Philadelphia, 1880, mentions sites in Kalamazoo County; p. 65, mentions garden beds; p. 68, cuts of garden beds on W. B. Cobbs' Farm at Schoolcraft, also one at Galesburgh and one in Kalamazoo, probably the one in the Park west of the mound.

FARMER, (SILAS). *History of Detroit and Michigan*, 1884, p. 321, mentions mounds in Wayne County.

FISHER, (A. W.). *Cache of Leaf-shaped Relics*, Popular Science News, February, 1901, Vol. XXXV, No. 2, p. 38.

FOSTER, (J. W.). *Prehistoric Races of the United States of America*, p. 265, p. 266, mentions copper mines in Ontonagon County; p. 155, mentions garden beds.

FOSTER and WHITNEY'S Report, 1850, p. 162, mentions mines in Keweenaw County; pp. 161-162, notices copper mines in Keweenaw County; pp. 159-161, describes and figures copper mines in Ontonagon County, and, p. 161, mentions mounds in Ontonagon County.

FOWLER, (S. W.). Smithsonian Report, 1879, p. 434, mentions shell-heaps and sites in Manistee County.

FOWKE, (GERARD). Copy of Fowke's Report on Michigan. A carefully compared copy made with permission of Professor Thomas from a copy made by Rev. Wm. M. Beauchamp, of Syracuse, N. Y., for his use while assisting in preparing the Thomas Catalogue.

_____ Mr. Gerard Fowke of Chillicothe, Ohio, made a reconnaissance of Michigan for the Bureau of American Ethnology.

GALATIAN, (A. B.). See I. M. Thomas.

GIBBS, (MORRIS). *Origin of Mounds*, Popular Science, March, 1899, p. 59.

GILLMAN, (HENRY). Smithsonian Report, 1874, pp. 369, 370, describes mines in Keweenaw County.

_____ Appleton's Journal, Vol. X, 1873, p. 173, describes mines in Keweenaw County.

_____ 6th Report of the Peabody Museum, pp. 13-19, describes and figures mounds in St. Clair County.

_____ Smithsonian Report, 1873, pp. 380-382, describes and figures mounds in Emmett County; pp. 378, 379, describes mounds in Iosco County; pp. 387-390, describes and figures pits in Keweenaw County; p. 380, mentions with plat mound in Mackinac County; pp. 382-384, describes with plat and figures mounds in Manitou County; p. 380, mentions mound in Presque Isle County; pp. 370-374, describes and figures mound in St. Clair County; pp. 367-368, describes and figures mound in Wayne County; pp. 364-365, partly describes with map mound in Wayne County.

_____ *The Mound-Builders and Platycnemism in Michigan*, Smithsonian Report 1873, Government Printing Office, 1874, pp. 364-390, Figs. 1-12, some being maps.

_____ Also reprint 1877.

_____ *Certain Characteristics Pertaining to Ancient Man in Michigan*, Smithsonian Report 1875, Government Printing Office, 1876, pp. 234-245, Figs. 1-13.

_____ Also reprint 1877.

_____ *The Ancient Men of the Great Lakes*. Abstract from Proceedings of the American Association for the Advancement of Science, Vol. XXIV, Salem, 1876, pp. 316-331, Figs. 1-7. Read August 16, 1875, at Detroit meeting.

_____ *Perforation of the Humerous conjoined with Platycnemism*, American Naturalist, Vol. IX, No. 7, 1875, pp. 427-428.

Grand Rapids. The Evening Press, February 20, 1904, refers to sites in Kent County.

Handbook of the American Indians, Bulletin 30 of the Bureau of Ethnology, pp. 149-150, refers to Saginaw County; p. 139, refers to Manitou County; p. 58, refers to Saginaw County; p. 535, mentions piece of hafted celt from Michigan; p. 345, refers to copper from Michigan.

HAUPTMAN. (See Science.)

HAVARD, (DR. V.). *The French Half Breeds of the Northwest*, Smithsonian Report, 1879, pp. 309-327; p. 318, mentions Michigan.

HAVEN, (——). *Archaeology of the United States*, contains report of Verandrier who explored this region before 1748.

HILLS, (LESLIE W.). American Archaeolgist, March 1898, p. 77, refers to a cache in Berrien County.

HINSDALE, (W. B.). Washtenaw Times, Ann Arbor, June 23, 1901, mounds in Washtenaw County.

History of Kalamazoo County.

HOLMES, (WM. H.). *Aboriginal Copper Mines of Isle Royale*, Lake Superior, American Anthropologist, N. S., Vol. 3, 1901, pp. 684-696, Plates XXIII-XXIV, Fig. 73.

History of Saginaw County, Michigan; together with sketches of its cities, villages and townships, educational, religious, civic, military, and political history; portraits of prominent persons, and biographies of representative citizens. History of Michigan, embracing accounts of the pre-historic races, aborigines, French, English and American conquests, and a general review of its civil, political and military history. Illustrated. Chicago, Chas. C. Chapman & Co., 1881, pp. 960. P. 268, refers to Rifle River in Ogemaw County; p. 287, refers to sites in Iosco County.

HODGMAN, (F.). *The Old Fort*, written for the Michigan Pioneer and Historical Society, June 5, 1902. Refers to fort in Kalamazoo County.

HOUGHTON, (JACOB). *Ancient Copper Mines of Lake Superior*, mentions mines in Ontonagon County.

HUBBARD, (BELA). American Antiquarian, Vol. I, 1878, pp. 4-9, partly describes and figures garden beds in Kalamazoo County; p. 7, partly describes rectangular and circular embankments in Kalamazoo County; p. 4 and Fig. 4, mentions garden beds in St. Joseph County.

_____ *Memorials of a Half Century*, 1887, Copyrighted G. P. Putnam Sons, p. 185, mentions L'Arbe Croche Village Site in Emmett Co.; p. 203, describes, with cut, sites in Macomb County.

_____ *Ancient Garden Beds of Michigan*, Pioneer Collections of the State of Michigan, Vol. II, 1877-78, pp. 21-27 and maps pp. 28-35, partly describes and figures garden beds in Kalamazoo County.

HUBBARD, (LUCIUS). Smithsonian Report, 1879, pp. 434-435, mentions mounds in Berrien County.

Huron, see Miner.

JENISON, (O. A.). Smithsonian Report, 1879, p. 435.

JENKS, (ALBERT ERNEST). *The Wild Rice Gatherers of the Upper Lakes*, 19th Report of the Bureau of Ethnology, Part 2, p. 1050, refers to Saginaw County and Bay County.

JENNINGS, (H. S.). The Michigan Academy of Science, Science N. S. XIII, No. 329, April 19, 1901, p. 616, refers to papers by Harlan I. Smith on "An Archaeological Survey of Michigan: The Antiquities of Michigan, Their Value and Impending Loss."

JONES, (JOSHUA). Smithsonian Report, 1879, p. 435, mentions mounds in Livingston County.

JONES, (PETER). *History of the Ojibway Indians*, 1861.

KELTON, (DWIGHT H.). *Annals of Fort Mackinac*, Copyrighted 1892.

KINZIE, (MRS. JOHN H.). "*Wau-Bun the Early Day in the Northwest*" New York, 1856.

KOHL, (J. G). *"Kitchi-Gami Wanderings Round Lake Superior."* London, 1860.

LA HONTON. *New Voyages*, Vol. I, p. 93, 1703, refers under the names Otontagans and Ottawas of Talon, to Otontagan, an Ottawa band living before 1680 on Manitoulin Island and driven out by the Iroquois.

LAPHAM, (I. A.). *Antiquities of Wisconsin*, p. 74, mentions copper mines in Ontonagon County and garden beds.

LARMOUR, (J. J.). Smithsonian Report 1880, p. 444, mentions mounds in Calhoun County.

LATHROP, (J. H.). *Prehistoric Mines of Lake Superior*, American Antiquarian, Vol. XXIII, No. 4, July and August 1901.

_____ Also printed in Northwest Magazine, Feb. 1901.

LEACH, (M. L.). *Ancient Forts in Ogemaw County, Michigan*, Annual Report of the Smithsonian Institution, 1884, Washington, Government Printing Office, 1885, pp. 849-851, with two maps.

_____ Also reprint in Papers Relating to Anthropology from the Smithsonian Report for 1884, Washington, Government Printing Office, 1885, pp. 11-13, with two maps.

_____ *Ancient Mounds in Clinton County, Michigan*, Annual Report of the Smithsonian Institution, 1884, Washington, Government Printing Office, 1885, pp. 839-848, describes and figures mounds; pp. 840-841, describes and figures mounds on a flat in Shiawassee County.

_____ Also reprint in No. 620 Papers Relating to Anthropology from the Smithsonian Report for 1884, Washington, Government Printing Office 1885.

_____ Address Traverse City, Michigan.

LEESON, (M. A.). *History of Macomb County, Michigan*, 1882, mentions sites in Macomb County.

MANKTELOW, (CHAS. W.). The American Archaeologist, April 1898, p. 105, and the American Archaeologist, December 1898, p. 323, reports mounds or earthworks near Boone and Cadillac, Wexford County.

_____ *Prehistoric Remains in Northern Michigan*, Popular Science News, Nov. 1902, p. 289.

_____ Address Cadillac, Michigan.

MASON, (OTIS T.). *Papers Relating to Anthropology*, 1884, pp. 4-10, mentions mounds in Clinton County; pp. 11-13, mentions enclosures in Ogemaw County; pp. 1-4, mentions mounds in Shiawassee County.

_____ United States National Museum Report 1902, p. 385, refers to Angwassag, Saginaw County.

MCCORMICK, (W. K.). *Mounds and Mound Builders of the Saginaw Valley*, Michigan Pioneer Collection, Vol. IV, 1881, Lansing, W. S. George & Co., 1883, p. 382, mentions sites in Bay County and refers to Ogemaw County; p. 379, mentions enclosures in Ogemaw County, and describes mounds in Genesee County; p. 380, mentions mounds and earthworks in Saginaw County.

MACLEAN, (JNO. P.). *Mound Builders*, pp. 76-77, mentions copper mines in Ontonagon County.

MALLORY, (ISAAC). *History of Baptist Indian Missions*, 1840, p. 366, mentions mound in Wayne County.

MIDDLETON, (JAMES D.). The Smithsonian Report, 1889, footnote on p. 47 in appendix I, refers to his work in Michigan.

Miner, The Michigan, Nov. 1, 1901. *The Lake Huron Region*. An early geographical Sketch of Lake Huron with accompanying map of interest. Saginaw, Michigan.

_____ Vol. VI, No. 2, January 1902, p. 12, mentions copper.

MOORE, (CHARLES). *The Ontonagon Copper Boulder in the United States National Museum*, United States National Museum Report for 1895, pp. 1021-1030, with two plates, Washington, Government Printing Office, 1897.

_____ Also reprint.

MOOREHEAD, (WARREN K.). *Prehistoric Implements*, Cincinnati, 1900, pp. 23 and 307, mentions a cache.

MORSE, (JEDIDIAH). Report to the Secretary of War of the United States on Indian Affairs, 1822, Appendix, p. 19, refers to Saganau.

Muir, Michigan, (Ionia County). *Story of a Fort Near Muir, Michigan*, Detroit News, Feb. 25, 1893.

_____ Also reprint in the Archaeologist, Vol. I, No. 4, pp.

65-67.

NADAILLAC. *Prehistoric America*, p. 81, refers to garden beds. New York Times, January 9, 1908, mentions discovery of a copper axe at Presque Isle, Presque Isle County.

_____ March 23, 1902, mentions copper found at Lake Gogebic.

_____ August 10, 1902, refers to perforated skulls found near Arkona, Ontario, similar to those found in Michigan.

OAKES, (H. E.). *The Garden Beds of Michigan Modeled.* American Antiquarian, Vol. XVIII, No. 6, November 1896, p. 323.

PACKARD, (R. L.). *Pre-Columbian Copper Mining in North America*, Smithsonian Report for 1892, Washington, Government Printing Office, 1893, pp. 175 and 178, refers to Marquette.

_____ Also reprint, p. 919.

_____ *Pre-Columbian Copper Mining in North America*, American Antiquarian. March, 1893, Vol. XV, No. 2, pp. 67-78,

continued in American Antiquarian, May, 1893, Vol. XV, No. 3, pp. 152-164.

PALMER, (FRIEND). *Early Days in Detroit*, p. 247, mentions copper.

Peabody Museum, Harvard University, 10th Annual Report, 1877 (Reports II) p. 20, refers to photograph, 11054, of stone ornament found in Fruitport, Michigan, presented by W. L. Coffinberry of Grand Rapids, Michigan.

_____ 16th and 17th Annual Reports, 1884, (Report III), p. 202, articles 29476-29521 from mound on Devil River, collected by Henry Gillman and presented by Stephen Salisbury.

_____ 19th Annual Report, 1886, p. 505, 38225, perforated crania, mound on River Rouge presented by Bela Hubbard. P. 508, articles from mound at Grand Rapids presented by W. L. Coffinberry.

PECK, (WILLIAM IRA). The Evening News, Detroit, Dec. 7, 1901, refers to fort in Ogemaw County.

PEET, (STEPHEN D.). American Antiquarian, Vol. VII, 1885, pp. 23-28, describes and figures garden beds in Kalamazoo County.

_____ *Emblematic Mounds*, Vol. II, p. 131, refers to garden beds.

Perforated, see Saginaw.

Pioneer Collections, Vol. II, 1877-78, p. 45, mentions sites in Manitou County.

Popular Science, March 1899, p. 59.

Popular Science Monthly, 1881, p. 601, mentions copper.

POST, (H. D.). Michigan Pioneer Collections, Vol. Ill, 1879-80, p. 296, mentions sites in Allegan County.

RILEY, (HENRY H.). Michigan Pioneer Collections, Vol. Ill, 1879-80, p. 14, refers to mounds discovered by Gillman in St. Clair County.

ROYCE. Map 1st. Report of the Bureau of American Ethnology, 1881, refers to Pocagons Village (Pocagon).

SAGARD, (THEODAT, GABRIEL). *Le Grand Voyage au Pays des Hurons.*

Saginaw Courier-Herald, June 30, 1901, refers to an earthwork in Ogemaw County.

_____ January 29, 1903, mentions mound in Genesee County.

_____ March 14, 1903, refers to perforated skull from Bay County in American Museum of Natural History.

_____ Nov. 1, 1905, Nov. 11, 1905, Dec. 17, 1905, and Dec. 30, 1905, refers to graves at Bridgeport, Saginaw County.

_____ May, 1907, mentions graves at Bridgeport, Saginaw County.

Saginaw Evening News, June 1, 1888, refers to Saginaw Grave.

_____ December 31, 1902, mentions Edinger collection.

_____ September 23, 1909, mentions a grave in Berrien County.

SAUR, (WM. C). *Illustrated Atlas of Kalamazoo County, Michigan*, with Early and Present History, Detroit, Mich., 1890, p. 79, refers to garden beds.

SCHOOLCRAFT, (HENRY R.). *Historical and Statistical Information respecting the History, Conditions and Prospects of the Indian Tribes of the United States*, Lippincott, Grambo & Company, 1851-1857, Vol. I, pp. 50-54-60 with plates VI and VII, refer to garden beds in the Grand River Valley.

Science, February 21, 1902, p. 309, refers to Hauptman Earthwork in Ogemaw County.

SHORT, (——). North Americans of Antiquity, pp. 89-92, mentions copper mines in Ontonagon County.

SMITH, (HARLAN I.). *The Antiquities of Michigan Their Value and Impending Loss.* John F. Elby & Co., Detroit, Michigan. A reprint of a syndicated article which appeared in the Detroit Evening News and the Detroit Free Press.

_____ *Prehistoric Michigan,* Popular Science News, May, 1901, pp. 110-111.

_____ Also reprint.

_____ *An Archaeological Survey of Michigan*, Third Report of the Michigan Academy of Science, 1901, pp. 35-37.

_____ Also separate.

_____ *Archaeological Survey of Michigan.* Presented before the Michigan Academy of Science at its seventh annual meeting, Ann Arbor, March 28, 1901, pp. 198-200.

_____ American Anthropologist, N. S., Vol. Ill, January-March, 1901. This paper with slight changes the same as "An Archaeological Survey of Michigan."

_____ Also reprint.

_____ *In Primitive Times.* Saginaw Evening News, April 9th, 1894.

_____ *The Saginaw Valley Collection*, The culture of the people once inhabiting a limited area near Saginaw, Michigan, as illustrated by material in the Anthropological Department of the American Museum of Natural History. Illustrated, 2 maps, 24 pp. Supplement to American Museum Journal, Vol. I, No. 12, November-December, 1901. A popular account.

_____ *Anthropological Matters in Michigan*, read at the 43rd Meeting of A. A. A. S. at Brooklyn, N. Y., 1894.

_____ *Relics of an Early Race*, Detroit Free Press, October 21, 1894, refers to sites in Saginaw and Kalamazoo Counties.

_____ *Study of Man*, Detroit Free Press, Nov. 12, 1893.

_____ *Legendary Invasion of the Saginaw Valley*, American Antiquarian, Chicago, Vol. XIII, No. 6, Nov. 1891, pp. 339-340.

_____ Reprinted under the title—*The Invasion of Saginaw Valley.* A legend of northern Michigan as told by an Indian, Detroit Free Press, Sunday, January 3, 1892, p. 11, column 4, also in daily issue of Saginaw Courier-Herald, January 7th, and in the weekly issue of the same January 14, 1892.

_____ *The Archaeology of the Saginaw Valley as illustrated at the World's Columbian Exposition.*

_____ Also reprint.

_____ *Notes on the Data of Michigan Archaeology.* Presented at the first meeting of the Michigan Academy of Science, Dec. 26, 1894. American Antiquarian, Vol. XVIII, No. 3, May, 1896, p. 144, part I.

_____ Also reprint.

_____ *The Development of Michigan Archaeology.* Presented at the first meeting of the Michigan Academy of Science, Dec. 26, 1894. The Inlander, VI, 8, May, 1896, part II.

_____ Also reprint.

_____ Partial Reprint in Preservation of Local Archaeological Evidences, Report of the Museums Association of the United Kingdom. Brighton Meeting for 1899.

_____ Also reprint, 1900.

_____ Also reprint Sci. Am. 23

_____ *Work in Anthropology at the University of Michigan for 1892*, University Record, Feb. 1894, pp. 98-100.

_____ Reprint Courier Presses, Ann Arbor, 1894.

_____ Also reprint Detroit Free Press.

_____ *An Earthwork Discovered in Michigan*, Science, 1901, p. 991, refers to Hauptman Earthwork in Ogemaw County.

_____ Science, 1901, p. 228, refers to Hauptman Earthwork in Ogemaw County.

_____ *Primitive Remains in the Saginaw Valley, Michigan, The Ayres Mound*, The Archaeologist, Vol. 1, No. 3? March, 1893, pp. 51-53.

_____ *Caches of the Saginaw Valley, Michigan*, Proceedings Am. Ass. for the Advancement of Science, Vol. XLII, 1894, pp. 300-303.

_____ Also separate.

_____ See also same article revised and extended in The Antiquarian, Columbus, Ohio, Vol. I, Pt. 2, Feb., 1897, pp. 30-33.

_____ *Summary of the Archaeology of the Saginaw Valley, Michigan, I,* American Anthropologist, N. S. Vol. 3? No. 2, April-June, 1901, pp. 286-293.

_____ Also separate.

_____ *Summary of the Archaeology of the Saginaw Valley, Michigan, II*, American Anthropologist, N. S. Vol. 3, No. 3, July-September, 1901, pp. 501-512.

_____ Also separate.

_____ *Summary of the Archaeology of the Saginaw Valley, Michigan, III*, American Anthropologist, N. S. Vol. 3, No. 4, October-December, 1901, pp. 726-736. This article covers in the Saginaw River Valley, Saginaw County as far as Ayres Graves inclusive.

_____ *Anthropological Work at the University of Michigan*, Memoir of the International Congress of Anthropology, Chicago, 1894.

_____ Lyceum Advocate.

SMITH, (EMILE). Wrote in German on Michigan Copper and also translated into English.

Smithsonian Report, 1897, p. 434, refers to mounds.

_____ 1892, p. 50, refers to Holmes' exploration of copper mines on Isle Royale.

SQUIER, (E. G.). *Aboriginal Monuments of New York*, p. 184, mentions copper mines in Ontonagon County.

STARR, (FREDERICK). American Antiquarian.

STEVENS, (EDWARD T.). *Flint Chips*, p. 540, refers to garden beds.

STOCKWELL, (G. ARCHIE). Smithsonian Report, 1879, p. 435, reports mounds in St. Clair County.

_____ Dr G. Archie Stockwell of Port Huron, Michigan, at the time of Mr. Fowke's reconnaissance, while hunting extensively in various parts of the state, had been watchful for mounds or other remains. He desired to make a systematic survey of Huron County and had collected many data regarding Michigan Archaeology which he freely offered to place at the disposal of science. In 1894 Dr. Stockwell removed to Detroit, Michigan.

STRONG, (E. A.). See Coffinberry.

SWINEFORD, (——). *History and Review of the Mineral Resources of Lake Superior*, mentions copper mines in Ontonagon County.

TALON. Refers to Ottawas (Otontagan).

TEED, (DELMAR E.). American Archaeologist, April 1898, note p. 105, assisted Chas. E. Manktelow explore mounds near Boon and Cadillac, Michigan.

_____ Address Cadillac, Michigan.

THOMAS, (CYRUS). 12th Report of the Bureau of Ethnology, pp. 550 and p. 33, refers to garden beds, describes enclosures in Ogemaw County.

_____ *Catalogue of Prehistoric Earth-Works East of the Rocky Mountains*, pp. 106-116, Plate X, and Archaeological map of Michigan. Washington, Government Printing Office, 1891.

THOMAS, (I. M.), and GALATIAN (A. B.). Compilers as well as publishers. *Indian Pioneer History of the Saginaw Valley with histories of East Saginaw, Saginaw City and Bay City from the earliest settlements, also Pioneer Directory and Business Advantages, 1866-67*. Published in East Saginaw. Copy Detroit Public Library.

THOMAS, (——). *Kalamazoo Directory and Business Advertisements, 1867-1868, together with History of Kalamazoo*, Kalamazoo, 1867, p. 7, refers to garden beds.

Tippecanoe Treaty (1832). U. S. Indian Treaty 701, 1873, refers to Pocagon's village (Pocagon).

University. *Wants University to Search for Prehistoric Remains*. Ann Arbor Argus Democrat, Ann Arbor, Michigan, February 27, 1903.

VERANDRIER. (See Haven.)

WARD, (HENRY L.). *A Remarkable Ceremonial Object from Michigan*, Bulletin of the Wisconsin Natural History Society, Vol. IV, N. S., No. 4, October, 1906, pp. 160-161.

Washington Treaty 1836. U. S. Indian Treaty, 1873, p. 607, refers to sites in Manitou County.

Washtenaw Times, June 26, 1901, refers to graves in Washtenaw County.

Wayerman, Walkins & Co. *History of Cass County*, 1882, mentions sites in Cass County.

Wayne County. *Find of Indian Skeletons*, American Antiquarian, November-December, 1894, Vol. XVI, No. 6, p. 383.

West Branch Herald Times, June 14, 1901, refers to wall around Rifle Lake. Possibly a natural ice push.

Western Gazetteer or Emigrant's Directory, 1817, p. 170, mentions sites in Wayne County.

WHITNEY. See Foster.

WHITTLESEY, (CHARLES). *Ancient Mines on the Shores of Lake Superior*, Contribution to Knowledge, 1863, pp. 17-20, describes and figures copper mines in Ontonagon County.

WILSON, (THOMAS). *Arrow Points, Spearheads and Knives of Prehistoric Times*. United States National Museum, 1897. P. 980, refers to caches in Saginaw County and in Huron County. Frontispiece represents a hafted celt from Genesee County.

_____ Report of the United States National Museum, 1892, part 1, p. 980, refers to cache from Chippewa County.

WILSON, (DANIEL). *Prehistoric Man*. Vol. I, p. 278, refers to copper mining.