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THE LAND MOLLUSCA OF CHEBOYGAN COUNTY,
MICHIGAN

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INTRODUCTION

THE purpose of this paper is to list completely and to furnish information on the ecological and habitudinal ranges of the land mollusks of Cheboygan County, Michigan. This fauna has seemed worthy of investigation since it is a typical one of the upper portion of the Lower Peninsula.

Various small collections of mollusks have been taken in the county at different times. Most of the samples were taken in the vicinity of the University of Michigan Biological Station at Douglas Lake. During the summer of 1933, I made collections at Douglas Lake and in various other localities in the county. There are gaps in the collecting, especially in the southern part, but since the latter area is a poor, sandy country, it is improbable that any species new to the county will be found there.

ECOLOGY

Of especial importance to the land molluscan fauna are the vegetation and the edaphic features of the area. The vegetation appears to exercise a more powerfully modifying influ-

ence on the assemblages of mollusks than does the soil. Moreover, the molluscan communities are as thoroughly affected by the special features, such as anthropoeic (human) and pyric (fire) factors, as are the plants. The land Mollusca inhabit all types of terrestrial plant-animal communities except those occurring on boggy ground. Undoubtedly all the types of molluscan assemblages occurring within the county have been observed with the possible exception of those of orchards, which are few. In addition the area is too uniform geologically and topographically to furnish much variety. In the long run the classification of these habitats proves to be a much simpler task than that involved in classifying the habitats of areas farther to the south.

Cheboygan County is a meeting point of the southern hardwood forests and the northern coniferous forests. In the past the poor, sandy soils of the western and southern parts of the county tended to favor the coniferous forests; the better soils of the remaining area were suitable ground for hardwoods. Within the last sixty years lumbering and fires have operated in the west and south to alter conditions, and in the west, at least, deciduous trees are coming to replace the conifers in many second-growth stands. In the richer northeastern area agriculture is profitable, and so much of the land is cultivated that only a small amount of woodland remains. All this has had a modifying effect on the molluscan assemblages. Not merely are there definite communities of species which differ according to whether they occur in hardwoods or conifers, but there are also special communities on both burned over and on cultivated land. As might be expected, the communities characteristic of burned over and lumbered woods are very frequent in the west and south, and culture ones of the open, cultivated land are frequent in the rest of the county.

In treating of the ecology of the land mollusks the following types of habitats will be considered: beech-maple hardwoods, bog woods, pine woods, aspen woods, lake shores, meadows, pastures and open fields, and roadsides. The beech-maple woods contain the climax type of molluscan community. Here

the species are most numerous, although not always most abundant in individuals. The large polygyras of the *Mesodon* type (in the old sense) predominate in size and numbers. This community may be designated as the *Mesodon* association or assemblage. The burned over areas of the aspen type contain a smaller fauna belonging to the pyric succession, the *Stenotrema-Endodonta* association (more or less equivalent to that of the *Triodopsis-Stenotrema* of the oak-hickory communities farther south). The pine woods are occupied by yet another molluscan succession, the *Zonites-Endodonta* association, a lower type of molluscan community. The pine woods and meadows have the most meager faunas of the whole series of habitats.

Before proceeding further it is well to define terms inasmuch as there has been no satisfactory terminology established for the various assemblages of any single animal phylum. The terms employed here are based on those used by the plant ecologists. A molluscan association is not an association for any particular purpose, but is an assemblage or molluscan community whose limits roughly lie within those of any given plant community. In a sense it is a subdivision of a pre-society as defined by the animal ecologists. The molluscan association roughly corresponds to the plant association, and like the latter requires a name. The name should not be taken from a specific name or any similar narrow designation, but should be a broad term like beech-maple, for example. This is necessary in order to preserve the broader correlation between communities of the same or similar facies in different parts of North America. The necessity for this practice may be seen in the case of the oak-hickory communities in Arkansas and Alabama, which contain the same molluscan association, even though the actual species involved are different. In naming and evaluating our molluscan associations the best criteria are those of the size and conspicuousness of the species and the abundance of individuals of those species. Thus the question involved is what are the most conspicuous and the most numerically predominant species in the community. The scheme for naming the associations is as follows: the common

unit for all climax and subclimax terrestrial molluscan communities in North America is the genus *Polygyra*. Ecologically speaking, this genus may be divided into a number of main categories. Under climax conditions the large polygyras of the *Mesodon* type (in the old sense) predominate, and the name *Mesodon* association is given to this type of community. Under subclimax conditions the polygyra of the *Triodopsis* (in the old sense) and *Stenotrema* types predominate, and such a community is called a *Triodopsis-Stenotrema* association. In the same way communities characterized by snails of the families Zonitidae and Endodontidae are designated as the *Zonites-Endodonta* association (the names not being used in the special modern generic sense).

In the treatment of each habitat the abundance of certain species will be indicated by symbols, c = common, f = frequent, r = rare. These are to be accepted as relative terms.

BEECH-MAPLE HARDWOODS

The beech-maple woods exist in patches of varying extent, and are best developed in localities where the soil moisture and soil conditions are at an optimum. They often grade into other types of plant associations. Along lake shores wherever they are second growth, there is a fair mixture of birches, especially along the borders.

The trees consist of such species as *Acer saccharum*, *Betula lutea*, *Fagus grandifolia*, and, on damp soils, *Fraxinus nigra*. Of the understory species a few may be mentioned, such as *Acer pennsylvanicum*, *Viburnum cassinoides*, *Lonicera glaucescens*, *Rhus toxicodendron*, *Amelanchier canadensis*, *Maianthemum canadense*, and *Polygonatum commutatum*. In the humus and under logs the following species of mollusks occur:

<i>Haplotrema concavum</i>	<i>Zonitoides arboreus</i> c
<i>Helicodiscus parallelus</i> c	<i>Polygyra fraterna</i> c
<i>Gonyodiscus cronkhitei</i> cats-	<i>Polygyra sayana</i> r
<i>killensis</i> c	<i>Polygyra thyroidus</i>
<i>Anguispira alternata</i> c	<i>Polygyra albolabris</i> c
<i>Deroceras laeve</i> <i>campestre</i>	

<i>Vitrina pellucida limpida</i> r	<i>Cochlicopa lubrica</i>
<i>Euconulus chersinus</i> r	<i>Columella edentula</i>
<i>Euconulus fulvus</i> r	<i>Acanthinula harpa</i> f
<i>Retinella rhoadsi</i>	<i>Strobilops labyrinthica</i> c
<i>Retinella indentata</i> f	<i>Succinea avara</i>
<i>Retinella binneyana</i> f	<i>Succinea ovalis</i>

Polygyra monodon was found once in the hardwoods of an island in Lake Huron.

BOG WOODS

The bog woods, present on low, wet, cold ground, are composed of the following trees: *Thuja occidentalis*, *Abies balsamea*, *Picea mariana*, and *Acer rubrum*. Some of the understory plants are *Clintonia borealis*, *Taxus canadensis*, *Coptis trifolia*, *Smilacina racemosa*, *Trientalis americana*, *Viola reniformis* and *Cypripedium acaule*. Around the bases of trees, "on log rafts," in moss, and among ferns are the following snails:

<i>Haplotrema concavum</i>	<i>Polygyra sayana</i> r
<i>Planogyra asteriscus</i> f	<i>Polygyra albolabris</i>
<i>Anguispira alternata</i> c	<i>Carychium exiguum</i> f
<i>Polygyra fraterna</i> c	

PINE WOODS

The pine woods belong to one of the successional stages following lumbering and fires. They are either white pine or jack pine communities. The latter community occurs on the poorest soil, and is a more impoverished type of coniferous woods than is the former. Among the trees are *Pinus strobus*, *P. resinosa*, and *P. banksiana*; among the understory species are *Myrica asplenifolium*, *Panicum depauperatum*, *Pteris aquilina*, *Vaccinium pennsylvanicum*, and *V. canadense*. Lichens and *Kladonia rangiferina* are of some importance to the snail, *Anguispira alternata*. The mollusks which occur in the pine woods are:

<i>Anguispira alternata</i> c	<i>Retinella indentata</i> c
<i>Philomycus carolinensis</i>	<i>Polygyra fraterna</i>
<i>Zonitoides arboreus</i>	

ASPEN WOODS

The aspen woods are prone to spring up very soon after fires; they immediately precede the pine succession. Among the important overstory plants are *Populus tremuloides*, *P. grandidentata*, *Betula alba papyrifera*, and *Prunus pennsylvanica*. Characteristic understory species include *Diervilla lonicera*, *Rhus glabra borealis*, *Gaylussacia baccata*, *Vaccinium pennsylvanicum*, *Rubus idaeus*, *Epigaea repens*, *Gaultheria procumbens*, and *Pteris aquilina*.

In spite of the fact that the type of molluscan community that occurs in aspens belongs to the pyric association, it is richer in species than the assemblage which succeeds it during pine succession:

<i>Gonyodiscus cronkhitei</i> cats-	
<i>killensis</i> c	<i>Polygyra fraterna</i> c
<i>Anguispira alternata</i> c	<i>Polygyra albolabris</i>
<i>Retinella indentata</i> f	<i>Strobilops labyrinthica</i>
<i>Zonitoides arboreus</i> c	

Philomycus carolinensis appears where the aspens are somewhat mixed with pines near the shores of lakes.

OPEN LAKE SHORES

The open lake shores are treeless or nearly treeless areas covered with sedges, reeds, and grasses; they include a part of the beach. Among the plants are *Eleocharis palustris*, *Scirpus americanus*, *Juncus balticus littoralis*, *Potentilla anserina*, and sometimes seedlings of *Acer rubrum* and *Salix*. The snails inhabiting these areas are:

<i>Gastrocopta contracta</i> r	<i>Succinea avara</i> c
<i>Acanthinula harpa</i> c	<i>Succinea retusa</i>

MEADOWS

Only one type of meadow has been observed, and this occurs in various of the old marl bays. The only species are:

<i>Anguispira alternata</i> c	<i>Polygyra monodon</i> c
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PASTURES AND OLD FIELDS

Pastures and old fields form a type of community which is artificial in origin. It is the result of the complete clearing of land followed by cultivation and grazing. It is a community of grasses and weeds, among which are milkweed, sumac, mullein, and blackberry (*Rubus allegheniensis*). Wherever the open country has been burned, fire-weeds such as *Epilobium angustifolium* spring up. Occasional invaders from the forests, such as bracken, appear. The snails live in grass and weeds, and seek shelter under planks, palings, rotten logs, and around stumps. The snails found in these habitats are:

<i>Helicodiscus parallelus</i>	<i>Polygyra fraterna</i> c
<i>Gonyodiscus cronkhitei</i> cats-	<i>Polygyra sayana</i> r
<i>killensis</i> f	<i>Polygyra albolabris</i> f
<i>Anguispira alternata</i> c	<i>Succinea ovalis</i>
<i>Zonitoides arboreus</i>	

ROADSIDES

Roadsides have much the same flora as do the open fields, and are often indistinguishable from them in general ecological features. Since they frequently occur along the edges of woods, they may contain invading plants from the woodlands. The snail fauna is a little different from that of the previous community:

<i>Helicodiscus parallelus</i> f	<i>Polygyra fraterna</i> c
<i>Gonyodiscus cronkhitei</i> cats-	<i>Polygyra albolabris</i>
<i>killensis</i> c	<i>Vertigo ventricosa</i> r
<i>Anguispira alternata</i> c	<i>Succinea ovalis</i>
<i>Zonitoides arboreus</i>	

TAXONOMIC DISCUSSION OF SPECIES

The land molluscan fauna of Cheboygan County is a mixture of boreal and southern species. The essentially northern character of the area may be seen in the comparatively few species of *Polygyra* which occur. Moreover, the three-toothed

type of *Polygyra* is entirely without representatives. In all, thirty species have been collected within the county.

1. *Haplotrema concavum* (Say)

Biological Station, Douglas Lake; woods near Marl Bay, Douglas Lake; Reese's Bog, north of Burt Lake; The Gorge, north of Burt Lake. The form occurring in this county is the rather diminutive snail referable to the name *minus* Ancy.¹ There seems to be no good reason for separating the small *Haplotrema concavum* under a subspecific name. Small sized individuals crop up all over eastern North America. On Mount LeConte, Sevier County, Tennessee, both the large and the small forms occur. H. B. Baker² mentions the fact that he found the species occurring only in the bog woods and that a search for it in the hardwood areas was unsuccessful. He states:

One is tempted to conclude that this species, weakened by living too far north, is unable to cope with its competitors in the more favorable habitats, and is, for that reason, restricted to the unfavorable, sparsely populated, boreal bog. . . .

Within a quarter of a mile west of the Biological Station there is a flourishing colony of these snails in the maple woods, and no diligent searching is needed to locate specimens.

This species inhabits leaf mold and the undersides of rotten logs in hardwoods. It also occurs among ferns in the bog woods.

2. *Planogyra asteriscus* Morse

Reese's Bog, north of Burt Lake. This snail lives in moss and among ferns in the bog woods.

3. *Helicodiscus parallelus* (Say)

The fields and roadsides southwest of Cheboygan; Biological Station, Douglas Lake; Colonial Point, Burt Lake. This species lives in leaf mold, under loose bark, in ferns, and at

¹ See H. Burrington Baker, "The Land Snail Genus *Haplotrema*," *Proc. Acad. Nat. Sci. Phila.*, 82 (1930): 412.

² *Ibid.*

the bases of rotting stumps, all in hardwoods. In the open country it inhabits old stumps along roadsides and the undersides of boards in fields.

4. *Gonyodiscus cronkhitei catskillensis* Pilsbry

Fields southwest of Cheboygan; Biological Station, Douglas Lake; hardwoods, Colonial Point, Burt Lake; pine woods, Indian River; Wolverine. This is one of the commonest of the small snails. It lives under rotten logs, loose bark, in leaf mold, and around rotten stumps in the woods. In open country it is most frequent under old planks or discarded building plaster.

5. *Anguispira alternata* (Say)

Cheboygan; fields near Duncan's Bay, east of Cheboygan; Bois Blanc Island; Mud Lake hardwoods, northwest of Riggsville; Biological Station, Douglas Lake; pastures at Nigger Creek, 5 miles southeast of Douglas Lake; The Gorge, north of Burt Lake; Fontinalis Run, north of Burt Lake; pine woods, Indian River. This universally occurring species is the commonest in the county. It occupies a variety of habitats, including leaf mold, the undersides of rotten logs, fallen bark, rotten stumps, ferns, and poison ivy, all within the hardwoods and aspens. In pines it lives under rotten wood that is frequently covered with lichens. After rains it has been observed to crawl over reindeer moss (*Kladonia rangiferina*) in considerable numbers. In bog woods it often lives at the bases of arbor vitae and spruce; in open country, in grass and under planks and rotten logs; in abandoned fields it is prone to congregate in old furrow lines.

6. *Philomycus carolinensis* (Bosc)

Pine Point and the vicinity of the Biological Station, Douglas Lake. Only young and partly grown individuals of this slug were observed. It is largely confined to mixtures of pines and aspens; it inhabits the under sides of fallen pine trunks.

7. *Deroceras laeve campestre* (Say)

Grapevine Point, Biological Station, Douglas Lake. This slug appears to be identical with the Palearctic species, *D. laeve* (Müller), and is only doubtfully subspecifically distinct. There is no good reason for supposing that any species of *Deroceras* ever evolved on the North American continent. In eastern North America the only autochthonous slugs belong to the genus *Philomycus*. In Cheboygan County, *D. l. campestre* was found to live under rotten birch and maple logs.

8. *Vitrina pellucida limpida* Gould

Biological Station, Douglas Lake. This snail lives in maple woods on shady banks in patches of *Pedicularis canadensis*. It is possibly subspecifically distinct from the Palearctic *V. pellucida* Müller.

9. *Euconulus chersinus* (Say)

Biological Station, Douglas Lake. This species lives in leaf mold in hardwoods.

10. *Euconulus fulvus* (Müller)

Ingleside, Douglas Lake. It was found in leaves at the bases of black ash (*Fraxinus nigra*).

11. *Retinella rhoadsi* Pilsbry

Mud Lake hardwoods, northwest of Riggsville; Biological Station, Douglas Lake; hardwoods, Colonial Point, Burt Lake. This snail lives most commonly in leaf débris, and also inhabits the under sides of rotten logs and fallen bark.

12. *Retinella indentata* (Say)

Mud Lake hardwoods, northwest of Riggsville; Biological Station, Douglas Lake. This species lives under loose bark, rotten logs, and in leaf débris or pine needles. In open country it inhabits the under sides of planks.

13. *Retinella binneyana* (Morse)

Biological Station, Douglas Lake. This species is most common in leaf débris, but may also be found under rotten logs and fallen bark, all within the limits of the hardwoods.

14. *Zonitoides arboreus* (Say)

Fields southwest of Cheboygan; Mud Lake hardwoods, northwest of Riggsville; Biological Station, Douglas Lake; pasture at Nigger Creek, 5 miles southeast of Douglas Lake; hardwoods, Colonial Point, Burt Lake; Indian River. This species occurs very generally in all parts of the area. In hardwoods, conifers, and aspens, it lives in plant debris and very frequently under rotten logs and around stumps. In open fields it inhabits the under sides of planks and logs, and along roadsides it is frequently found living around stumps.

15. *Polygyra monodon* (Rackett)

Field near Duncan's Bay, Cheboygan; Bois Blanc Island. Under rotten logs in the hardwoods. A high-spired form lives under logs in meadows.

16. *Polygyra fraterna* (Say)

Fields southwest of Cheboygan; pastures at Nigger Creek, 5 miles southeast of Douglas Lake; Bogardus Point, Douglas Lake; Bryant's, Douglas Lake; Biological Station, Douglas Lake; Fontinalis Run, north of Burt Lake; Topinabee; pine woods, Indian River. In hardwoods and aspens this snail lives in leaf debris and under rotten logs. In open country it lives among sumac, in grass, under boards and rotten logs, in lumber piles, and under rejected building plaster. After *Anguispira alternata* it is the commonest and most widely distributed species in the county. As is the case in other parts of its range, however, it is scarce in some of the denser woodland. It has a marked preference for the less shady spots, and is a characteristic species of the open fields.

17. *Polygyra sayana* Pilsbry

Bog woods and pastures at Nigger Creek, 5 miles southeast of Douglas Lake; Mud Lake hardwoods, northwest of Riggsville. This species appears to be scarce everywhere. As in New England it has a definite tendency to live in open country. In open fields it lives under palings and rotten logs. In hardwoods it also lives under rotten logs. It appears to shun pines, but it is not averse to hemlocks or arbor vitae.

18. *Polygyra thyroidus* (Say)

Riggsville Corners; Mud Lake hardwoods, northwest of Riggsville; Biological Station, Douglas Lake. This snail lives under rotten logs and in leaf mold. It is fairly common wherever it occurs, but its distribution in the county is very much localized. It has not been found in open country, although it is universally present in open country in the eastern and southern United States.

19. *Polygyra albolabris* (Say)

Bois Blanc Island; Mud Lake hardwoods, northwest of Riggsville; pastures at Nigger Creek, 5 miles southeast of Douglas Lake; Bryant's, Douglas Lake; Biological Station, Douglas Lake; Reese's Bog, north of Burt Lake. This species probably stands third in rank among the most abundant and widely distributed species in the county. It is quite variable in size, and the smallest specimens are referable to the form *maritima* Pilsbry. The normal sized specimens come from the richer hardwoods, while hill tops, aspens, and sandy soils are populated with *maritima*. The dry, open fields also harbor this form, but the richer pastures of the eastern part of the county are peopled with fairly large specimens. This species lives commonly in leaf mold or under rotten logs in hardwoods, aspens, arbor vitae, and in mixtures of aspens and pines. In open fields, which it inhabits throughout much of its range, it is fairly frequent in grass and particularly under planks and logs. It has been found to congregate in old furrow lines in abandoned fields. When inactive it may be found buried at the roots of grass.

20. *Cochlicopa lubrica* (Müller)

Biological Station, Douglas Lake. This snail is apparently of limited range within the county. The form occurring at the Biological Station is referable to the form *appalachicola* Pilsbry. The specimens agree exactly with typical specimens of that form collected at Asheville, North Carolina,³ and this

³ Allan F. Archer, "The Ecology of the Land Mollusca of Asheville, North Carolina," *Naut.*, 48 (1935): 82.

seems to argue that *appalachicola* is not a geographical race. At Douglas Lake it lives in leaf mold and under rotten logs in hardwoods. It is strange that here, as well as in the Southeast, the species does not occupy the open country as it ordinarily does in most parts of North America, but instead, prefers the shady woods. This may point to a physiological difference between it and the main body of the species.

21. *Columella edentula* (Draparnaud)

Biological Station, Douglas Lake. This species lives in the hardwoods on shady banks above the lake, and inhabits leaf débris and the under sides of birch and maple logs.

22. *Acanthinula harpa* (Say)

Sedge Point, Douglas Lake; Biological Station, Douglas Lake. This snail is quite common in restricted localities. It seems to prefer locations near lake shores. In hardwoods it lives in thick, damp leaf mold on banks above lakes. On open lake shores it lives deeply down in damp, thick grass.

23. *Strobilops labyrinthica* (Say)

Biological Station, Douglas Lake; hardwoods, Colonial Point, Burt Lake. This is one of the commonest of the small species, and occupies hardwoods, aspens, and shrubby areas. It lives in leaf mold, under fallen bark, rotten logs, and at the bases of stumps. In open, shrubby areas it inhabits plant débris at the bases of stumps, and also occurs under boards and palings. The form in Cheboygan County is referable to *virgo* Pilsbry.

24. *Vertigo ventricosa* (Morse)

Pine woods, Indian River. This rare species was turned up once under some rubbish along a roadside.

25. *Gastrocopta contracta* (Say)

Sedge Point, Douglas Lake. This snail lives in a dense mat of rushes on an open lake shore.

26. *Succinea avara* Say

Sedge Point, Douglas Lake; Pine Point, Douglas Lake; Biological Station, Douglas Lake. This species attains considerable size in the county, especially on lake shores. It has a broad range of habitats, as may be seen from the fact that it occurs on dry limestone mountains in Alabama. In hardwoods it lives in leaf mold. On several occasions it was found wandering on sandy beaches. On open lake shores *S. avara* lives at the bases of grasses.

27. *Succinea retusa* Lea

Sedge Point, Douglas Lake. This species lives among rushes along the shore of the lake.

28. *Succinea ovalis* Say

Bois Blanc Island; Biological Station, Douglas Lake; pine woods, Indian River. This *Succinea* seems to avoid damp habitats. It lives in leaf mold in hardwoods. In open fields it inhabits grasses and weeds, and along roadsides congregates under boards and rubbish.

29. *Carychium exile* H. C. Lea

Reese's Bog, north of Burt Lake. This species is frequent in moss, ferns, and in plant débris in bog woods.

30. *Retinella electrina* (Gould)

Since the present paper has been in press the occurrence of this species in Cheboygan County has been verified.

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