

- TRYON, G. W. Jr. 1866. Descriptions of New Fresh-water Shells of the U. S. Am. Jour. of Con. II, p. 4.
- TRYON, G. W. Jr. 1866. Observations on an Abnormal Specimen of *Physa gyrina* Say. Am. Jour. of Con. II, p. 4.
- TRYON, G. W. Jr. 1866-7-8. Monograph of the Terrestrial Mollusca of the U.S. Am. Jour. of Con. II, pp. 218 and 306; III pp. 84, 155 and 298; IV, p. 5. Also printed separately in one volume.
- TRYON, G. W. Jr. 1870. A monograph of the Fresh-water Univalve Mollusca of the United States. A continuation of Haldeman's Monograph of 1842.
- TRYON, G. W. Jr. 1873. Land and Fresh-water Shells of North America. Pt IV: Strepomatidae. = Smiths, Misc Coll. No. 253.
- WALKER & BEECHER 1876. List of Land and Fresh-water Shells found about Ann Arbor, Michigan. Proc. A.A. Sci Assn. for 1876, p. 43.
- (PAGE 27)
- WALKER, Bryant. 1879. Catalogue of the Shell-bearing Mollusca of Michigan. Jour. of Con. II, p. 325.
- WALKER, Bryant. 1888. On the re-discovery of *Planorbis multivolvis* Case and *P. truncatus* Miles. Jour. of Con V, p. 330.
- WALKER, Bryant. 1889. On the Occurrence of *Unio complanatus* Sol. in Michigan. Nautilus III, p. 16.
- WALKER, Bryant. 1891. *Unio complanatus* Sol. in Northern Michigan. Nautilus V, p. 95.
- WALKER, Bryant. 1892. The Shell-bearing Mollusca of Michigan. Nautilus VI, pp. 13, 31, 42, 63 and 135.
- WALKER, Bryant. 1892. Notes on *Unio luteolus* Lam. Nautilus VI, p. 94.
- WALKER, Bryant. 1893. Shells of the Saginaw Valley, Michigan. Nautilus VII, p. 125.

THE TERRESTRIAL MOLLUSCA OF MICHIGAN

BY BRYANT WALKER

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THE TERRESTRIAL MOLLUSCA OF MICHIGAN.

This paper is based mainly upon the records accumulated by the Conchological Section of the Academy. All other available sources of information, however, have been utilized, and it therefore represents substantially everything that is known at the present time in regard to the extent and distribution of this portion of the fauna of the state.

In the catalogue of the mollusca of the state, which was presented at the first meeting

of the academy in 1894, it was shown that up to that time seventy-five species of terrestrial mollusca had been cited from Michigan.

Of these four species and one variety, viz:

*Helix virgata*, DeCosta.

*Polygyra clausa* (Say)

*Pupa decora* Gld.

*Succinea campestris* Say.

" *ovalis higginsii* Bld.

were deemed of too doubtful occurrence to be recognized unequivocally as members of our fauna. The remaining seventy-one species were then considered to be sufficiently established as inhabitants of the state and were so catalogued. Since the publication of that paper the work of compiling the census has been undertaken and completed. Special attention has been given to the authentication of the occurrence of every species heretofore quoted from the state, and, with but one or two exceptions, this has been satisfactorily accomplished. As the result of these investigations, one species, then considered as doubtful, (*Polygyra clausa*) has been authenticated, and for the reasons stated at length in the accompanying annotated catalogue, three other species and two varieties must be erased for the present, at least, from our faunal list. They are:

*Omphalina inornata* (Say)

*Zonitoides limatulus* (Ward)

*Succinea aurea* Lea

*Polygyra thyroides bucculenta* (Gld).

" *palliatu alba* (Currier).

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The remaining sixty eight species included in the catalogue of 1894 have been authenticated by the actual inspection of Michigan specimens. In addition to these, the following six species and two varieties have been added to our fauna:

*Strobilops affinis* Pils.

*Vitrea wheatleyi* Bld.

*Gastrodonta intertexta* (Binn.)

" *demissa* (Binn.)

*Agriolimax agrestis* (L.)

*Polygyra albolabris minor* Sterki

*Conulus fulvus mortoni* (Jeffer.)

*Conulus chersinus polygyratus* Pils.

making a total of seventy five species, which have been indisputably established as living in this state.

While it is quite possible that some of the rejected species may hereafter be found within

our borders, and that new or additional ones may be reported, yet it is not probable that the present list will be largely increased.

But, while in this particular our fauna can be said to have been well developed, our knowledge as to the distribution of the different species is lamentably deficient. I have indicated on the accompanying chart the number of species which have been reported from each of the counties of the state. From this it will be seen how small a part of the state has been collected over with any sort of thoroughness. Of the fifteen counties in the upper peninsula, only three are represented by even a single reported species, while of the sixty eight counties in the lower peninsula, the fauna of twenty seven, or nearly one-half, is entirely unknown; twenty two are represented by from one to ten species; eight by from ten to twenty species, and only eleven by more than twenty. Kent is the banner county with fifty two species to its credit. When it is considered that all of the southern counties have, in all probability, as large a fauna as is now reported from Kent, and that the species reported from Charlevoix and Chippewa counties range through the entire northern part of the state, the poverty of our knowledge and its entire inadequacy for anything like positive statements in regard to the distribution of the different species is only too obvious.

The great extent of unknown territory in the center of the state north of the Saginaw-Grand valley is especially noticeable and is particularly unfortunate. The Saginaw-Grand valley and the counties lying south of it, and the Grand Traverse region, have been sufficiently explored to give a substantially accurate knowledge of their fauna as a whole. But with this great stretch of unexplored territory

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lying between them, the northern extension of the species peculiar to the one, and the southern range of those characteristic of the other are wholly unknown, and any attempt to discuss the reason underlying their distribution is necessarily futile when the facts of distribution themselves are wholly conjectural.

All that can be done now is to state such facts as to the general distribution of the fauna of the state as are shown by the returns of the census, noting any apparent peculiarities of the range of the different species, and



leave any systematic discussion of the subject to such future time as our increased knowledge will justify the attempt.

Of the ultimate origin of our fauna, but little is known. The geologists tell us that the terrestrial mollusca range back in time certainly as far as the Carboniferous age and possibly into the Devonian. Indeed, the fact that their diversity of form gives sufficient indication that the *Helicidae* had become widely differentiated during those early epochs in which they lived, probably quite as widely as their living representatives are, and under closely similar forms\* would indicate that their separation from their fluviatile or marine ancestors must have occurred at a much earlier date.

A very large part of our fauna is peculiar to North America, and has undoubtedly descended from those ancient forms, which peopled the shores of the great Mesozoic sea and hid under the bark of the fallen giants of the Carboniferous forests. Whether these early mollusca had spread into the Michigan of that day is not known. It seems entirely probable, but there is as yet no evidence either to prove or disprove the existence of such a fauna in this region prior to the Glacial epoch.

But, however that may be, the immediate source of our present fauna must be sought in the states lying to the south and beyond the reach of the ice sheet, which in the Glacial period buried Michigan under hundreds of feet of ice and utterly exterminated every form of molluscan life that may have previously existed here. The extensive Post-pleiocene deposits in the Mississippi valley prove conclusively that the fauna then existing was substantially the same as is now found in that region. With the retreat of the ice, the mollusca returned to the north and repopled the new land. It seems probable that even the so-called circumpolar species, which probably originated in the old world, had made their advent into America prior to the Glacial period, during some earlier age, when a milder climate in the extreme north was more

\*White, Review Non-Marine Fossil Mollusca of N.A., p. 445.

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favorable to their introduction and dispersion. The fact that three of the seven specimens com-

mon to both continents occur fossil in the loess of Iowa, and another, *Vitrea hammonis* (Strom), has been found associated with the remains of a mastodon in Berrien county in this state, would seem to substantiate this theory.

The following species have been found in the Post-pleiocene deposits in this state:

*Polygyra albolabris maritima* Pils.

" *thyroides* (Say).

" *monodon* (Rack).

*Pyramidula alternata* Say.

*Vitrea hammonis* (Strom).

*Zonitoides arboreus* (Say).

*Strobilops labyrinthica* (Say).

*Succinea retusa* Lea.

*Vertigo gouldii* Binn.

*Carychium exiguum* (Say.)

Of the twelve species given by W. G. Binney as being universally distributed over North America, all are found in Michigan, and nearly all of them are among our most common and abundant forms. They are:

*Pyramidula striatella* (Anth.)

*Punctum pygmaeum* (Drap.)

*Helicodiscus lineatus* (Say).

*Vallonia pulchella* (Müll).

*Pupa muscorum* (L.)

*Conulus fulvus* (Müll).\*

*Vitrea hammonis* (Strom).

" *indentata* (Say).

*Zonitoides nitidus* (Müll).

" *arboreus* (Say).

" *minusculus* (Binn).

" *milium* (Mse).

Of the species considered by the same author as characteristic of the Northern Region, twelve are represented in our fauna, viz:

*Vitrea limpida* Gld.

*Vitrea binneyana* (Mse).

" *ferrea* (Mse).

*Zonitoides exiguus* (Stimp).

*Gastrodonta multidentata* (Say)

*Acanthinula harpa* (Say).

*Pyramidula asteriscus* (Mse)

*Vertigo gouldii* Binn.

" *bollesiana* Mse.

" *ventricosa* Mse,

*Cochlicopa lubrica* (Müll).

*Sphyradium edentulum* (Drap).

Five of these have apparently a general distribution over the state, viz:

*Vertigo gouldii* Binn. *Gastrodonta multidentata* (Say)

" *ventricosa* Mse. *tata* (Say)

*Cochlicopa lubrica* (Müll).

*Sphyradium edentulum* (Drap).

*Zonitoides exiguus* (Stimp.)

*Vitrea binneyana* (Mse.), and *Zonitoides exiguus* (Stimp.) have both been reported from Kent county. This, however,

\*Since the recent revision of this genus by Pilsbry this species would scarcely fall within this category.

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is the only locality reported for either of these species south of the line of Wexford and Iosco counties. The remaining five boreal species have thus far been found only in the Grand Traverse region and along the St. Mary's river in the upper peninsula.

The remaining forty nine species comprised our fauna belong to the Interior Region of Binney, which corresponds substantially with Transition and Upper Austral Life Zones as established by C. Hart Merriam. Of these, twenty one species have a general distribution as far north, at least, as the eastern extremity of the upper peninsula. One, *Polygyra sayii* (Binn.), is apparently restricted to the northern part of the lower peninsula, but on the east coast comes down as far south as Tuscola and Huron counties. While the remaining twenty seven species have not, as yet, been reported from north of the Saginaw-Grand valley, except *Polygyra leaii* (Wd.), and *Gastrodonta intertexta* (Binn.), which range northeasterly into the 'Thumb' (Huron, Tuscola and Sanilac counties) I have been unable to satisfactorily correlate the apparent distribution of these various groups with the life zones established by Dr. Merriam. Whether it is because the data at hand are insufficient or because the mollusca are not as susceptible as other forms of life to the peculiar local conditions upon which they are based, or because the data from which the lines of these zones across the state have been established are insufficient and therefore possibly inaccurate, I do not know. They are, I understand, so far as Michigan is concerned, more or less theoretical and, I am told, do not coincide with the views of some of our local observers.

According to Merriam, the upper peninsula and the northern part of the lower peninsula lying east of the Grand Traverse region, and north of Iosco county, belong to the Boreal Zone.

The Lake Michigan shore as far north as the mouth of Grand Traverse Bay and the entire

southern part of the state, lying south of (approximately) the north line of Jackson, Washenaw and Wayne counties are included in the Upper Austral Zone.

While the remainder of the state, including the Grand Traverse region, form part of the Transition Zone.

Of the five purely boreal species belonging to our fauna, all are found at Charlevoix and Petoskey, which are in the Grand Traverse extension of the Transition Zone. While *Polygyra sayii* (Binn.), which in Michigan is quite as characteristic a northern form, is found from Charlevoix on the west coast to Huron and Tuscola counties east of Saginaw

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Bay. These facts would seem to indicate an extension of the Boreal Zone beyond its present, described limits.

In the southern part of the state, with possibly one exception, there is nothing to indicate from a molluscan point of view, any distinction between the Transition and Upper Austral Zones. The fauna extends with substantial uniformity from lake to lake. While it is apparently the fact that the mollusca, both land and fresh water, are more abundant both in species and individuals in the western part of the state than they are in the eastern, owing, no doubt, to more favorable conditions of environment, the difference is solely one of degree and not that any considerable number of western species are wholly absent from the eastern counties. That the larger number of species reported from Kent is the result of more thorough collecting is shown by the fact that with the exception of *Vertigo morsei* Sterki, and *Gastrodonta demissa* (Binn.), every one of its fiftytwo species has been reported from one or more of the eastern counties. There are a few species, however, which seem to form an exception to this rule, and, if their present apparent distribution is confirmed, would seem to be confined substantially to the limits of the Upper Austral Zone as outlined by Merriam. These are:

*Polygyra inflecta* (Say).

" *profunda* (Say).

" *hirsuta* (Say).

*Vertigo milium* Gld.

*Gastrodonta ligera* (Say).

*Pyramidula solitaria* (Say).

These species are reported from Kent in the



western part of the state, and in one or more of the south-eastern counties of Oakland, Macomb, Wayne, Washtenaw, Monroe and Lenawee.

Three other species, *Strobilops affinis* Pils., *Gastrodonta suppressa* (Say), and *Pupoides marginatus* (Say) range as far north as Genesee county on the east. No one of them, as yet, have been reported from the interior of the state lying between the counties above mentioned, nor east of Kent county in the Saginaw-Grand valley. *Polygyra elevata* (Say), another common species of this zone a little further south, has thus far been found only in Berrien, Kent and Osceola counties, although it has been reported from recent deposits in Washtenaw county. *Pyramidula solitaria* (Say) is peculiar in having also been found in Chippewa county in the upper peninsula, but has not been reported from any locality between that and Kent county. *Gastrodonta demissa* (Binn.), is another species common further south, which has been found at Grand Rapids, but not elsewhere, as yet, in our limits.

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The only known localities for *Vertigo morsei* Sterki, Kent county, Michigan, and north-western Ohio, may be mentioned in the same connection.

It would be a matter of great interest if the range of these species could be accurately ascertained and compared with the data from which the dividing line between the Transition and Upper Austral Zones has been established. It is possible that definite knowledge on this subject might be of value in determining the actual boundaries of these zones in the state.

There are some facts shown by the returns which are of interest in regard to the distribution of individual species.

There are nine species, which thus far have been reported from a single locality, viz:

<i>Vallonia costata</i> (Müll.)	Shiawassee county.
<i>Polygyra mitchelliana</i> (Lea)	Macomb "
<i>Pupa muscorum</i> (L)	Kent "
<i>Vertigo morsei</i>	" "
" <i>bollesiana</i> Mse Charlevoix	" "
" <i>tridentata</i> Wolf	Washtenaw "
<i>Gastrodonta intertexta</i> (Binn.)	Sanilac "
" <i>demissa</i> (Binn.)	Kent "
<i>Pyramidula asteriscus</i> (Mse.)	Charlevoix "

The carinated form of *Conulus fulvus*, the var. *mortoni* (Jeffr.) has been found only at

East Saginaw where, it is interesting to note, it was associated with the typical *Strobilops labyrinthica* (Say), also a carinated form.

The albino form of *Pyramidula solitaria* (Say) has been reported only from Kent county. And the corresponding form of *P. striatella* (Anth.) solely from Mackinac Island.

The apparent absence of *Polygyra exoleta* (Binn.) from the western half of the state is very peculiar. This is one of our largest species, not likely to be overlooked by even a careless collector, and it is usually found wherever its near relative *P. albolabris* (Say) occurs, although in Michigan, at least, it is not commonly as abundant in individuals. Yet it has not been reported from any locality west of the principal meridian in the lower peninsula, although it has been found as far north as St. Mary's river in the upper peninsula, while its associated species is found everywhere.

The failure to find the unicolored form of the common *Polygyra multilineata* (Say) in the eastern part of the state is also quite curious.

The apparent restriction of the imperforate form of *Polygyra monodon* (Rack.) to the southern part of the state,

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while the typical form is of general and abundant distribution is also of interest.

*Bifidaria corticaria* (Say) has not yet been reported outside of the Saginaw-Grand valley, through which it seems to range there from one extremity to the other.

The occurrence of *Vitrea wheatleyi* (Bld.) in Michigan, with an indicated range over the whole of the lower peninsular is of peculiar interest. Originally described from the Tennessee mountains, it has recently been reported from western Pennsylvania and Indiana, which with its wide range in this state, would indicate that it will be found to be of general occurrence in the northern and central states.

The discovery of *Gastrodonta demissa* (Binn.) in Kent county is even more surprising as it has not heretofore been found west of Pennsylvania in any of the states north of the Ohio river. The identification of the species has been concurred in by Dr. V. Sterki, so that there can be no question on that score.

In conclusion, it may be said that the re-

sult of the present investigation has been not so much to exploit the extent of our knowledge of the terrestrial mollusca of the state as to emphasize its meagreness and to render almost painfully apparent the vast amount of work that must be done before any satisfactory results can be expected from the study of our fauna as a whole. When the fauna of every county of the state is known with the same accuracy as that of Kent county is to-day, then, and not until then, can the conchologists of Michigan begin to rest from their labors. For the accomplishment of this work, we must look to the individual collectors of the state. Every local collection with authentic localities is a distinct contribution to science. And if the many teachers of zoölogy in our public schools would seek to interest their scholars in the fauna and flora of their immediate neighborhood and stimulate the formation of local collections, much valuable work might be done and many a good collector started on the broad and pleasant path that leads through the woods and fields and along the 'still waters' to health and happiness.

ANNOTATED CATALOGUE OF THE TERRESTRIAL  
MOLLUSCA OF MICHIGAN.

1. ACANTHINULA HARPA (Say).  
A northern species. Charlevoix and Petoskey in the Grand Traverse region are the only localities reported.
  2. VALLONIA PULCHELLA (Müll.)  
Common and of general distribution in the lower peninsula. Not yet reported in the upper peninsula.
  3. VALLONIA EXCENTRICA Sterki.  
Apparently of general distribution in the southern part of the lower peninsula. Not yet reported north of Newaygo county.
  4. VALLONIA COSTATA (Müll.)  
Rare. Owosso, Shiawassee county, is the only known locality.
  5. POLYGYRA TRIDENTATA (Say).  
Not a very abundant species. Saginaw-Grand valley and southeastern counties. Not reported from the southwestern part of the state nor
- from the 'Thumb.' 'Not abundant in Kent county,' Streng.
  6. POLYGYRA FRAUDULENTA Pils.  
More abundant than the preceding species. Distribution the same. 'Not abundant in Kent county,' Streng.
  7. POLYGYRA INFLECTA (Say).  
Quite rare. Kent, Washtenaw, Wayne and Monroe counties.
  8. POLYGYRA PROFUNDA (Say).  
Southern part of the state. Not yet reported north of Muskegon.
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- 8a. POLYGYRA PROFUNDA ALBA (Walker).  
Pale horn color without bands. This variety occurs occasionally in Washtenaw and Monroe counties, associated with the typical form. The other extreme (*unicolor*) in which the bands coalesce and cover the entire surface has not yet been noticed in this state.
  9. POLYGYRA SAYII (Binn.)  
Rare and restricted to the northern part of the state. Reported from Charlevoix, Presque Isle, Huron and Tuscola counties.
  10. POLYGYRA ALBOLABRIS (Say).  
Abundant over the entire state, and exhibits considerable variation in size, color and thickness of the shell. Streng states that 'it was formerly abundant in Kent county, but is becoming scarcer.' The variety cited by DeCamp as *rufa* DeKay does not differ sufficiently in color to justify its retention even as a color form.
  - 10a. POLYGYRA ALBOLABRIS DENTATA (Tryon).  
Occurs not infrequently associated with the typical form 'Rare in Kent county,' Streng.  
Carrier catalogued this form in 1868, and credited it to Say, and in my former lists I followed his citation, but Say does not appear to ever have described it. Pilsbry in his recent catalogue of the land shells of North America credits it to me. This is erroneous as the variety was formally described by Tryon in the Manual of Conchology (III p. 150).
  - 10b. POLYGYRA ALBOLABRIS MARITIMA Pils.  
The shells from Traverse City called tra-



*versensis* by Leach, which have been referred to this form, are not quite typical. They seem to be intermediate between the true *maritima* and the small form described by Sterki as var. *minor*. The same form has been collected at Grand Rapids by DeCamp. Streng considers the Grand Rapids form identical with *minor* and reports it as 'scarce.' The shell from Presque Isle county doubtfully referred to this form in the Nautilus (VI, p. 17) should rather be considered as *minor*.

10c. POLYGYRA ALBOLABRIS MINOR Sterki.

This 'peculiar, small, thin-shelled form' differs from the usual form of *albolabris* not only in these particulars, but in its very decidedly depressed form. The shell usually is noticeably thinner than in the typical *albolabris* and with a

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narrower reflection of the lip, but occasionally examples are found with the broadly reflected lip and thicker shell characteristic of the typical form.

Three examples from Port Austin, Huron county, which are identical with Ohio specimens named by Sterki, measure as follows:

Alt.		Greater diam.	Lesser diam.
11	mm.	19½ mm.	11 mm.
13½	"	21½ "	12 "
13	"	23 "	13½ "

It has also been found at Lansing and in Presque Isle, Charlevoix and Marquette counties. In the last locality it was associated with specimens similar in form, but larger, thus connecting it with the typical form.

11. POLYGYRA EXOLETA (Binn.).

The apparent distribution of this species is peculiar. It has not been reported from west of Lansing nor north of Saginaw. Its failure to appear in the southwestern part of the state seems extraordinary, in view of the fact, that as a rule molluscan life is much more abundant on the western side of the state than on the eastern.

12. POLYGYRA MULTILINEATA (Say).

Usually an abundant species south of the Saginaw Grand Valley.

12a. POLYGYRA MULTILINEATA ALBA (Witter).

This form was catalogued, but without description, by Carrier in 1868. It was described under the same name in 1878 by Witter (J. of Con. I 384). It has been found associated with the typical form in Kent and Washtenaw counties. 'Rare in Kent county,' (Streng).

12b. POLYGYRA MULTILINEATA RUBRA (Witter).

Like the preceding, catalogued without description in 1868 as var. *unicolor* by Carrier. Witter (loc. cit.) described it in 1878 as var. *rubra*.

Listed only from Kent and Ottawa counties in the western part of the state. It has not as yet been noticed in the eastern portion. 'Rare in Kent county,' Streng.

13. POLYGYRA PALLIATA (Say).

Saginaw-Grand valley and in the southeastern part of the state. It will probably be found to have a general distribution through the entire southern portion. 'Scarce in Kent county,' Streng.

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14. POLYGYRA ELEVATA (Say).

Very rare. Until recently Niles, Berrien county, was the only locality known. A fine specimen from Grand Rapids has lately been submitted for examination by Mr. W. Miller of that city, who also reports it from Reed City, Osceola county. It has been reported as fossil in the recent deposits at Ann Arbor by Beecher.

15. POLYGYRA THYROIDES (Say).

Generally distributed through the southern part of the state. It also occurs in the marl deposits at Traverse City.

16. POLYGYRA CLAUSA (Say).

Very rare. A single specimen from Grand Rapids collected by Mr. W. Miller has recently been submitted for examination and is the only authentic record of the occurrence of the species in the state. It was first cited by Sager and subsequently by Miles. Carrier included it in his first catalogue (1859), but omitted it in his later lists. This would indicate that he was not satisfied that his first citation was correct. I have not been able to verify any of the earlier citations for this species. It is not to be found among the rem-

nants of the collection of the Flint Scientific Institute now deposited in the High School at Flint, nor in the Miles collection at the Agricultural College. The following note by Dr. Miles in his annotated report to the Census is the only information accessible.

'Sager's listing of *H. clausa* as a Michigan species was repeatedly verified in the early collections of shells in Genesee county by members of the Flint Scientific Institute. Unfortunately these specimens have been scattered and lost. As Binney in Terr. Moll. II, p. 109, makes *H. mitchelliana* a synonym of *H. clausa*, no attempt was made to separate the two forms and it may be that we labeled *clausa* in some cases that would now be placed under *mitchelliana*.' The fact that the specimen of *mitchelliana* in the Lathrop collection was labeled 'clausa' would seem to substantiate this view as Dr. Lathrop was in quite intimate relations with the Flint naturalists.

#### 17. POLYGYRA MITCHELLIANA (Lea).

A single specimen from Armada, Macomb county, in the Lathrop collection, now in my possession, is the only recorded occurrence of this species in Michigan. It was labeled 'clausa.' The fact that this species has been found in the eastern part of the state would to a certain extent tend

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to corroborate Dr. Miles' supposition that the two had been confounded by the early collectors. It should be stated, however, that Dr. Miles' note was written before the discovery of *P. clausa* in Kent county had been made and was the only known Michigan specimen of either species.

#### 18. POLYGYRA HIRSUTA (Say).

Common where found, but apparently local in its distribution. Macomb, Wayne, Washtenaw and Monroe in the southeastern part of the state and Kent in the western are the only counties thus far to be credited with it.

#### 19. POLYGYRA MONODON (Rack.)

This is one of the few *Polygyrae* reported from the upper peninsula and the returns indicate that it is found generally over the whole state. 'Not abundant in Kent county,' Streng.

#### 19a. POLYGYRA MONODON ALBIDA n. v.

Pale greenish-white. Charlevoix and Grand Rapids.

The latter example is peculiar in having a double parietal tooth. The last half of the body whorl was evidently badly crushed just as the parietal tooth had begun to be formed. In rebuilding the shell, the new lip was formed slightly behind where it normally should have been, and a new parietal tooth deposited diverging from the first one at a slight angle, so that the two make a >.

#### 19b. POLYGYRA MONODON FRATERNA (Say).

Appears to be of general distribution south of the Saginaw-Grand Valley, but as yet has not been reported further north.

'Not abundant in Kent county,' Streng.

#### 19c. POLYGYRA MONODON Rack. var.

In the De Camp collection are two examples of a small form of this species which deserve special mention. Unfortunately no exact locality is mentioned, simply 'Michigan.' They are imperforate like *monodon aliciae*, but have the spire more depressed with the suture less impressed, and the last whorl is inclined to be obtusely angled rather than regularly rounded as in that form. Their dimensions are as follows:

Alt.	Greater diam.	Lesser diam.
5¼ mm.	7¼ mm.	7 mm.
4¼ "	7½ "	7 "

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Specimens of *monodon aliciae* from the original locality of the same diameter are ¼ mm greater in height. The general effect of the Michigan specimens is that of a depressed shell rather than that of a globular one as given by the true *aliciae*. While this form seems to be sufficiently distinct both from the type and the var. *aliciae*, yet in view of the small number of specimens and the indefinite locality it does not seem desirable to separate it under a varietal name at present.

#### 20. POLYGYRA LEAI (Ward).

Generally distributed south of the Saginaw-Grand valley. Alpena is the only reported locality further north. 'Not abundant in Kent county,' Streng.

#### 21. STROBILOPS LABYRINTHICA (Say).

Apparently one of the rarer species. Saginaw, Kent, Kalamazoo and Berrien counties are the only localities reported.

The recent revision of the species of this genus by Pilsbry render all the early records



for this form unavailable except generically. I have accordingly cited for all the species of *Strobilops* only such localities as have been verified by personal examination of specimens.

22. STROBILOPS VIRGO (Pils.)

The only species of the genus represented in the northern part of the state, where it is quite common. South of Iosco county, the only localities reported are in Oakland, Saginaw and Kalamazoo counties. In the latter two, it was found associated with *labyrinthica* and in the first named with *affinis*.

23. STROBILOPS AFFINIS Pils.

This is the most common species of the genus in the southern part of the state. It has not, as yet, been reported north of the Saginaw-Grand valley. In Kent county it was found associated with *labyrinthica* and in Oakland county with *virgo*. In Genessee, Macomb, Washtenaw and Lenawee counties it was the only species represented. This form can easily be distinguished from *virgo* not only by its larger size and its peculiar armature of numerous short lamellae extending in a forwardly curved series from the axis across the base and up the side wall' as stated by Pilsbry, but also by the constantly larger umbilicus at all stages of growth. In *virgo* the umbilicus is a mere perforation. Where for any reason the arrangement of the lamellae or the parietal folds cannot be observed,

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this difference in the umbilicus renders the separation of the species a matter of comparative ease.

The peculiar arrangement of the internal lamellae characteristic of this species is only assumed at maturity. In immature specimens the arrangement is almost precisely the same as that of young *virgo*. But they can easily be separated by observing the difference in the size of the umbilicus.

Gude (Science Gossip, III p 126) has shown that the same peculiarity is to be found in the East Indian *Corillae*.

24. PUPOIDES MARGINATUS (Say).

Most commonly known as *Pupa* or *Leucochila fallax*.

Not a common species. Reported from Kent, Genessee and Washtenaw counties, also from Post-pleiocene deposits in Berrien county (Naut. XI p. 121).

25. BIFIDARIA ARMIFERA (Say).

The returns indicate a general distribution through the southern part of the state. 'Scarce in Kent county,' Streng.

26. BIFIDARIA CONTRACTA (Say).

The most common species of the genus and of general distribution over the lower peninsula.

27. BIFIDARIA CORTICARIA (Say).

Saginaw-Grand valley in Kent, Saginaw and Gratiot counties. 'Rare in Kent county,' Streng.

28. BIFIDARIA CURVIDENS (Gld.)

Not abundant, but apparently of general distribution through the state south of the Saginaw-Grand valley. 'Rare in Kent county,' Streng.

29. BIFIDARIA PENTODON (Say).

Distribution similar to the preceding. Also in Newaygo and Charlevoix counties. 'Plenty in some localities in Kent county,' Streng.

30. PUPA MUSCORUM (L.)

Kent county is the only reported locality for this species, where it is 'rare' according to Streng.

31. VERTIGO MILIUM (Gld.)

Reported only from Kent, Oakland and Lenawee counties. 'Rare in Kent county,' Streng.

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32. VERTIGO OVATA (Say).

Generally distributed over the lower peninsula. Also on Lime island in the St. Mary's River, Chippewa county. The most common species of the genus. 'Plenty in some localities in Kent county,' Streng.

33. VERTIGO MORSEI Sterki.

The types of this species were discovered by Dr. DeCamp at Dewey's Mill, Kent county, and were listed by him as *Pupa decora* (Gld.) It has not, as yet, been found elsewhere in the state.

## 34. VERTIGO VENTRICOSA (Mse.)

Grand Rapids, where it has been found by De Camp and Streng, is the only known locality. 'Rare in Kent county,' Streng.

## 34a. VERTIGO VENTRICOSA ELATIOR Sterki

The two known localities, East Saginaw and Charlevoix indicate a range across the northern part of the state.

## 35. VERTIGO GOULDII Binn.

The returns indicate a general distribution over the state, but it is apparently not as common a species as *ovata*, though usually abundant where found.

## 36. VERTIGO BOLLESIANA (Mse.)

Charlevoix is the only locality reported.

## 37. VERTIGO TRIDENTATA Wolf.

A single specimen from Ann Arbor is the only one known from this state.

## 38. COCHLICOPA LUBRICA (Müll.)

This species, more commonly known as *Ferussacca subcylindrica* (L.), is very generally distributed in both peninsulas.

## 39. CIRCINARIA CONCAVA (Say).

Of general distribution south of the Saginaw-Grand valley. North of that it has only been reported from Lime Island in the St. Mary's river. 'Not very abundant in Kent county,' Streng.

## 40. OMPHALINA FULGINOSA (Griff.)

Apparently rare and local. Reported from Ottawa, Kent, Genessee and Washtenaw and Monroe counties, which indicate a range across the southern part of the state. 'Very rare in Kent county,' Streng.

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## 41. VITRINA LIMPIDA Gld.

Abundant on Lime Island in the St. Mary's river. Found also at Charlevoix and Traverse City. A northern species.

## 42. VITREA CELLARIA (Müll.)

First found a number of years ago in a green-house in the city of Detroit. Later a single specimen was found among material collected at Alma, Gratiot county, of Prof. C.A.

Davis, Another specimen was discovered in a lot of *Vitreae* collected by Prof. F. E. Wood at Bay City.

## 43. VITREA HAMMONIS (Strom).

A common species of general distribution, better known as *V. radiatula* (Ald.) or *viridula* (Mke.) It was not as common a species as *arboreus*. 'Not abundant in Kent county,' Streng.

## 44. VITREA WHEATLEYI (Bld.)

This species has only been recently recognized as a member of our fauna. A specimen collected over forty years ago by Dr. Miles in Tuscola county and labeled *limatula* (Wd.) by W. G. Binney is still in the collection of the Agricultural College at Lansing. Almost simultaneously with the proper determination of this specimen by Dr. V. Sterki, the species was discovered in Kalamazoo county by Dr. R. J. Kirkland. It has also been found at Grand Rapids and at Traverse City. These citations indicate a general distribution in the lower peninsula.

## 45. VITREA BINNEYANA (Mse.)

The returns indicate a general distribution in the northern part of the state. South of Iosco county, it has been reported only from Kent county, where it is 'rare' according to Streng.

## 46. VITREA FERREA (Mse.)

Reported only from the Grand Traverse region at Petoskey, Charlevoix and Traverse City.

## 47. VITREA INDENTATA (Say).

Generally distributed in both peninsulas, but not as common as either *arboreus* or *hammonis*. 'Rare in Kent county,' Streng.

## 48. CONULUS FULVUS (Müll.)

As in the case of *Strobilops*, the recent revision of the species of *Conulus* by Pilsbry render the returns of the census

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valueless except as a generic record. As a genus, *Conulus* is generally distributed over the state. In considering the different species, only such localities are recorded as have been personally verified by the examination of specimens.



This species is quite common and of general distribution in both peninsulas. Streng reports '*fulvus*' as 'rare' in Kent county.

48a. *CONULUS FULVUS MORTONI* (Jeffreys).

Two characteristic examples collected by Lothrop at East Saginaw are the only ones seen from this state.

It is an interesting and curious coincidence that the locality where these specimens were found is also one of the few places in the state where the carinated form of *Strobilops* has been collected.

49. *CONULUS CHERSINUS POLYGYRATUS* Pils.

Although not as common as the typical *fulvus*, this form has apparently an equally extensive range over the state. In fifteen localities represented by *fulvus*, this form was found associated with it in seven. It was the only species found in material from Mackinac Island, while at East Saginaw it was associated with *fulvus mortoni*.

50. *ZONITOIDES NITIDUS* (Mill.)

A common and abundant species of general distribution.

51. *ZONITOIDES ARBOREUS* (Say).

Abundant everywhere.

52. *ZONITOIDES MINUSCULUS* (Binn.)

Common and of general distribution.

53. *ZONITOIDES EXIGUUS* (Stimp.)

Northern part of the state. The only locality reported south of Wexford county is Grand Rapids.

54. *ZONITOIDES MILIUM* (Mse.)

Scattering returns indicate a general distribution for this species. 'Very rare in Kent county,' Streng.

55. *GASTRODONTA INTERTEXTA* (Binn.)

The only Michigan examples known are in the Agricultural College museum and were collected many years ago in Sanilac county. Evidently rare as it has not been reported from any other locality.

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56. *GASTRODONTA DEMISSA* (Binn.)

Grand Rapids collected by DeCamp and iden-

tified by Sterki. Also reported by Streng. The occurrence of this species in Michigan far to the north of its usual habitat is quite interesting. It is not quoted by Call in his catalogue of Indiana mollusca. The presence of *Vitrea wheatleyi* in this state is a similar instance of eccentric distribution. 'Very rare in Kent county,' Streng.

57. *GASTRODONTA LIGERA* (Say).

The returns indicate a general distribution across the southern part of the state. Specimens with a wider umbilicus approaching var. *stonei* occur occasionally. 'Not abundant in Kent county,' Streng.

58. *GASTRODONTA SUPPRESSA* (Say).

Apparently rare and local. Kent and Genesee counties are the only localities reported. 'Rare in Kent county,' Streng.

59. *GASTRODONTA MULTIDENTATA* (Binn.)

Rare and local. It has been found in Emmet, Grand Traverse, Iosco, Saginaw and Kalamazoo counties, which indicates a general distribution.

60. *AGRIOLIMAX AGRESTIS* (L.)

This is the latest addition to our fauna. It was found by Prof. R. H. Pettit on the grounds of the Agricultural College near Lansing, under an old log on the bank of the Cedar river. As the college green-houses are within a few hundred yards of the place where the slugs were found, it seems probable that they were imported with some of the greenhouse plants.

61. *AGRIOLIMAX CAMPESTRIS* (Binn.)

Generally distributed.

62. *PHILOMYCUS CAROLINENSIS* (Bosc.)

Generally distributed in the lower peninsula.

63. *PYRAMIDULA ALTERNATA* (Say).

Common everywhere.

63a. *PYRAMIDULA ALTERNATA ALBA* (Tryon).

Western part of the state from Lime Island, St. Mary's river, to Grand Rapids, associated with the typical form and

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often intergrading with it. It has not as yet been reported from any of the eastern counties. 'Rare in Kent county,' Streng.

## 64. PYRAMIDULA SOLITARIA (Say).

Rare in the southeastern part of the state, but apparently more abundant in Kent county, the only locality reported from the west. 'Formerly abundant but getting scarce in Kent county,' Streng.

64a. PYRAMIDULA SOLITARIA ALBINA (W.G. Binn.)  
Kent county.

## 65. PYRAMIDULA PERSPECTIVA (Say).

Generally distributed from the Saginaw-Grand valley, south. 'Plentiful in some localities in Kent county,' Streng.

## 66. PYRAMIDULA STRIATELLA (Anth.)

Very common and of general distribution.

## 66a. PYRAMIDULA STRIATELLA ALBA.

Greenish white, otherwise similar to the typical form. Mackinac Island. I have an impression, which I have not been able to verify, that this form was described by some one several years ago.

## 67. PYRAMIDULA ASTERISCUS (Mse.)

Charlevoix.

## 68. HELICODISCUS LINEATUS (Say).

Common and of general distribution.

## 69. PUNCTUM PYGMAEUM (Drap.)

The returns indicate a general distribution. 'Rare in Kent county,' Streng.

## 70. SPHYRADIUM EDENTULUM (Drap.)

Apparently of general distribution, though not abundant.

## 71. SUCCINEA RETUSA Lea.

The use of this name for the form heretofore commonly known as *S. ovalis* Gld. is correct, provided that all the inquiry, as to what Say's *Succinea ovalis* really was, has been foreclosed. *Succinea ovalis* Gld. clearly has no standing under the rules of nomenclature. If the ques-

tion were an open one and was to be decided from Say's description alone, the decision of Gould (Inv. Mass. 1st Ed.) referring it to this

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species would seem to be fully justified. Whether Dr. Amos Binney's statement that the identity of Say's *ovalis* and *obliqua* 'is rendered certain by the inspection of the original specimens labelled by Mr. Say' is to be allowed to overrule the obvious application of Say's description is a question for the systematists to determine. His decision has apparently been accepted without question by all the later writers on the subject.

Just what Lea's *Succinea retusa* is, and how far it can be considered to cover the various forms commonly included under *S. ovalis* Gld. is quite uncertain. The group is one of the most perplexing ones among our terrestrial mollusca. There is an enormous amount of variation and it seems almost impossible to draw any satisfactory specific lines from the slight and elusive characters afforded by the shells. Almost nothing has been done in working out the anatomical characteristics, and until that is done, it is questionable whether any satisfactory arrangement can be made. There are several well marked varieties found in Michigan, which might be satisfactorily described from selected examples, but in any considerable number of specimens they seem to inter-grade almost without limit. Under the circumstances, it does not seem wise at present to attempt any formal characterization of them.

As a group, *S. retusa* in its varying forms is found abundantly in all parts of the state.

What may be considered, perhaps, as the typical form, characterized by a very short spire and a patulous aperture expanding anteriorly, is very common.

A larger form with a somewhat more elongated spire is probably the same as Calkins' *S. calumetensis*.

The form, which has been doubtfully referred to *S. higginsi*, is smaller and more slender than the preceding and is quite characteristic of the northern part of the state. It has considerable resemblance to *S. elevans* Risso and is probably the form that Cockerill has referred to that species. The large form from



East Saginaw from the Lathrop collection (Naut. VII p. 127) seems to bear the same relation to this form that *calumetensis* does to *retusa*. A somewhat similar form, but with a more slender spire has been submitted for examination from Grand Rapids. It has a striking resemblance to some of the west coast species.

The form known as *S. peoriensis* Wolf is typically quite sufficiently distinct from the usual form of *retusa* to be entitled to at least varietal rank.

An albino form also occurs occasionally.

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71a. *SUCCINEA RETUSA* MAGISTER Pils.

Cited from Michigan by Pilsbry. I have not seen any specimens however from this state which agree with the description of this form. The unusually large specimens from East Saginaw mentioned in the (Nautilus VII, p. 120), are quite different.

71b. *SUCCINEA RETUSA* DECAMPI Tryon.

It seems probable that this will prove to be simply a color variety common to all the various forms of *S. retusa*. The typical *decampi*, of which two specimens from the original lot collected by DeCamp are in my possession, are quite evidently immature and, barring the peculiar ashy-gray color, would be referred to the elongated form of *retusa* above mentioned. Similar specimens occur in Lenawee county, and others, not quite typical in color, from Sugar Island, St. Mary's river. A more effuse form, similar in shape to *peoriensis*, but quite typical in color, is of quite frequent occurrence and often attains considerable size, some examples measuring 14 mm in length.

72. *SUCCINEA OBLIQUA* Say

If, as stated by Binney, Say's *ovalis* and *obliqua* are synonyms, this species should be known under the former name, if the rules of priority are to be enforced.

*S. ovalis* was described in 1817 and *S. obliqua* in 1824. The use of *obliqua* was inaugurated arbitrarily by Dr. Amos Binney (Terr. Moll II p. 64) in an 'attempt to reconcile the differences' in the use of the names by retaining *ovalis* for Gould's species and applying to 'Mr. Say's species his second name *obliqua*.' This, of course, he had no right to

do. *Ovalis* has priority for either one species or the other, and should be recognized.

Although not as abundant as either *retusa* or *avara* this species has a general distribution in the lower peninsula. It has not yet been reported from the upper peninsula. Occasional specimens are very close to the eastern form known as *totteniana* both in color and form.

73. *SUCCINEA AVARA* Say.

Very abundant and of general distribution. Lime Island in the St. Mary's river is the most northern locality yet reported.

73a. *SUCCINEA AVARA ALBA* Ck'll.

Occurs occasionally associated with the typical form.

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73b. *SUCCINEA AVARA MAJOR* Binn.

Specimens exceeding 10 mm. in length may be referred to this variety. It occurs abundantly in some localities both in the typical and *vermeta* form. The largest specimens I have seen is of the latter type and is 14 mm. in length.

73c. *SUCCINEA AVARA VERMETA* Say.

Quite common, associated with the typical form and inter-grading with it completely.

74. *CARYCHIUM EXIGUUM* (Say).

Common and of general distribution.

75. *CARYCHIUM EXILE* H. C. Lea.

Comparatively rare, but the returns indicate a general distribution.

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UNAUTHENTICATED AND DOUBTFUL SPECIES.

*POLYGYRA PALLIATA ALBA* (Currier).

Listed, but without description by Currier in his catalogue of 1868, where it is stated that it is in 'my cabinet.' I have been entirely unsuccessful in locating this form. It is not now in the Currier collection, which is in the possession of the Kent Scientific Institute of Grand Rapids. Nor has it been





