

LATE CENOZOIC NON-MARINE MOLLUSCAN ASSOCIATIONS  
IN EASTERN NORTH AMERICA

AURELE LA ROCQUE

Department of Geology, The Ohio State University, Columbus 10, Ohio

(Continued from STERKIANA 13: 53)

INCIDENCE OF SPECIES IN ASSOCIATIONS

The numerous species recorded in previous parts of this paper present a bewildering abundance and an extremely varied stratigraphic and geographic distribution. In order to facilitate interpretation of these data, the species recorded are listed here in order, followed by the numbers of the associations, living or fossil, in which they have been recorded. It would be hazardous, to say the least, to draw firm conclusions from these lists concerning the value of species as index fossils for parts of the Pleistocene. Our knowledge is as yet too fragmentary for this and experience has shown in the past that whenever a species was designated as the guide fossil for a particular part of the Pleistocene, further collecting almost infallibly recorded it for higher or lower divisions. What these data can yield, I think, is to show which species occur most frequently or most rarely in a given part of the Pleistocene and what species commonly

or rarely occur with it. Since living assemblages are included, these lists can provide useful ecologic data for interpreting fossil assemblages.

In addition, these lists are the primary data on which studies in dispersal can be based. Several of these, for individual species as well as genera, have been completed and others are under way. They have yielded interesting results which will be published individually. As an example of one of these studies, a detailed analysis of the Newell Lake (Nos. W-45-47) and Jewell Hill (Nos. W-48-51) deposits shows the diversity of species that reached two very similar Pleistocene lakes which were practically contemporaneous and of the same order of size. The factors which are responsible for the observed diversity appear to be extremely complex but may be revealed, in part, by detailed analysis.

Incidence by Species

1. NAIADES

Naiad fragments:  
W-26 27 35

*Actinonaias carinata*

MICH 52 54 56 57 58 59 60 63 64 65  
NY 35

<sup>1</sup> The page number in parentheses is that of the complete paper; the one to the right of it is that of this number of STERKIANA

*Actinonaias carinata* (cont.)

OHIO 43

WIS 6 7 27 76 79 80 83 108 114 120 121 127

130 131 132 133

*Actinonaias ellipsiformis*

MICH 56 57 58 59 60 61 62 63 65

*Alasmidonta calceolus*

MICH 47 48 49 50 53 56 57

OHIO 43

*Alasmidonta marginata*

MICH 48 49 50 51 52 56 57 59 61 63 65

OHIO 43

ONT 5

WIS 108

*Alasmidonta marginata variabilis*

WIS 58 76 121 132

*Alasmidonta undulata*

NY 24

ONT 1

QUE 1 4

*Amblema costata*

MAN 38

OHIO 43

WIS 58 81 83 115 131 132

*Amblema plicata*

WIS 6

*Anodonta* sp.

W-29 (fragments)

*Anodonta cataracta*

NY 5b, 5c, 7 14 23 24 25 26 30 35 38

ONT 1 9

*Anodonta fluviatilis*

ONT 7 9

*Anodonta fragilis*

QUE 2

*Anodonta grandis*

N-1 (?)

S-6 (?)

MICH 41 42 43 44 45 48 49 50 51 52 53 54

55 61 68

OHIO 43

QUE 5

*Anodonta grandis benedictensis*

ONT 1

*Anodonta grandis footiana*

MAN 36 38

MINN 15

NY 3a 5c 14 17 20 23 24 29 40b

*Anodonta grandis footiana* (cont.)

WIS 1 2 7 16 22 25 42 53 56 79 82 85 89

119 123

*Anodonta grandis plana*

WIS 14 17 27 49 54 58 60 77 81 83 86 93 96

100 105 106 117 120 122 127 130 131 132

*Anodonta imbecillis*

MICH 49 51 52 53 54

OHIO 43

WIS 58 83 87

*Anodonta implicata*

NY 3a 17 22 23 24 26 30 35 40b

WIS 7

*Anodonta kennicotti*

MAN 16 23

MINN 13a 18

WIS 14 16

*Anodonta lacustris*

QUE 2

*Anodonta marginata*

W-45 46 47

MINN 15 18

NY 14 24 31 35 40b

QUE 1 3 4 7

WIS 1 2 7 8 9 12 14 16 19 20 22 23 27 28

33 34 41 42 44 47 49 51 53 54 55 56 58

59 60 62 68 75 78 79 80 81 82 83 87 89

93 95 96 105 106 116 117 120 121 123 124

127 128 130

*Anodontoides birgei*

WIS 17

*Anodontoides ferussacianus*

MICH 46 47 48 49 53 57 65 67

OHIO 43

ONT 1

WIS 54

*Anodontoides ferussacianus subcylindraceus*

ONT 10

WIS 14 42 47 49 58 59 75 81 83 85 87 89 93

108 117 123 130 131

*Anodontoides modesta*

MINN 13a 18

*Carunculina parva*

MICH 52 53 54

OHIO 43

*Cyclonaias tuberculata*

MICH 51 52 54 63 65

OHIO 43

- Cyprogenia irrorata*  
 OHIO 43
- Dysnomia torulosa rangiana*  
 OHIO 43
- Dysnomia triquetra*  
 MICH 45 49 50 51 54 59
- Elliptio complanatus*  
 NY 2a 2b 3a 4c 5b 5c 6 7 10 13 14 15a 15b  
 16 17 18c 19 21 22 23 24 26 27 28 29 30 32 33  
 34 35 40b 41 42 45  
 OHIO 43  
 ONT 1 7 10  
 QUE 1 2 3 4 5 7 8
- Elliptio dilatatus*  
 MICH 45 48 49 50 51 52 54 55 56 57 58 59  
 61 62 63 64 65 66 67  
 OHIO 43  
 ONT 1  
 WIS 58 131
- Elliptio dilatatus delicatus*  
 WIS 27 58 76 83 108
- Elliptio dilatatus sterkii*  
 WIS 82
- Fusconaia flava*  
 MICH 52 54 55 56 57 61 63 64 65  
 OHIO 43  
 WIS 27 58 76 82 83 87 108 115 127 130 131
- Fusconaia subrotunda*  
 OHIO 43
- Fusconaia subrotunda kirtlandiana*  
 OHIO 43
- Lampsilis fasciola*  
 MICH 49 50 51 52 54  
 OHIO 43
- Lampsilis radiata*  
 NY 2a 3a 5b 5c 6 15a 15b 23 29 30 32 35 38  
 40b 41 45  
 ONT 1 9 10
- Lampsilis radiata borealis*  
 NY 15b 32 35 40b 42 43b 45
- Lampsilis radiata siliquoidea*  
 W-45 46 47  
 MICH 42 43 44 45 48 49 50 51 52 60
- Lampsilis radiata siliquoidea+rosacea*  
 MINN 13a 18 22a  
 NY 15a 23 29 33 35  
 OHIO 43  
 ONT 5 7 9
- Lampsilis radiata siliquoidea +rosacea (cont.)*  
 QUE 2 5 7 8  
 WIS 1 6 7 17 27 54 58 76 78 80 81 83 105  
 114 117 120 121 127 130 131 132 133
- Lampsilis radiata siliquoidea rosacea*  
 MAN 23 36 38  
 WIS 9 12 16 23 25 29 42 47 59 79 82 85 86  
 89 93 106 122 123
- Lampsilis ventricosa*  
 MAN 23 38  
 MICH 43 44 45 49 50 51 52 53 54 56 57 59  
 60 62 64 65  
 OHIO 43  
 ONT 1  
 WIS 6 7
- Lampsilis ventricosa lurida*  
 WIS 25 26 42 47 79 80
- Lampsilis ventricosa occidens*  
 MINN 22a  
 WIS 27 58 76 81 83 108 114 120 121 127 130  
 131 132 133
- Lasmigona complanata*  
 MICH 52 53 67  
 OHIO 43  
 WIS 121 127 130 131 132
- Lasmigona complanata katherinae*  
 MAN 36 38
- Lasmigona compressa*  
 MICH 46 47 48 49 50 55 66  
 OHIO 43  
 ONT 4  
 WIS 7 14 17 27 58 76 81 82 83 87 108 120  
 123 130 131
- Lasmigona costata*  
 MICH 50 51 52 54 55 56 57 65  
 OHIO 43  
 ONT 5 10  
 WIS 7 27 58 76 80 81 83 87 108 120 121 122  
 127 131 132
- Lastena lata*  
 OHIO 43
- Leptodea fragilis*  
 ONT 1
- Ligumia nasuta*  
 MICH 54
- Ligumia recta*  
 WIS 6 82

- Ligumia recta latissima*  
 MAN 38  
 MICH 50 51 52 53 54  
 OHIO 43  
 ONT 1 5  
 WIS 58 76 83 108 121 132
- Ligumia subrostrata*  
 PLI-3?
- Margaritana margaritifera*  
 NY 13 15a 15b 17 21 41 43b
- Obovaria olivaria*  
 ONT 1
- Obovaria subrotunda*  
 MICH 54  
 OHIO 43
- Plethobasus cyphus*  
 OHIO 43
- Pleurobema clava*  
 OHIO 43
- Pleurobema cordatum coccineum*  
 MICH 59 65  
 OHIO 43  
 WIS 58 83 108 131
- Pleurobema cordatum pyramidatum*  
 OHIO 43
- Proptera alata megaptera*  
 MAN 38  
 ONT 1
- Ptychobranthus fasciolaris*  
 MICH 49 50 51 52 54  
 OHIO 43
- Quadrula cylindrica*  
 OHIO 43
- Quadrula metanevra wardii*  
 OHIO 43
- Quadrula pustulosa*  
 MICH 54  
 OHIO 43
- Quadrula quadrula*  
 S-6
- Simpsoniconcha ambigua*  
 OHIO 43
- Strophitus rugosus*  
 MAN 36 38  
 MICH 43 44 45 47 48 49 50 51 55 56 57 59  
 60 61 63 65  
 NY 19 22  
 OHIO 43
- Strophitus rugosus (cont.)*  
 ONT 1 5 10  
 QUE 1  
 WIS 7
- Strophitus rugosus pavonius*  
 WIS 27 58 76 79 80 81 83 87 108 120 121  
 122 127 130
- Tritogonia tuberculata*  
 OHIO 43
- Truncilla triquetra*  
 OHIO 43
- Villosa fabalis*  
 MICH 52 54  
 OHIO 43
- Villosa iris*  
 MICH 45 47 48 49 50 51 52 54 56 57 58 59  
 62 63 64 65 66 67  
 NY 15b 22  
 OHIO 43
- Villosa iris novi-eboraci*  
 OHIO 43

## 2. SPHAERIIDAE

- Pisidium* sp.  
 K-5 --- W-35 71 72  
 MICH 10 11  
 MINN 10 11a 12 13a 15 16 20  
 NY 4b 11 21  
 OHIO 29 30 31 37
- Pisidium adamsi*  
 W-27 36 37 38 39 42  
 MAN 20  
 OHIO 43  
 WIS 15 27 42 49 55 58 63 79 81 85 95 116  
 121 123 128 130 133
- Pisidium adamsi affine*  
 W-27
- Pisidium aequilaterale*  
 NY 21
- Pisidium casertanum*  
 PLI-1 2 3 --- N-1 2 --- S-1 2 4 5 6 --- W-  
 27 28 29 36 37 38 45 48 49 50 51 52 53 54  
 56 57 58 59  
 MAN 25  
 NY 1  
 OHIO 43

*Pisidium casertanum* (cont.)

ONT 3 7 9

WIS 4 5 21 43 68 89 95 102 106 107 109 118  
133*Pisidium compressum*

N-1 --- K-1 2 --- Y-1 2 4 7 8 11 12 13 14

15 16 17 18 19 20 --- S-1 6 --- W-26

27 28 29 30 31 32 33 34 36 37 38 39 40

41 42 45 46 47 53 54 55

OHIO 43

ONT 9

QUE 3

WIS 15 16 17 27 28 29 49 54 55 56 60 79 80

84 85 86 89 93 97 121 123 128 130 133

*Pisidium compressum laevigatum*

NY 4b 4c 11 21

W-27

*Pisidium cruciatum*

OHIO 43

*Pisidium dubium*

ONT 1

WIS 6 123 133

*Pisidium fallax*

W-26 27

OHIO 43

*Pisidium fallax septentrionale*

WIS 80 87

*Pisidium ferrugineum*

W-27 28 29 33 34 37 38 39 42 45 46 47 52

53 54 55

WIS 51 79 98 116 121 128

*Pisidium henslowanum*

NY 21

*Pisidium idahoense*

WIS 110

*Pisidium levissimum*

WIS 79

*Pisidium lilljeborgi*

W-27

WIS 13 27 29 55 79 85 98 116 123 128

*Pisidium lilljeborgi cristata*

WIS 15 79

*Pisidium nitidum*

N-1 2 --- S-6 --- W-27 28 29 31 32 33 34

36 37 38 39 41 42 45 46 47 48 49 50 51

52 53 54 55

OHIO 43

WIS 55 79 129

*Pisidium nitidum contortum*

S-1 --- W-53 54 55

*Pisidium nitidum pauperulum*

W-30 31 32 33 34 37 38 39 40 41 42 45 46

47 53 54 55

WIS 15 16 28 29 51 54 79 93 116 123 128 133

*Pisidium obtusale*

S-1 --- W-27 28 31

*Pisidium obtusale rotundatum*

W-45 48 49 50 51 52 53 54 55

WIS 13 43 79

*Pisidium obtusale ventricosum*

W-33 34 37 38 39 41 42 52 53 54 55

ONT 3

*Pisidium ohioense*

W-27 28

*Pisidium punctatum*

OHIO 43

WIS 133

*Pisidium pusillum*

WIS 61

*Pisidium variabile*

W-27 29 31 33 34 36 37 38 39 41 42 52 53

54 55

NY 4b 21

OHIO 43

WIS 15 16 28 29 32 37 42 54 59 60 68 71 78

79 84 85 86 89 93 97 109 116 123 124

128 133

*Pisidium walkeri*

W-27 36 38 39 42 53 54

OHIO 43

*Pisidium walkeri mainense*

W-38 54 55

*Sphaerium* sp.

PLI-1 --- Y-8 9 11 16 19 20 --- W-35

OHIO 29 32 33 34 35 36 37 38 39 40 41 42

*Sphaerium fabale*

OHIO 43

*Sphaerium jayense*

WIS 51 78

*Sphaerium lacustre*

N-2 --- W-29 33 34 36 37 38 39 41 42 45 46

47 50 51 53 54

MAN 25

*Sphaerium lacustre ryckholti*

WIS 107

*Sphaerium nitidum*

MAN 24

*Sphaerium occidentale*

S-1

MAN 30

MINN 19

NY 1

OHIO 43

ONT 7

WIS 4 21 43 136

*Sphaerium partumeium*

N-1 2 --- S-2 --- W-27

MAN 25

MICH 10 14

MINN 15 17

OHIO 43

WIS 30 42 45 51 60 63 99

4 136

*Sphaerium rhomboideum*

W-27 33 34 36 38 42 53 54 55

OHIO 43

ONT 1 3 9

QUE 1

WIS 42 68

*Sphaerium rosaceum*

NY 35

QUE 1

WIS 5 28 54 68 79 102

*Sphaerium securis*

W-27

MAN 21

MINN 15 16 17

NY 1 35 37

OHIO 43

ONT 3

WIS 4 10 23 43 45 53 60 61 63 102 106

107 133

*Sphaerium simile*

ONT 9

WIS 1

*Sphaerium steinii*

WIS 87

*Sphaerium striatinum*

PLI-1

N-1 --- S-6 --- W-27 31

NY 14 25

OHIO 43

ONT 1 4

*Sphaerium striatinum* (cont.)

WIS 6 83 134

*Sphaerium striatinum* f. *bakeri*

WIS 122

*Sphaerium striatinum* f. *emarginatum*

ONT 4

WIS 58 76 80 83 87

*Sphaerium striatinum* f. *modestum*

ONT 6

*Sphaerium striatinum* f. *solidulum*

OHIO 43

WIS 122

*Sphaerium striatinum* f. *stamineum*

W-27

MINN 22a

OHIO 43

WIS 17 27 58 60 79 80 81 108 117 131 132 133

*Sphaerium striatinum* f. *vermontanum*

NY 3a 4b 4c 10 11 15b 21 23 24 26 30 32 37

*Sphaerium sulcatum*

N-1 --- S-1 --- W-27 29 31 33 34 45 46 47

53 54 55

MINN 10 11a 13a 15

OHIO 43

ONT 5 7

QUE 2

WIS 25 28 42 49 54 60 68 80 106 117 123 125

*Sphaerium sulcatum* f. *crassum*

MAN 16

WIS 83 132

*Sphaerium sulcatum* f. *fallax*

WIS 15 16 47 50 60 62 78 83 89 130

*Sphaerium transversum*

N-1 2 --- S-6

MAN 23

OHIO 43

ONT 1 6

## 3. FRESHWATER GILL-BREATHING GASTROPODS

*Amnicola* sp.

MAN 33

QUE 3

*Amnicola integra*

WIS 3

*Amnicola leightoni*

W-29 30 31 32 33 34 38 39 40 41 42 45 46

47 48 49 50 51

*Amnicola limosa*

W -27  
 MAN 19 23  
 MINN 9 10 11b 13a 13b 14a 14b 15 16 17  
 18 22a  
 NY 21 36  
 OHIO 18 19 29 43  
 ONT 3 9  
 QUE 2  
 WIS 11 14 15 16 17 27 28 29 32 37 38 39 42  
 45 46 47 48 51 52 55 56 59 60 65 68 69  
 70 79 80 85 86 87 88 89 90 92 93 94 95  
 97 98 106 113 116 123 133

*Amnicola limosa parva*

K-2 --- Y-1 16

*Amnicola lustrica* (see also *Marstonia lustrica*)

W-27 28 33 33<sup>o</sup> 34 34<sup>o</sup> 36 37 38 39 40 41 42  
 45 46 47 48 49 50 51  
 ° "aff. precursor"  
 MINN 9 10 11b 15 16  
 NY 2b 4b 4c 11 12 21 23 25 32 37 40a  
 ONT 9  
 WIS 15 16 28 29 47 51 52 55 59 79 84 85 86  
 88 89 90 98 116 123 128

*Amnicola precursor*

W -33 34

*Amnicola walkeri*

W-29 53 54 55  
 MAN 23  
 MICH 10  
 MINN 17  
 OHIO 43  
 WIS 28 42 81 98 124

*Bulimus tentaculatus*

NY 3b 10 14 15b 21 22 31 32 36 37 38 40a  
 42 43  
 ONT 1 3

*Campeloma decisum*

MAN 26 35  
 MICH 40 (drift)  
 NY 19 20  
 ONT 1 5 7 9  
 QUE 1 2 3 4  
 WIS 1 6 7 17 19 25 38 39 42 46 47 52 57 60  
 62 73 75 79 80 81 83 87 100 117 118 120  
 123 129 132 133

*Campeloma integrum*

NY 4b 4c 5a 10 11 15b 22 24 32 40a 42  
 OHIO 43

*Campeloma milesii*

WIS 28 29 33 35 48 49 55 56 57 62 79 83 85  
 86 87 93 96 103 106 108 111 116 123 124  
 128 129 131

*Campeloma rufum*

W -31 (cf.) 32 (cf.)  
 MINN 22a

*Campeloma subsolidum*

U-10  
 OHIO 18

*Gillia altilis*

NY 3b 4b 4c 15b 32

*Goniobasis depygis*

W-25

*Goniobasis livescens*

W-28  
 NY 3a 5b 6 7 15a 15b 16 21 22 23 26 27 29  
 30 32 35  
 OHIO 8 9 10 11 12 13 14 16 17 18 19 21 43  
 ONT 4 6 7

*Goniobasis livescens gracillior*

OHIO 43

*Lithasia obovata*

OHIO 43

*Lyogyrus pupoideus*

W-27 (?)

*Marstonia crybetes*

PLI-1 3 --- N-2

*Marstonia decepta* (see also *Amnicola lustrica*)

PLI-1

*Marstonia lustrica* (see also *Amnicola l.*)

OHIO 43

*Pleurocera acutum*

OHIO 17 18 21

*Pleurocera labiatum*

OHIO 43

*Pomatiopsis cincinnatiensis*

Y-7 10 16

*Pomatiopsis lapidaria*

W-25 26 28 56 58 59 --- U-10

*Probythinella lacustris*

S-6 --- W-27 ---

OHIO 43

*Somatogyrus subglobosus*

NY 3b 14 15b 32

ONT 1

*Somatogyrus subglobosus isogonus*

OHIO 43

*Somatogyrus tryoni*

WIS 132 133

*Valvata bicarinata normalis*

NY 4b 32 37 38 43

*Valvata lewisi*

N-1 --- K-1 --- Y-8 --- W-35 53 54 55

MAN 25

NY 1

ONT 3 5

WIS 15 69 84 85 86 93 123

*Valvata sincera*

W-27 29 33 34 72

*Valvata sincera nylanderi*

WIS 98

*Valvata tricarinata*

N-1 2 --- K-1 2 4 7 --- Y-1 7 8 11 16 ---

S-1 6 --- W-27 29 30 31 32 33 34 36 37 38

39 40 41 42 45 46 47 48 49 50 51 54 55 72

MAN 12 23 32 33

MINN 9 10 11b 13b 14a 15 16 17 18

NY 3b 21

OHIO 20 29 43

ONT 9

QUE 8

WIS 15 51 59 75 79 86 89 97 98 123 124 128

*Viviparus contectoides*

NY 3b 42

*Viviparidae*, indet. --- N-2

## 4. FRESHWATER LUNG-BREATHING GASTROPODS

*Acella haldemani*

W-27 33 34 37 38 39 45 47 54

MINN 9 15

NY 2b 4a 12 36

WIS 11 31 42 47

*Acroloxus coloradensis*

N-1 2

*Anisus pattersoni*

N-1 2 --- K-1 2 --- Y-2 3 9 11 12 13 14

19 20 --- S-6 7 --- W-60

*Aplexa hypnorum*

N-1 --- A-1 --- K-4 --- Y-7 11 12 13 14

--- S-1 6 --- W-28 --- U-4

MAN 1 2 3 4 7 11 25 35

MICH 11 12 13 37

MINN 20

NY 1

*Aplexa hypnorum* (cont.)

OHIO 32 33 43

WIS 4 136

*Armiger crista*

K-4 --- S-4 --- W-27 28 35 48 49 50 51 53

54 57 58 59

MICH 10

MINN 15 17

ONT 3

*Bulimnea megasoma*

N-1 2

MAN 20 21 35

MINN 9 14d 15

QUE 1 7 8

WIS 4 18 31 40 42 47 54 60 72 79 83 86 106

123 137

*Ferrissia?*

MICH 10

OHIO 29

*Ferrissia meekiana*

N-1 2 --- S-2 6 --- W-27 28

OHIO 43

*Ferrissia parallela*

Y-2 4 7 14 18 19 20 --- S-1 --- W-27 29 34

35 36 37 38 39 41 42 45 54 56 57 58 59 \*28

MAN 21

MINN 9 17 18

NY 12 40a 43

OHIO 18 19

ONT 5 7

WIS 3 4 5 15 29 42 47 60 63 64 83 104 106

107 117 123 124

*Ferrissia rivularis*

PLI-1 2 3 --- N-1 2 --- S-1

MAN 36

MINN 22a

OHIO 43

*Ferrissia shimeki*

OHIO 43

*Ferrissia tarda*

W-31 32

MINN 22a

NY 18a

OHIO 43

WIS 108

*Fossaria* sp.

W-73



*Fossaria dalli*

PLI-1 3 4 --- N-1 2 --- A-1 --- S-2 3 6

--- W-28

MAN 25

MICH 11 13

*Fossaria dalli grandis*

W-60

*Fossaria galbana*

Y-21 --- I-5 --- S-1 (cf.) --- W-35

*Fossaria humilis*

OHIO 8 9 10 11 13 15 19 20 43

*Fossaria humilis modicella*

S-1 --- W-27 28 56 57 58 59

MAN 6

WIS 134

*Fossaria humilis rustica*

W-28

*Fossaria obrussa*

N-1 --- S-6 --- W-38 39 45 46 47 48 49

50 51

OHIO 29 31 32 33 34 35 37 38 40 41 42

WIS 4 48 54 59 61 79 106 119 128

*Fossaria obrussa decampi*

W-27 29 30 31 32 33 34 45 46 48 49 50 51

52 53 54 55 56 57 58 59 72

MAN 12

MINN 13a 13b 16 17

WIS 55 79 84 85 123

*Fossaria obrussa exigua*

MAN 6 15 30 31 33

WIS 14 59

*Fossaria parva*

K-5 6 7 --- Y-6 7 8 11 13 15 --- I-7 ---

W-9 10 28 43 64 67 69 71

MICH 37

OHIO 31

*Fossaria parva sterkii*

MAN 37

*Fossaria parva var.*

MAN 11

*Fossaria umbilicata*

MAN 37

ONT 4

*Gyraulus sp.*

QUE 3

*Gyraulus altissimus*

W-29 30 31 32 33 34 35 36 37 38 39 40 41 42

45 46 47 48 49 50 51 52 56 57 58 59 72

*Gyraulus altissimus (cont.)*

MINN 17

*Gyraulus "albus" (Müller)*

W-27 (?)

*Gyraulus "arcticus"*

MAN 7 10 16 21 25 31 32 33 34

NY 1

WIS 59

*Gyraulus circumstriatus*

S-2 3 4 5 6

MINN 12 19

OHIO 43

WIS 43 79 85 95 123

*Gyraulus circumstriatus walkeri*

NY 1

*Gyraulus deflectus*

W-29 33 34 53 54 55

MAN 12

MICH 10

OHIO 43

ONT 3 9

QUE 2

WIS 9 23 37 42 47 60 61 79 80 85 89 95 99

112 113

*Gyraulus deflectus obliquus*

MINN 13b 16 17

NY 1

QUE 4

WIS 14 15 16 42 59 69 80 85 86 90 93 94 96

98 102 116 123 124 135

*Gyraulus hirsutus*

W-29

MAN 12 16 21 25 34 35

MICH 10

NY 2b 4b 5b 16 18b 21 23 29 37 40a

OHIO 43

ONT 9

WIS 3 4 29 55 66 70 79 89 98 106 119 123 128

*Gyraulus labiatus*

K-4 5 --- Y-1 3 4 6 8 9 10 11 14 15 16 17

18 19 20

*Gyraulus parvus*

PLI-1 2 --- N-1 2 --- A-1 --- S-6 7 ---

W-27 28 60

MICH 10 11

MINN 9 10 13b 14b 15 16

NY 1 38 43

OHIO 10 19 20 29 31 32 33 34 35 36 37 38

40 41 42 43

*Gyraulus parvus* (cont.)

ONT 7 9

WIS 3 5 14 16 18 27 28 29 51 54 55 68 74 79

84 85 86 89 94 104 106 107 123 124

*Gyraulus similis*

K-1 2 4 5 --- Y-3 5 9 12 14 15 16 18 19 ---

I-3(?) --- S-1

*Helisoma anceps*

PLI-1 --- N-1 2 --- Y-16 20 --- I-3 ---

S-1 6 --- W-60

MAN 36

MICH 10

NY 2a 6 14 15b 21 22 30 32 37 40a

OHIO 43

ONT 7 9

QUE 3 8

WIS 14 15 16 19 25 27 28 29 44 46 47 56 58

73 79 81 85 89 93 100 103 104 112 116

117 123 127 128 133

*Helisoma anceps cahni*

WIS 8 9 16

*Helisoma anceps latchfordi*

QUE 1

*Helisoma anceps sayi*

MAN 16 17 21

ONT 5

WIS 28 42 59 60 67 86 98 106 119 123

*Helisoma anceps striatum*

W-29 30 31 32 33 34 36 37 38 39 41 42 45

46 47 48 49 50 51 53 54 55

MINN 10 11b 11c 13b 14b 14c 15 16

WIS 1 2

*Helisoma anceps unicarinarum*

WIS 4 20 28 31 42 63 68 87 99 102 106 111

124 128

*Helisoma "binneyi"*

NY 5a 14 16 22 35 40a 41

WIS 1 2 4

*Helisoma campanulatum*

W-27 29 33 34 38 45 46 47 48 49 50 53 54 55

MINN 10 11b 11c 13a 13b 14a 14b 14c 15

16 17

NY 2a 2b 3b 4a 4b 5b 6 7 9 10 11 14 15b 16

21 22 23 25 27 29 30 32 34 36 37 40a 41

42 43 44

OHIO 29 43

ONT 9

*Helisoma campanulatum* (cont.)

WIS 1 2 3 15 19 20 23 28 29 30 42 47 68 69 79

85 87 89 90 93 94 96 97 100 112 116 123

124 128

*Helisoma campanulatum davisii*

MAN 8

*Helisoma campanulatum ferrissii*

WIS 50

*Helisoma cf. H. campanulatum wisconsinense*

Y-1 3 4 9

*Helisoma campanulatum wisconsinense*

MAN 16 17

ONT 5

QUE 1 2 3 4 8

WIS 9 16 23 28 47 56 59 67 83 86 91 98 101

106 119 123 126

*Helisoma infracarinatum*

ONT 5

QUE 2

*Helisoma pseudotrivolvis*

WIS 51

*Helisoma trivolvis*

N-2 --- K-2 4 --- Y-7 8 10 11 14 15 16 ---

S-1 2 6 --- W-25 27 28 32 35 50 51 56 57 58

--- U-2 4

MAN 8 25

NY 1 2b 7 15b 18b 31 34 35 36 37 38 39 42

OHIO 18 19 20 30 37 42 43

ONT 1 3 7 9 10

QUE 3 8

WIS 4 10 15 23 40 42 47 49 54 59 60 68 72

79 80 81 83 86 87 89 106 112 116 117

123 125

*Helisoma trivolvis macrostomum*

MINN 10 11c 14d 15 16 21

*Helisoma trivolvis pilsbryi*

MAN 16

QUE 1

WIS 29 42 47 59 93 106

*Helisoma trivolvis winslowi*

WIS 58 91 98

*Laevapex diaphanus*

OHIO 43

*Laevapex fuscus*

MINN 11c

NY 36 38

OHIO 18 19

WIS 86

- Laevapex kirklandi*  
 S-6 --- W-27 28  
 OHIO 43  
 WIS 98  
 "Limnaea fragilis"  
 U-4 5  
*Lymnaea indet.*  
 Y-8 11 12 17 --- U-4  
*Lymnaea stagnalis*  
 MAN 25  
*Lymnaea stagnalis jugularis*  
 S-6 --- W-27 33 34 45  
 MAN 8 10 16 32 33 34 35  
 MINN 10 11c 14c 14d 15  
 ONT 1 5 9  
 QUE 3 5 8  
 WIS 4 16 27 80 93 94 96 106  
*Lymnaea stagnalis lillianae*  
 MAN 14  
 NY 5a 7 16 22 29 30 34 35 36 38 39 41  
 QUE 1 4  
 WIS 1 2 25 42 47 79 81 89 106 128  
*Lymnaea stagnalis sanctaemariae*  
 MAN 17  
 WIS 19 98 102 105  
 "Lymnaea stagnalis wisconsinensis"  
 WIS 1  
*Menetus sp.*  
 W-60  
*Menetus dilatatus*  
 W-27  
*Menetus opercularis multilineatus*  
 W-32  
*Menetus pearlettei*  
 K-1 2 4 --- Y-1 3 4 9 10 14 15 16 19 20  
*Physa sp.*  
 Y-3 4 10 --- W-26  
 QUE 4 8  
*Physa anatina*  
 PLI- 1 2 3 4 --- N-1 2 --- A-1 --- K-2 4 5  
 --- Y-15 18 --- S-1 (cf.) --- S-2 3 4 6 ---  
 W-29  
*Physa "ancillaria"*  
 MAN 13  
*Physa ancillaria* (including "magnalacustris")  
 OHIO 8 9 10 11 13 14 15 19 20 43  
 ONT 3 5  
 WIS 1 2 3  
*Physa ancillaria warreniana*  
 NY 2b 3b 4a 4c 5a 5b 6 7 8 9 14 15b 16 21 22  
 23 26 29 30 32 34 35 36 37 40a 41 42 43 44  
*Physa aplectoides*  
 W-28  
*Physa "billingsi"*  
 ONT 6 7  
*Physa elliptica*  
 Y-9 14 16 17 --- S-1 (cf.) --- W-28  
 MICH 10 12  
 NY 1  
 WIS 79  
*Physa gyrina*  
 N-1 2 --- S-2 6 --- W-27 28 30 31 32 35 36  
 37 38 39 42 48 49 50 51 56 57 58 59 ---  
 U-4  
 MAN 7 8 9 10 17 21 25 31  
 MINN 9 10 11b 11c 13b 14b 14c 16  
 NY 9 18b  
 OHIO 30 31 32 35 36 40 42 43  
 WIS 4 59 66 104 125 135  
*Physa "gyrina hildrethiana"*  
 MAN 29  
*Physa heterostropha*  
 W-27 33 34 --- U-1 4  
 OHIO 29 43  
 ONT 7 9  
*Physa "integra"*  
 W-27 28  
 MAN 32 36  
 NY 3b 15a 31 32  
 ONT 5  
 WIS 17  
*Physa laphami*  
 WIS 9 11 14 16 25 47 56 88 95 100 102 116 133  
*Physa latchfordi*  
 QUE 1 3  
*Physa michiganensis*  
 WIS 27  
*Physa obrüssoides*  
 WIS 74 81  
*Physa "sayi"*  
 W-27 45 46 47  
 WIS 15 23 24 28 30 36 37 38 39 42 44 50 54  
 58 62 67 74 93 96 98 106 117 123 124 128  
*Physa skinneri*  
 N-1 2 --- A-1 --- S-6  
 "Planorbis sp."  
 U-4

- Planorbula armigera*  
 N-1 2 --- W-28 35 51 56 57 58 59 --- U-4  
 MAN 10  
 MICH 10 12 14  
 MINN 15  
 OHIO 43  
 WIS 4 106 107 112 136
- Planorbula campestris*  
 MAN 3 4
- Planorbula crassilabris*  
 MAN 4 16 20 25 31
- Planorbula nebraskensis*  
 Y-1 3 4
- Planorbula vulcanata*  
 Y-4 5 9 10
- Planorbula vulcanata occidentalis*  
 Y-12 14 16
- Promenetus dilatatus*  
 OHIO 43
- Promenetus exacuus*  
 S-1 --- W-27 29 30 32 33 34 35 36 37 38 39  
 41 42 45 46 47 48 49 50 51  
 MAN 8 10 12 16 18 21 35  
 MICH 10 14  
 MINN 13b 15 16 17  
 NY 1 33  
 OHIO 20 29 39 41 43  
 ONT 3 9  
 QUE 1  
 WIS 15 42 54 58 61 79 98 116
- Promenetus exacuus megas*  
 MINN 13b 15 16 17  
 WIS 28 59 68 79 97
- Promenetus kansasensis*  
 PLI-1 2 3 --- N-1 2 --- A-1 --- S-2 4 6
- Promenetus rubellus*  
 NY 1  
 OHIO 43
- Promenetus umbilicatellus*  
 PLI-1 2 3 4 --- N-1 2 --- A-1 --- K-1 4  
 --- Y-2 3 10 12 14 17 18 19 20 --- S-2 6  
 --- W-28  
 MAN 1a 4 28  
 MINN 20  
 OHIO 43
- Pseudosuccinea columella*  
 W-27 45 46  
 NY 2b 4a 9
- Pseudosuccinea columella (cont.)*  
 OHIO 33 35 36 38 40 43  
 QUE 1 3  
 WIS 3 4 8 31 95 106
- Pseudosuccinea columella "casta"*  
 MAN 18
- Stagnicola sp.*  
 PLI - 1 4 --- A-1
- Stagnicola cf. S. arctica*  
 M AN 39
- Stagnicola bulimoides*  
 K-4 5 --- Y-11 15 --- S-1
- Stagnicola bulimoides techella*  
 PLI-1 2 3 4 --- A-1
- Stagnicola caperata*  
 PLI-4 --- N-1 2 --- A-1 --- K-1 4 5 ---  
 Y-7 14 19 20 --- I-3 --- S-1 2 3 4 5 6  
 --- W-28  
 MAN 3 4 11  
 ONT 7 10
- Stagnicola catascopium*  
 MAN 22  
 NY 3a 4c 5a 5b 6 7 10 14 15a 15b 21 22 23  
 25 26 27 29 30 32 34 35 36 37 40a 41 42  
 ONT 10  
 WIS 79
- Stagnicola desidiosa*  
 OHIO 43  
 ONT 9  
 QUE 2
- Stagnicola emarginata*  
 MAN 12 (var.) 22  
 NY 7 13 14 23  
 ONT 4 6  
 WIS 16 73 97 123
- Stagnicola emarginata canadensis*  
 QUE 3
- Stagnicola emarginata vilasensis*  
 WIS 28
- Stagnicola emarginata wisconsinensis*  
 WIS 98 106
- Stagnicola exilis*  
 PLI-3  
 MINN 15  
 WIS 42 47 83 100
- Stagnicola lanceata*  
 W-35  
 MAN 5 21 35

*Stagnicola lanceata* (cont.)

WIS 2 4 9 47 99 106 123

*Stagnicola nashotahensis*

W-28

*Stagnicola palustris*K-2 4 5 --- Y-1 2 3 4 7 9 10 11 14 --- Y-  
16 17 --- S-1 (cf.) --- W-29

MAN 2 4 7 8 9 10 24 25 29 30 31 32 34 37

MICH 12 13 14 37

OHIO 29 31 32 34 37 41 42 43

ONT 3 7

*Stagnicola palustris elodes*

W-35

NY 1

WIS 18

*Stagnicola cf. S. reflexa*

N-1

*Stagnicola reflexa*

N-2 --- Y-9 12 14 --- S-6 --- W-28

*Stagnicola umbrosa*

W-50 51 --- U-2

*Stagnicola woodruffi*

OHIO 20

## 5. LAND GASTROPODA

*Allogona profunda*

W-24 25 26 27 28 --- U-1 5 8 9 12 13

MICH 40

OHIO 3 5 7 22 23 43

ONT 11 14

*Allogona profunda strontiana*

OHIO 1 2

ONT 12 13

*Anguispira alternata*W-24 25 26 28 62 73 --- U-3 5 6 --- U-9  
10 12 13

MICH 1 2 3 4 6 7 8 23 25 26 27 28 29 31 32

33 36 39 40

MINN 4

OHIO 3 6 7 26 27 28 29 43

ONT 7 8 11 14

*Anguispira alternata eriensis*

OHIO 1 2

ONT 12 13

*Anguispira kochi*

W-24 25 26 28 --- U-8 9 10 12 13

*Anguispira kochi* (cont.)

OHIO 1 5 7 43

ONT 11

*Anguispira kochi mynesites*

OHIO 3

*Anguispira kochi roseoapicata*

ONT 11 13 14

*Anguispira kochi strontiana*

OHIO 2

ONT 12

*Bulimulus dealbatus*

U-12 (var.) 13

*Carychium* sp.

N-1

*Carychium exiguum*PLI-3 --- N-2 --- S-1 (cf.) 2 3 4 6 --- W-  
6 16 27 28 56 57 58 59

MICH 2 20 22 25

OHIO 1 6 43

ONT 7

*Carychium exile*

W-28 51 73 --- U-10

OHIO 43

ONT 3

*Carychium exile canadense*K-6 --- &-21 --- I-5 6 --- W-43 44 56 57  
58 59 60 64

MINN 3 4 5

*Carychium perexiguum*

K-1 2 --- Y-3 4 5 6 7 10 12 13 17 18 19 20

*Catinella gelida* var.

K-6 7 --- I -5

*Catinella gelida*

I-7 --- W-61 62 63 64 65 66 67 68 69 70 71

*Cionella lubrica*

K-6 --- Y-2 6 7 11 12 13 21 --- I-5 ---

S-7 --- W-5 6 9 24 43 44 60 61 62 64 65

MICH 1 30 31 40

MINN 1 3 4 5 8

OHIO 43

ONT 3 7 8

*Columella* sp.

I-2

*Columella alticola*

W-5 6 9 12 15 17 44 61 62 63 64 66 67 69 73

MAN 39

*Columella edentula*

K-6 --- Y-21 --- I-5 --- W-28

- Columella edentula* (cont.)  
 MICH 1 40  
 OHIO 43  
 ONT 2 3
- Deroceras* sp.  
 Y-21 --- I-6 --- W-44  
 OHIO 29
- Deroceras aenigma*  
 PLI-1 2 3 4 --- N-1 2 --- A-1 --- K-1 2  
 --- Y-2 3 5 6 7 11 12 13 16 17 18 19 20 ---  
 S-1 (cf.) 2 3 4 5 --- W-28 (cf.)
- Deroceras laeve*  
 K-7 --- I-5 --- W-2 3 4 12 28 (cf.) 62 64  
 65 67 69 71  
 MAN 39  
 MICH 1 22 28 31 32 33 34 35 36 40  
 OHIO 4 34 39 43  
 ONT 7 14
- Deroceras reticulatum*  
 MICH 30 31  
 OHIO 32 34 37 38 39 42
- Discus cronkhitei*  
 K-1 2 5 6 --- Y-2 4 5 6 7 8 12 13 14 16 17  
 21 --- I-3 5 --- S-6 --- W-2 3 4 5 6 7  
 8 11 12 13 17 18 22 24 26 27 28 44 64  
 65 66 69 73 --- U-2 4 7 14  
 MICH 30  
 OHIO 1 6 43  
 ONT 7 8 10  
 QUE 6
- Discus cronkhitei anthonyi*  
 MINN 1 2 3 4 5 7 8
- Discus cronkhitei catskillensis*  
 MICH 1 4 7 8 9 40
- Discus mcclintocki*  
 W-60
- Discus patulus*  
 W-24 28 61 --- U-9  
 OHIO 29 43
- Discus shimeki*  
 W-2 3 4 5 6 7 9 11 12 13 15 17 18 19 20  
 21 22
- Euconulus* sp.  
 W-43 (?)
- Euconulus chersinus*  
 W-28  
 MICH 1 9 17 18 20 21 22 23 25 26 28 31 32  
 33 34 38 39
- Euconulus chersinus polygyratus*  
 MICH 40
- Euconulus fulvus*  
 K-6 --- Y-2 5 6 7 8 10 12 13 14 17 --- Y-21  
 --- I-5 --- S-1 2 3 4 7 --- W-2 4 5 6 9 10  
 12 15 16 17 19 20 21 22 28 56 57 58 60 61 62  
 64 65 66 67 69 73  
 MAN 39  
 MICH 1 9  
 MINN 1 2 4 5 7  
 OHIO 43  
 ONT 7 8 10
- Gastrocopta* sp.  
 S-1 --- W-28
- Gastrocopta armifera*  
 N-2 --- K-3 6 7 --- Y-3 10 14 19 20 ---  
 I-3(?) 4 5 --- S-1 2 3 4 5 6 --- W-1 8 9 24  
 28 62 63 64 65 70 73 --- U-3 4 10 12 13 14  
 MICH 32 33 35  
 OHIO 1 4 7 43  
 ONT 11
- Gastrocopta chauliodonta*  
 N-1 2 --- A-1
- Gastrocopta contracta*  
 K-2 --- Y-8 10 18 --- S-1 2 3 4 5 6 ---  
 W-24 26 28 56 57 58 59 --- U-10 13  
 MICH 5 21 22 23 25 26 32 33 40  
 OHIO 1 4 7 43  
 ONT 2 3 10 11 12 14
- Gastrocopta corticaria*  
 W-28  
 MICH 25  
 OHIO 43  
 ONT 3 11
- Gastrocopta cristata*  
 PLI-4 --- N-1 2 --- A-1 --- Y-2 13 15 17  
 18 19 20 --- S-1 2 3 4 5 6
- Gastrocopta* cf. *G. falcis*  
 K-3
- Gastrocopta falcis*  
 Y-11 13
- Gastrocopta franzenae*  
 PLI-1 2 3 4
- Gastrocopta holzingeri*  
 PLI-1 3 --- Y-6 17 --- S-1 2 3 4 6 --- W-6  
 OHIO 1 4 7
- Gastrocopta mcclungi*  
 K-3 --- I-4

*Gastrocopta paracristata*

PLI-1 2 3 4 --- A-1

*Gastrocopta pellucida hordeacella*

PLI-2 3 --- N-2 --- S-2 3 4

*Gastrocopta pentodon*

S-1 --- W-28 48 49 50 51 67

MICH 18 25 26 32 33 34 36

OHIO 1 4 43

ONT 2

*Gastrocopta proarmifera*

K-1 3 5 --- Y-2 6 7 8 11 12 13 14 15 16

17 19 20 21

*Gastrocopta procera*

N-2 --- K-3 --- Y-8 16 17 18 --- I-4 ---

S-1 6 --- W-73 --- U-10(?)

*Gastrocopta rexroadensis*

PLI-1 2

*Gastrocopta riograndensis*

I-3(?)

*Gastrocopta scaevoscala*

PLI-4 --- N-2

*Gastrocopta tappaniana*

PLI-1 3 4 --- N-1 2 --- A-1 --- Y-2 3 4 5

6 8 10 11 12 14 15 17 18 19 20 --- I-3 7

--- S-1 (cf.) 2 3 4 5 6 --- W-28 54 56

57 58 59 70

MINN 3 4

OHIO 1

*Gastrocopta tridentata*

Y-7

*Guppya sterkii*

W-28

OHIO 43

*Haplotrema concavum*

W-24 25 26 28 --- U-8 9 12 13 14

MICH 1 2

OHIO 22 23 24 25 26 43

ONT 7 8 11 12 13

QUE 6

*Hawaiiia minuscula*

PLI-1 2 3 4 -- N-1 2 --- A-1 --- K-1 4 ---

Y-2 3 4 6 7 10 11 12 13 14 15 16 17 18 19 20

--- I-3 --- S-1 2 3 4 5 6 --- W-2 3 4 5 8 9

15 17 20 21 22 23 28 35 44 47 56 57 58 59 60

63 --- U-10

MICH 22 25 28 32 33 34 39

OHIO 1 4 29 43

*Hawaiiia minuscula (cont.)*

MINN 3

ONT 11

*Helicodiscus sp.*

W-43

*Helicodiscus parallelus*

N-2 --- K-2 3 --- Y-7 8 10 11 16 17 18 ---

I-3 --- S-1 2 3 4 5 --- W-8 9 14 15 21 22

24 28 56 57 58 59 --- U-2 4 10 12 13

MICH 1 7 8 25 26 32 33 34 39 40

MINN 2 4 5 7 22b

OHIO 1 6 7 25 43

ONT 3 8 12

QUE 6

*Helicodiscus singleyanus*

PLI-1 3 4 --- N-1 2 --- A-1 --- K-3 ---

S-2 4 5 6 --- W-3 9 17 21 26

OHIO 43

*Helicoid, undet. fragments*

W-43

*Hendersonia occulta*

K-2 4 6 --- Y-2 7 21 --- I-5 --- S-7 ---

W-4 5 60 61 62 64 65 73 --- U-7 10 12 13 14

MICH 40

*Mesodon appressus*

W-24 --- U-8 9 10 12 13

*Mesodon clausus*

W-26 35 --- U-9

OHIO 24

*Mesodon dentiferus*

ONT 7

*Mesodon elevatus*

W-24 25 26 --- U-8 9 10 12 13

OHIO 1

*Mesodon inflectus*

W-24 26 --- U-9 13

OHIO 1 2 3 5 7 27 28 43

ONT 11 12 13 14

*Mesodon mitchellianus*

W-24 26

OHIO 43

*Mesodon pennsylvanicus*

W-24 28 --- U-9

OHIO 43

*Mesodon sayanus*

MICH 1 2 7

ONT 7 8

- Mesodon thyroidus*  
 W-24 25 26 28 --- U-8 9 10  
 MICH 1  
 OHIO 5 7 23 24 29 43  
 ONT 7 12
- Mesodon zaletus*  
 W-24 26 --- U-10  
 OHIO 1 2 5 7  
 ONT 11 12 13 14
- Mesomphix cupreus*  
 OHIO 43
- Mesomphix inornatus*  
 OHIO 22  
 ONT 8
- Mesomphix perlaevis*  
 OHIO 22
- Nesovitrea? sp.*  
 PLI-1
- Nesovitrea binneyana*  
 W-24(cf.) 56 57 58 59  
 MICH 1 40  
 MINN 1 2 3 4 5 7  
 ONT 7
- Nesovitrea electrina*  
 PLI-3 --- N-2 --- K-2 6 --- Y-2 6 7 8 11  
 12 13 14 16 17 19 20 21 --- I-3 5 ---  
 S-1 2 3 4 --- W-2 4 5 6 12 28 63 64 65 67  
 73 --- U-7 14  
 MICH 20 25 26 27 33 34  
 OHIO 4 26 43  
 ONT 7 8 10 14
- Oxyloma sp. (?)*  
 K-5
- Oxyloma decampi gouldi*  
 K-6 --- Y-21 --- I-5 --- W-64
- Oxyloma navarrei*  
 Y-9 10 11
- Oxyloma retusa*  
 N-2 --- S-6 --- W-26(?) 27 28 35 56 57 58  
 59 73 --- U-12 13  
 MICH 5 15 16 17 19 24 25 36 40  
 MINN 6 13b 16  
 NY 34  
 OHIO 7 29 31 39 43  
 ONT 7 8 10
- Oxyloma retusa higginsi*  
 OHIO 4 19
- Oxyloma verrilli*  
 MAN 39
- Pallifera sp.*  
 OHIO 29
- Pallifera dorsalis*  
 MICH 9  
 OHIO 43
- Philomycus caroliniensis*  
 MICH 3 4 25  
 OHIO 5 43  
 ONT 7 10
- Philomycus rushi*  
 MICH 25 26 28 29 32 33
- Paravitrea multidentata*  
 OHIO 43
- Planogyra asteriscus*  
 MICH 2  
 MINN 7  
 ONT 3
- Polygyra rexroadensis*  
 PLI-3 4
- Polygyra texasiana*  
 Y-17
- Punctum minutissimum*  
 K-6 7 --- Y-21 --- I-5 7 --- S-1 --- W-28  
 56 57 58 62 63 64 65 70  
 MICH 18 25 26 32 33  
 OHIO 1 43  
 ONT 3  
 QUE 6
- Pupilla blandi*  
 Y-17 --- I-3 --- S-1 4 6 --- W-1 2 4 5 9 11  
 12 15 16 17 19 20 21 22 23 73(?)
- Pupilla muscorum*  
 K-2 4 6 7 --- Y-2 5 6 7 8 12 13 --- Y-14 16  
 17 19 20 --- S-6 7 --- W-1 3 4 5 6 7 8 9  
 11 12 13 14 15 16 17 18 19 20 21 22 23 60  
 61 62 64 65 66 67 68 69 73  
 MAN 39
- Pupilla muscorum sinistra*  
 Y-6 7 11 12 --- S-6
- Pupillid?*  
 PLI-2 --- A-1 (n. gen.?)
- Pupoides albilabris*  
 PLI-1 3 4 --- N-1 2 --- A-1 --- K-3 5 ---  
 Y-3 4 6 11 15 17 18 19 20 --- I-3 4 ---  
 S-1 2 3 4 5 6 --- W-24 28 73 --- U-13



*Pupoides albilabris* (cont.)

MICH 32 33

OHIO 43

*Pupoides inornatus*

PLI-2 3 --- N-1 --- S-6

*Retinella* sp.

W-52 53 54

QUE 6

*Retinella indentata*

W-26 27 28 56 57 58 59 73 --- U-4 12

MICH 1 3 4 9 21 25 26 27 28 29 32 33

OHIO 1 4 43

ONT 10

*Retinella indentata paucilirata*

OHIO 22

*Retinella rhoadsi*

S-1 (cf.) --- W-28

MICH 1

*Retinella wheatleyi*

W-28

OHIO 23 26 43

*Stenotrema* sp.

I-6 --- W-43 44

*Stenotrema fraternum*

U-10 13

MICH 1 2 3 4 7 8 9 21 23 25 26 27 28 29 31

32 33 34 39 40

OHIO 1 23 24 25 26 28

ONT 11

*Stenotrema hirsutum*Y-21 --- I-5 --- W-25 26 28 --- U-3 9 10  
13 14

MICH 21 25 28 29 36

OHIO 23 24 25 26 27 29 43

*Stenotrema leaii*

K-1 3 6 --- Y-5 7 8 11 12 13 16 21 --- I-4

5 7 --- S-1 2 3 4 5 6 --- W-24 25 28

35 61 64 65 67 73 --- U-3 9 10 14

MICH 6 30

OHIO 4 7 43

ONT 7 8

QUE 6

*Stenotrema stenotrema*

W-24

*Striatura exigua*

MICH 18

OHIO 43

*Striatura exigua* (cont.)

ONT 2 3

QUE 6

*Striatura ferrea*

OHIO 43

QUE 6

*Striatura milium*

W-5 6 9 12 16 17 19

MICH 17 18 23 25

MINN 3 7

OHIO 43

ONT 2 3

QUE 6

*Strobilops* sp.

QUE 6

*Strobilops aenea*

OHIO 29

*Strobilops affinis*

W-28

MICH 20 21

*Strobilops labyrinthica*PLI-1 --- K-6 --- Y-21 --- I-5 --- W-28  
56 57 58 59 60 --- U-12 13 14

MICH 1 4 9

MINN 1 2 3 4 5 6 7 8

OHIO 43

ONT 10

*Strobilops labyrinthica virgo*

MICH 40

OHIO 43

*Strobilops sparsicosta*

PLI-2 3 --- N-1 2 --- Y-2 5 6 12 17 18 19 20

*Strobilops texasiana*

S-1

cf. *Succinea*

PLI-1 2 3 4 --- N-1 2 --- A-1

*Succinea* sp.

W-25

*Succinea avara*

Y-12 15 --- S-1 (cf.) --- W-1 2 3 4 5 6 7 8

9 10 11 12 13 14 15 16 17 18 19 20 21 22

23 26 27 28 43 44 51 52 53 54 55 56 58

59 73 --- U-6

MAN 39

MICH 1 5 22 32 33 34 36 40

NY 42

OHIO 7 43

ONT 11 12 14

- Succinea avara* var.  
Y-21
- Succinea grosvenori*  
K-2 4 --- Y-2 3 4 5 6 7 8 11 12 13 14 15 16  
17 18 19 20 --- I-1 2 3(?) 4 --- S-1 7 ---  
W-2 4 5 6 7 9 12 13 15 16 17 18 19 20 21  
43 44 60 61 64 --- U-3
- Succinea "obliqua"*  
U-4
- Succinea ovalis*  
Y-11 16 --- I-6 --- S-1 --- W-2 24(?) 27  
28 35 48 49 50 51 62 63 --- U-4 (?) 6  
12 13  
MICH 1 7 8 17 20 25 28 29 32  
MINN 3 7  
OHIO 57 43  
ONT 7 8 10
- Triodopsis albolabris*  
W-24 26 28 --- U-2 8 9 10 13  
MICH 1 2 4 7 8 9 21 22 25 26 27 28 29 32  
33 34 36 40  
OHIO 1 3 4 5 22 25 26 43  
ONT 7 8 10
- Triodopsis albolabris alleni*  
U-8 9
- Triodopsis albolabris goodrichi*  
ONT 12 13
- Triodopsis denotata*  
W-24 28  
OHIO 23 43  
ONT 7 11
- Triodopsis divesta*  
U-3
- Triodopsis fraudulenta*  
ONT 11 12 13
- Triodopsis fraudulenta vulgata*  
W-26 28  
OHIO 5 7 27 28 43
- Triodopsis multilineata*  
W-24 26 28 --- U-1 2 4 6 10 12 13  
OHIO 4 7 43
- Triodopsis tridentata*  
W-24 25 28 --- U-12  
OHIO 22 23 24 25 26 29 43
- Vallonia* sp.  
U-10
- Vallonia albula*  
I-7 --- W-64 65 66 67 69
- Vallonia costata*  
W-73  
MICH 32 35  
OHIO 43
- Vallonia cyclophorella*  
S-6
- Vallonia excentrica*  
OHIO 4 43
- Vallonia* cf. *V. excentrica*  
K-6 --- I-7
- Vallonia gracilicosta*  
PLI-3 --- K-1 3 4 7 --- Y-2 5 6 7 8 10 11  
12 13 14 15 16 17 18 19 20 --- I-3 ---  
S-1 2 4 6 --- W-1 2 3 4 5 6 7 8 9 10 11  
12 13 14 15 16 17 18 19 20 21 22 23 43  
44 63  
MINN 2 5
- Vallonia parvula*  
PLI-4 --- S-1 2 3 4 5 6  
OHIO 1 4  
ONT 11 14
- Vallonia perspectiva*  
PLI-1 3 --- N-2 --- A-1
- Vallonia pulchella*  
N-1 --- K-3 --- Y-2 8 10 11 12 15 19 20 ---  
W-24 28 73 --- U-4 7 10  
MICH 31 32 33 34 35 38  
OHIO 1 4 7 43  
ONT 7
- Venridens demissus*  
OHIO 25 26
- Venridens intertextus*  
OHIO 22 23 24 43
- Venridens ligerus*  
W-24 26 28 --- U-9 10  
OHIO 22 23 24 27 43
- Venridens suppressus*  
MICH 25 27 28 32 33  
OHIO 43
- Vertigo* sp.  
QUE 6 (3 species)
- Vertigo alpestris oughtoni*  
K-6 --- S-7 --- W-43 44 60 61 64 66 67  
68 69  
MAN 39
- Vertigo binneyana*  
MAN 39

- Vertigo bollesiana*  
ONT 2
- Vertigo coloradensis*  
W-2
- Vertigo elatior*  
K-6 7 --- Y-21 --- I-5 7 --- W-28 63 64  
65 66 69 70  
MICH 40  
OHIO 43
- Vertigo gouldi*  
Y-6 8 12 14 --- S-6 --- W-73  
OHIO 43  
ONT 2
- Vertigo gouldi hannai*  
K-7 --- W-70
- Vertigo gouldi hubrichti*  
K-6 --- W-62 65
- Vertigo gouldi paradoxa*  
W-4 5 6 7 9 12 15 17 19
- Vertigo hibbardi*  
PLI- 1 3
- Vertigo milium*  
PLI- 1 2 3 4 --- N-1 2 --- A-1 --- K- 1 5  
--- Y-2 4 6 8 10 12 14 17 18 --- S- 1 2 3  
4 6 --- W-3 13 28 56 57 58 59  
OHIO 1 43
- Vertigo modesta*  
K-4 6 --- Y-2 7 21 (cf.) --- I-5 7 --- W-4  
5 6 9 12 13 15 16 17 18 19 20 21 22 ---  
W-62 64 65 66 69
- Vertigo modesta corpulenta*  
W-73
- Vertigo morsei*  
W-28 52 53 54 55 56 57 58 59
- Vertigo nylanderi*  
I-7
- Vertigo ovata*  
N-1 2 --- A-1 --- K-1 4 5 --- Y-2 3 5 10  
11 12 13 14 15 17 18 19 20 --- S-1 2 3  
4 5 6 --- W-28 35 48 49 50 51 67  
MICH 17 22  
OHIO 43  
ONT 2 3 7
- Vertigo pygmaea*  
S-7 --- W-60 61
- Vertigo tridentata*  
Y-10 --- W-2 28  
OHIO 43
- Vertigo ventricosa*  
MICH 8 18  
MINN 3 4  
OHIO 43
- Vitrina limpida*  
MICH 1  
MINN 3 7  
ONT 7
- Zonitoides sp.* ---- QUE 6
- Zonitoides arboreus*  
N-2 --- K-2 --- Y-7 8 10 11 12 16 --- S-1  
2 3 4 5 6 --- W-6 7 9 17 26 27 28 56 57  
58 59 73 --- U-10 14  
MICH 1 3 4 7 8 9 17 20 23 25 26 27 28 31 32  
33 34 36 38 39 40  
MINN 1 2 3 4 5 6 7 8 22b  
OHIO 1 3 4 7 26 43  
ONT 7 8 10 11 14
- Zonitoides nitidus*  
MICH 24 30  
OHIO 43  
ONT 3 7
- Zoogenetes harpa*  
MICH 1 5

## Discussion

**NAIADES.** The scarcity of Naiades in Pleistocene deposits is worth noting. Sparks (1964:20) has noted a similar scarcity in the Pleistocene of England and attributes it to the fact that "thick-shelled genera, *Unio* and *Potamida*, usually shale off into flakes, while the thin-shelled *Anodonta* is easily crushed in the sediment." He

notes also that in open sections, where the shells can be extracted with care, more Naiades turn up. There is no doubt that snails, in general, are more numerous than Naiades in absolute numbers of individuals; the size of the adult is a factor here and accounts for the relatively greater frequency of Sphaeriidae as well as snails.

Nevertheless it is a striking fact that in deposits that have been collected by methods which should turn up Naiades in abundance (e. g. W-28-42 and 45-59) they are scarce or lacking and represented by few species, as compared with their abundance and variety in northern lakes at present. This scarcity may be due to the hazards of distribution as parasites of fish but it would seem that some other factor enters into play here to yield such a low incidence of Naiades. Perhaps the fact that many Pleistocene collections are from lakes that did not form part of a river system may have something to do with the observed scarcity of Naiades. On the other hand, there is the possibility that the chaotic drainage - or lack of drainage - in lakes formed on a moraine surface may have prevented fish from reaching the isolated ponds and lakes studied. If this is true, we can only wonder at the much more efficient methods of dispersal available to Sphaeriidae and snails in general; although there are notable exceptions to their generally wide distribution which will be discussed later in this paper. Finally, it should be pointed out that Naiades were much more abundant in some beds of the Paleocene and Eocene (e. g. the Flagstaff, Colton, and Green River formations of Utah) than in the Pleistocene associations studied here. In addition, although some of the Naiades in these Tertiary beds have suffered severe crushing and distortion, they do not flake off until exposed to weathering; freshly exposed specimens preserve the shell intact and the details of the umbonal sculpture are as clear as they were in life. To sum up, judging by frequency of occurrence alone, Naiades are the scarcest of the five ecological groups of Mollusca recorded in Pleistocene assemblages in North America. Whether this was due to inferior means of dispersal or unsuitability of environment for most species remains to be ascertained.

**SPHAERIIDAE.** Discussion of this group can be undertaken much more satisfactorily since Herrington (1962) has given us a rational arrangement of the species. His classification has been followed in the lists presented in the first

part of this paper and many specific names proposed by Sterki have been reduced to synonymy as advocated by Herrington.

A striking fact which immediately stands out is the number of circumpolar species that are found in the Pleistocene deposits of North America along with a small number of purely North American species. These records should lay to rest once and for all the possibility that some of these European species, first known as living species, were introduced here. They may have been reintroduced by Man but we can be certain that most of them had already come to our continent by other means than human introduction during the Pleistocene. In fact, some of them may have originated here and have spread to Asia and Europe where they happened to attract first notice by scientists; the fact that a genus or species was first described from Europe by Müller, Poli, or Pfeiffer does not mean that it originated there. This point needs to be emphasized as it has been taken for granted by many writers in the past, in the Mollusca and in other groups of invertebrates and vertebrates.

As compared with the Naiades, the Sphaeriidae have excellent means of dispersal and a high reproduction rate - in spite of a smaller number of young - as exemplified by their incidence both in Pleistocene and present non-marine environments. On the other hand, the species are distributed in a seemingly - perhaps truly - haphazard way. To exemplify this, we need only examine the lists of sphaeriids for deposits in northern Ohio (W-27, 28, 29, 45-51). Within a restricted area, in penecontemporaneous deposits, the records for individual species vary not only from deposit to deposit as a whole but in the various stratigraphic levels within a single deposit. (See Table 1).

TO BE CONTINUED IN A FUTURE

NUMBER OF STERKIANA