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RECENT COLLECTIONS OF FRESHWATER MUSSELS (BIVALVIA: UNIONIDAE) FROM WESTERN NEW YORK

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ABSTRACT – We surveyed the unionid faunas of 52 sites in western New York between 1987 and 1990. We found living populations of 23 species, including *Villosa fabalis* and *Lampsilis fasciola*. A subfossil shell of *Obovaria subrotunda* from the Allegheny River basin represents the first record of this species from New York. Many of the unionid communities of the Allegheny River basin are intact, whereas many communities of the Great Lakes basin in the Buffalo metropolitan area have been destroyed. Between six and 17 species have apparently been lost from the formerly rich fauna of the Niagara-Erie basin. We review geological evidence to support the idea that the Niagara River may have held some rare Ohioan unionid species until recently.

KEY WORDS – Unionidae, New York, Niagara River, Allegheny River, ecology, distribution, endangered species.

INTRODUCTION

Western New York forms the northeastern boundary of the Ohioan unionacean province. While some Ohioan species are found in central and eastern New York (Clarke & Berg, 1959; Harman, 1970; Strayer, 1987), the representation of Ohioan species drops sharply from Buffalo to Albany and farther east. Western New York, therefore, represents both the gateway of postglacial faunal exchange between the Ohioan and Atlantic Slope unionid faunas and a potential refuge for increasingly scarce Ohioan species (cf. Stansbery, 1970).

The only major work on the molluscan fauna of western New York was done by Robertson & Blakeslee (1948), although a number of important records were published by Lewis (1874), Marshall (1895), Letson (1909) and Baker (1928). We surveyed the waters of western New York to determine the present status of unionid populations, especially for several rare species known historically from the region, and to gather distributional records from areas (chiefly the Allegheny basin) that were overlooked by previous authors.

THE STUDY AREA

This paper is concerned with the area west of the Genesee River basin in New York, encompassing parts of the Allegheny River, Lake Erie, Niagara River, and Lake Ontario basins (Fig. 1). Almost all of this area was

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so the various sedimentary rocks of the region are mantled by a wide variety of glacial deposits (Richard & Fisher, 1970; Cadwell, 1988). The land is rolling, and supports agricultural fields and forests as well as urban and suburban areas. Metropolitan Buffalo (roughly bounded by stations 28, 36, 44, and 30 on Fig. 1) is the only large city in the region. Streams in the area range in size from headwater streams to the Allegheny and Niagara Rivers, with mean annual discharges of 79 and 5,777 m^3/sec, respectively (Hood *et al.*, 1983). Stream water in the study area typically is hard and nutrient-rich (*e.g.*, Hood *et al.*, 1983).

METHODS

We visited 52 sites in the study area (Fig. 1; Table 1) during the summers of 1987, 1989, and 1990, chiefly during periods of low, clear water. We collected mussels by handpicking while wading or snorkeling, sometimes with the aid of glass-bottom buckets. At a few very turbid sites, we searched for mussels with our hands, which greatly reduced the efficiency of our survey. Most specimens were identified and returned immediately to the sediments. Voucher specimens from this work have been deposited in the New York State Museum (NYSM) in Albany. In addition, we searched the collections of the Museum of Comparative Zoology (MCZ), the American Museum of Natural History (AMNH), the New York State Museum (NYSM), and the Buffalo Science Museum (BSM) for relevant lots. Mussel nomenclature follows Turgeon *et al.* (1988).

RESULTS AND DISCUSSION

The upper Allegheny drainage in New York (stations 1-26) now contains a typical Ohioan headwater assemblage of 15 species, plus two species known only from old, empty valves (Table 2). All 17 of these species were reported from the Allegheny drainage in Pennsylvania (Ortmann, 1919). An additional 20 species are known historically from the lower Allegheny drainage in Pennsylvania (Ortmann, 1919), but most of these are large-river species that would not be expected to occur as far upstream as New York. A few species found by Ortmann but not by us *(e.g., Pleurobema clava, Quadrula cylindrica, Villosa iris)* do occur in small streams and may yet turn up in New York.

All but two of the 15 species now found in the New York waters of the Allegheny drainage are common and widespread. *Villosa fabalis,* recently listed as a Category Two species (possibly endangered or threatened) under the Federal Endangered Species Act, lives in a short stretch of Olean Creek (stations 17-19). The population probably is small. All shells and the living animal we found were on shallow, gravelly riffles among *Myriophyllum,* apparently the typical habitat for this species (Ortmann, 1919; van der Schalie, 1938). The only other records of *V. fabalis* from New York are from Chautauqua Lake and its outlet (Ortmann, 1919). *Lampsilis fasciola* is found in small numbers at several sites in the upper Allegheny drainage in New York. This Ohioan species is rare throughout much of its former range (van der Schalie, 1975; Cummings & Berlocher, 1990). Previous records of *L. fasciola* from New York include a few historical records from the Great Lakes basin in western New York (Marshall, 1895; Robertson & Blakeslee, 1948).

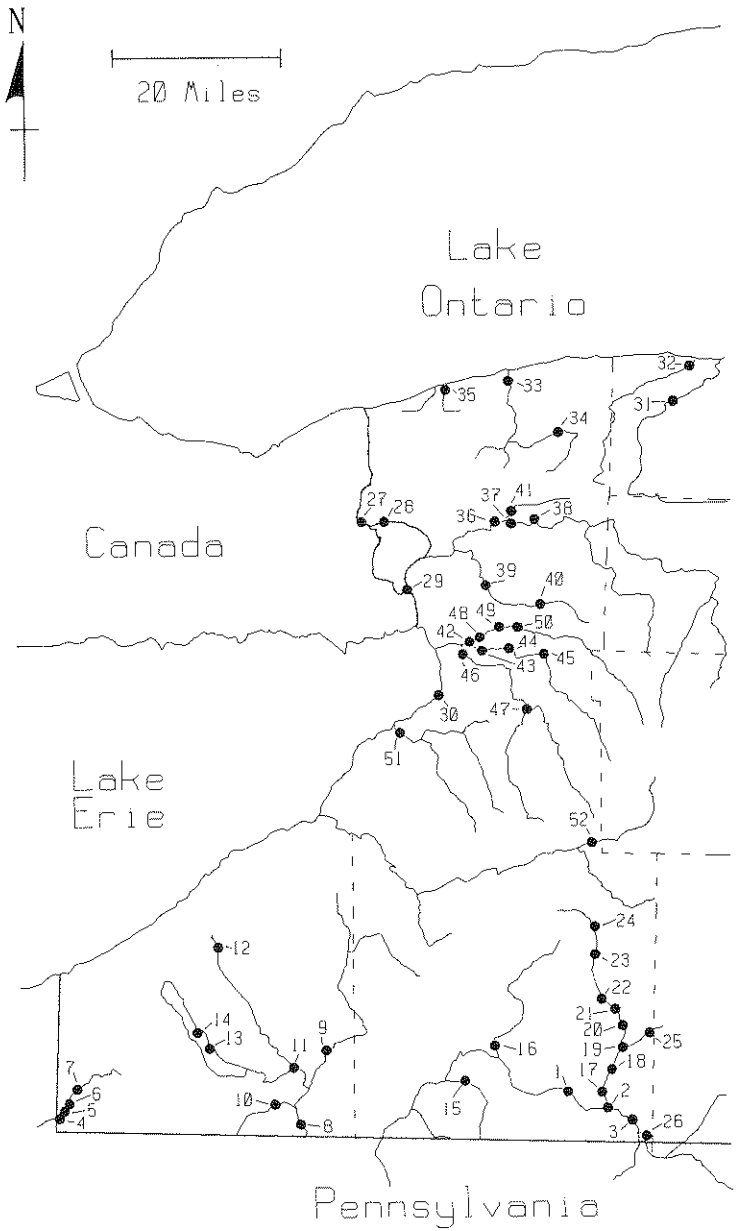

FIG. 1. Collecting sites in western New York. Dashed lines show county boundaries. See Table 1 for precise locations of sampling sites.

TABLE 1. Location of sampling sites shown in Fig. 1.

1. Allegheny River at Route 17 downstream of Allegany, town of Allegany, Cattaraugus Co.
2. Allegheny River at Route 16, town of Olean, Cattaraugus Co.
3. Allegheny River at Steam Valley Road, town of Portville, Cattaraugus Co.
4. French Creek at New York-Pennsylvania line, town of French Creek, Chautauqua Co.
5. French Creek at White Hill Road, town of French Creek, Chautauqua Co.
6. French Creek at Marvin Road, town of French Creek, Chautauqua Co.
7. French Creek at King Road, town of French Creek, Chautauqua Co.
8. Conewango Creek at Riverside Road, town of Kiantone, Chautauqua Co.
9. Conewango Creek at Route 62, town of Poland, Chautauqua Co.
10. Stillwater Creek at Bacon Road, town of Kiantone, Chautauqua Co.
11. Junction of Conewango Creek and Chadakoin River, town of Ellicott, Chautauqua Co.
12. Cassadaga Creek at Luce Road, town of Stockton, Chautauqua Co.
13. Chautauqua Lake at Bemus Point, town of Ellery, Chautauqua Co.
14. Chautauqua Lake at Long Point, town of Ellery, Chautauqua Co.
15. Red House Brook at Route 17, town of Red House, Cattaraugus Co.
16. Great Valley Creek at Route 219, town of Great Valley, Cattaraugus Co.
17. Olean Creek at Route 16, town of Olean, Cattaraugus Co.
18. Olean Creek at Union Valley Road, town of Olean, Cattaraugus Co.
19. Olean Creek at Dutch Hill Road, town of Hinsdale, Cattaraugus Co.
20. Ischua Creek at Farwell Road, town of Ischua, Cattaraugus Co.
21. Ischua Creek at Dutch Hill Road, town of Ischua, Cattaraugus Co.
22. Ischua Creek at Pierce Hill Road, town of Franklinville, Cattaraugus Co.
23. Ischua Creek at Main Street, Franklinville, Cattaraugus Co.
24. Ischua Creek at Route 16/98, town of Farmersville, Cattaraugus Co.
25. Oil Creek at Cattaraugus-Allegany Co. line
26. Oswayo Creek at North Carroll Road, town of Portville, Cattaraugus Co.
27. Niagara River at Goat Island, town of Niagara, Niagara Co.
28. Niagara River at Buckhorn Island State Park, town of Grand Island, Erie Co.
29. Niagara River at Beaver Island State Park, town of Grand Island, Erie Co.
30. Lake Erie at Athol Springs, town of Hamburg, Erie Co.
31. Oak Orchard Creek at Townline Road, town of Ridgeway, Orleans Co.
32. Johnson Creek at Route 18, town of Carlton, Orleans Co.
33. Eighteenmile Creek at Burt Dam Park, town of Newfane, Niagara Co.
34. Eighteenmile Creek at Hartland Road, town of Hartland, Niagara Co.
35. East Branch of Twelvemile Creek at Route 18, town of Wilson, Niagara Co.
36. Tonawanda Creek at New Road, town of Amherst, Erie Co.
37. Tonawanda Creek at Transit Road, town of Pendleton, Niagara Co.
38. Tonawanda Creek at Rapids, town of Lockport, Niagara Co.
39. Ellicott Creek at Glen Road, Williamsville, town of Amherst, Erie Co.
40. Ellicott Creek at Stony Road, town of Lancaster, Erie Co.
41. Mud Creek at Transit Road, town of Pendleton, Niagara Co.
42. Buffalo River at Harlem Road, town of West Seneca, Erie Co.
43. Buffalo Creek 1 km below Route 277, town of West Seneca, Erie Co.
44. Buffalo Creek at Transit Road, town of Elma, Erie Co.
45. Buffalo Creek at Girdle Road, town of Elma, Erie Co.
46. Cazenovia Creek at Cazenovia Park, town of Lackawanna, Erie Co.
47. Cazenovia Creek at Route 20A, town of Aurora, Erie Co.
48. Cayuga Creek at Clinton Street, town of West Seneca, Erie Co.
49. Cayuga Creek at Como Park Road, town of Cheektowaga, Erie Co.
50. Cayuga Creek at Transit Road, town of Cheektowaga, Erie Co.
51. Eighteenmile Creek at Route 5, town of Hamburg, Erie Co.
52. Cattaraugus Creek at Route 16, town of Sardinia, Erie Co.

TABLE 2. Collection records of unionids from the Allegheny River basin in western New York. Site locations are given in Table 1 and Fig. 1. Numbers show the numbers of living animals found at each site. D = recently dead shells found, d = subfossil shells found, L = living animals found but not counted.

Site Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Actinonaias ligamentina	D	1	69		L	L		d	7								31									18
Alasmidonta marginata	D	D	d				d		1						13		D		L							
Amblema plicata								d																		
Anodonta grandis								d	4		D								D							D
Anodontoides ferussacianus							d																			1
Elliptio dilatata	D	1	27		L	L			D				D	L			62	1	L							44
Lampsilis cardium	D	1	59		L									L	4		9		d							18
Lampsilis fasciola		1	5		D												2									1
Lampsilis siliquoidea			3		L	L		d	16		1		D	L					d				d			2
Lasmigona compressa												1			3											
Lasmigona costata	D	D	21		L	L			1						3		34	5	L							8
Ligumia recta		D	4																							
Obovaria subrotunda								d																		
Pleurobema coccineum	D	1	8			D		d									3									2
Ptychobranchus fasciolaris					L	L							D	L												
Strophitus undulatus		D			L				3					D	18		D	D	L				D			
Villosa fabalis																	1	d	d							
Number of species	6	9	9	0	8	6	2	6	7	0	2	1	3	5	5	0	9	4	8	0	0	0	2	0	0	9
Person-hours	2	3	4.5	1.8	2.8	2.7	1.2	2.2	2	1	2	1	0.3	1	0.3	1	4	0.7	3.3	0.5	0.6	0.5	1.5	1.5	1	1.7

The widely quoted record of *L. fasciola* from Butternut Creek in Otsego County (*e.g.*, Marshall, 1895) is based on a malformed specimen of *Lampsilis radiata* (ANSP 32391).

Most of the streams in the Allegheny basin in New York still support healthy mussel communities. Notable exceptions include the lower Conewango Creek (stations 8, 11), which probably has suffered from wastes from Jamestown and local agriculture, Oil Creek (station 25), which has been straightened and channelized, and two stations on French Creek (stations, 4, 7) that inexplicably lacked unionids. The area of the Allegheny River impounded by Kinzua Dam (below station 1) almost certainly does not now contain its original mussel fauna, but we did not survey this area.

In contrast, mussel communities at many sites in the Great Lakes basin in western New York have been badly degraded by human activities in metropolitan Buffalo. The Buffalo River drainage (stations 42-50), which flows through suburban areas, has been particularly badly affected. We found sparse, species-poor mussel communities in the Buffalo River drainage (Table 3) in contrast to the rich communities (17 species, including *Simpsonaias ambigua)* reported by Letson (1909) and others. Many streams outside the immediate metropolitan Buffalo area (*e.g.*, stations 31-41) still contain healthy communities of mussels. For example, Tonawanda Creek in Erie County (stations 37, 38) supported 12 species of unionids both in the 1930's and 1940's (Robertson & Blakeslee, 1948) and in 1987 and 1990 (this study), although the lists of species found in these two periods were not identical.

We found living representatives of 19 species of unionids plus dead shells of two others that probably still live in the Great Lakes basin in western New York (Table 3). None of these species is rare globally. Apparently, many species of mussels have disappeared from the Great Lakes basin in western New York over the last century or so. It is difficult to place an exact figure on the number of these local extinctions, because the historical record of mussel collections is of such mixed quality. Historical records from the Great Lakes basin in western New York (Table 4) contain species records that are well supported by photographs or museum lots (group A in Table 4), species records that are almost certainly spurious (probably based on misidentifications or switched museum labels) (group C in Table 4), and a large number of species records that are poorly supported by museum lots or photographs, but which are not implausible enough to reject outright (group B in Table 4). Many of these latter records are based on very old collections (early to mid-19th century) or represent species that are easily confused with other, more common species (*e.g.*, *Actinonaias ligamentina* with *Lampsilis* spp.; *Potamilus ohiensis* with *Leptodea fragilis*, etc.). Nevertheless, between six and 17 mussel species probably have been eliminated from the Great Lakes basin in western New York. Many of these species now are rare or endangered throughout their ranges (*e.g.*, *Epioblasma* spp., *Simpsonaias ambigua, Lampsilis abrupta, Leptodea leptodon, and Potamilus capax).*

The existence of several big-river mussels *(Epioblasma obliquata, Lampsilis abrupta, Lampsilis teres, Leptodea leptodon,* and *Potamilus capax)* in the Niagara River has been largely ignored or dismissed by most

TABLE 3. Collection records of unionids from the Great Lakes basin in western New York. Site locations are given in Table 1 and Fig. 1. Numbers show the numbers of living animals found at each site. D = recently dead shells found, d = subfossil shells found, L = living animals found but not counted.

Site Number	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Alasmidonta marginata					1																					
Alasmidonta viridis																		D								
Amblema plicata											14	23			1											
Anodonta grandis		D	D			D				D	D			1	3											
Anodontoides ferussacianus			1					1						8	5											
Elliptio complanata					34	4		115																		
Elliptio dilatata	d	d	D	D							6	3														
Fusconaia flava		D	6					8			2	2											d			
Lampsilis cardium			d	D							D									D						
Lampsilis siliquoidea	d	D	8	D	18	32		8			20	47		21	17											
Lasmigona compressa					D										1	D		3								
Lasmigona costata					10	4		4		D	9	19														
Leptodea fragilis		D	D	D		2				D	2					1	D					1				
Ligumia nasuta		1	3																							
Ligumia recta											1	D														
Obovaria olivaria	d																									
Pleurobema coccineum			1																							
Potamilus alatus			D	D		1					1											1				
Ptychobranchus fasciolaris			2	D							2	D														
Strophitus undulatus	d	D	D								1					D	8	31		D				D		
Villosa iris	d	1	D			D		L			D															
Number of species	5	8	13	6	5	7	0	6	0	3	13	7	0	3	5	3	2	3	0	2	0	2	1	1	0	0
Person-hours	0.5	1.5	5	0.7	1.3	1.7	0.7	1.3	0.4	0.1	3.2	–	1	1.5	0.7	1.5	2.6	2.5	0.3	1.5	1.5	0.7	1.5	1	1	1

TABLE 4. Species of freshwater mussels recorded from the Great Lakes basin in western New York, but not found in the present survey.

A. Well supported records	Source[a]	Location[b]
Epioblasma triquetra (Rafinesque)	2, 4	N, E
Lampsilis fasciola Rafinesque	4, 5	N
Quadrula quadrula (Rafinesque)	4	N
Simpsonaias ambigua (Say)	1, 2, 3, 6	B, E
Toxolasma parvus (Barnes)	4, 6	T
Truncilla truncata Rafinesque	2, 4	T
B. Poorly supported records		
Actinonaias ligamentina (Lamarck)	4, 5	N, T
Cyclonaias tuberculata (Rafinesque)	3	E
Epioblasma obliquata (Rafinesque)	7	N
Lampsilis abrupta (Say)	4, 10	N
Lampsilis teres (Rafinesque)	2, 5, 8	N
Lasmigona complanata (Barnes)	2, 9	?
Leptodea leptodon (Rafinesque)	3	?
Obovaria subrotunda (Rafinesque)	3	E
Potamilus capax (Green)	4, 10	N, O
Potamilus ohiensis (Rafinesque)	4, 5	B, E
Quadrula pustulosa (Lea)	4, 5	N
C. Spurious records		
Anodonta cataracta Say	5	B
Leptodea ochracea (Say)	5	B
Ligumia subrostrata (Say)	5	N
Margaritifera margaritifera (Linnaeus)	3	E
Venustaconcha ellipsiformis (Conrad)	2	?

[a]Sources: 1 = Lewis (1874), 2 = Marshall (1895), 3 = Letson (1905), 4 = Robertson & Blakeslee (1948), 5 = Letson (1909), 6 = AMNH collections, 7 = Johnson (1978), 8 = NYSM collections, 9 = ANSP (Academy of Natural Sciences of Philadelphia) collections, 10 = Johnson (1980).

[b]B = Buffalo River or its tributaries, E = Lake Erie, N = Niagara River, O = Lake Ontario or its tributaries east of the Niagara River, T = Tonawanda Creek or its tributaries, ? = specific locality not specified (*e.g.*, "near Buffalo" or "western New York").

malacologists, because the Niagara River is so far from any other known populations of these species. Indeed, as we have just noted, historical evidence for these records is equivocal, so some or all of these records may be spurious. Nevertheless, there are close zoogeographical connections between the Niagara River and the nearest known populations of these five species (the Wabash or Maumee Rivers), as already noted by Ortmann (1924). About 13,300 B.P., the present basin of Lake Erie was nearly dry (due to the low elevation of the sill at Niagara Falls). The Maumee and Detroit Rivers formed the headwaters of a large river that ran across the dry bed of Lake Erie to the Niagara River (Coleman, 1922; Calkin & Feenstra, 1985). The course of this river was interrupted only by a small lake in the deepest parts

of present-day Lake Erie. Any big-river mussels that crossed the Maumee-Wabash divide 1100 years earlier presumably would have found suitable habitat in this river and could have dispersed eastward to Niagara Falls. As the Niagara outlet rose through isostatic rebound, this river was drowned, leaving the Niagara River (and in the headwaters, the Detroit River) as the only large-river habitat in the region. There is thus every reason to believe that the Niagara River might have supported, at least until recently, a rich mussel fauna containing some outlying populations of Wabash-Maumee species. The Detroit River held 25 species of unionids as late as 1983, including some fairly large-river species such as *Epioblasma torulosa, Obovaria olivaria, Truncilla* spp., and *Obliquaria reflexa* (W. Kovalak, pers. comm.). Unfortunately, we did not have the resources to do a proper survey of the swift, very large Niagara River. Such a survey would be very desirable, to verify the existence of rare or relict mussel species in the Niagara River.

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