

# Distribution and density of three uncommon or imperiled unionid mussel species in northern New York

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## INTRODUCTION

- Eastern pearlshell *Margaritifera margaritifera*, pocketbook *Lampsilis ovata* and yellow lampmussel *Lampsilis cariosa* are listed as species of greatest conservation need in New York.
- Elktoe and Creek heelsplitter were the only species listed by Strayer and Jirka (1997) for the Little Salmon River but this is likely to be due to a lack of collecting in northern New York as no records of Eastern elliptio were recorded, which is the most common unionid mussel in New York.
- The Salmon and Little Salmon rivers flow out of the Adirondack Park and through Quebec before entering the St. Lawrence River (Fig. 1).

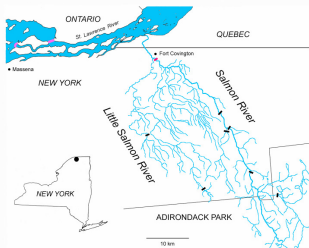


Figure 1. Watershed of the Salmon and Little Salmon rivers. The Fort Covington Dam (in red) was removed in 2009, other existing river dams are in black. The Robert Moses Power Dam (right) and Long Sault Dam (left) in the St. Lawrence River are shown in violet.

## SITE DESCRIPTION and METHODS

- Both rivers were 4th-order and have coarse sand/cobble substrate in riffles and sand/silt substrate in glides.
- The study site extended from the confluence of the Salmon and Little Salmon rivers near Lewis Marina (Fig. 2):
  - upriver 7.5 km to the Cushman Road Bridge, transect 9 in the Salmon River.
  - upriver 3.5 km to the Foster Road Bridge, transect 15 in Little Salmon River.
- Systematic sampling with three random starts was used at riffle transects, and double sampling in glide transects from 2005 through 2012.
- A maximum of 30 quadrats of 1 m<sup>2</sup> were sampled with each random start. Each quadrat was designated by placing a 1 m<sup>2</sup> PVC grid (subdivided into four 0.25m<sup>2</sup> subquadrats) on the river bottom; 20% of glide quadrats were excavated.
- An underwater viewing scope was used to facilitate finding mussels.
- 37 middens (magenta boxes in Fig. 2) were searched and articulated empty shells were identified and counted.

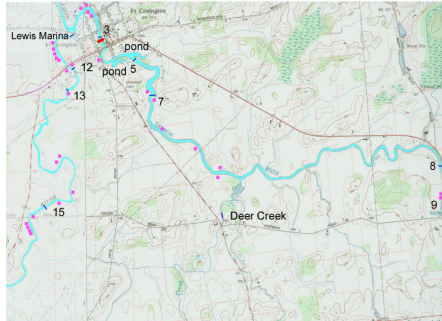


Figure 2. Transects used for sampling mussels. The transects at Lewis Marina and Deer Creek were parallel to the river, all others were perpendicular to the river. Transect width ranged from 25 m to 70 m. Two ponds were drained by the removal of the dam (in red) in 2009. Middens are shown as magenta boxes.

- Population estimates of species were made for transects (Strayer and Smith 2003) but were not extrapolated to the study area.

## RESULTS

### Distribution

- 1404 living mussels of twelve species were collected in transects, dominated by Eastern elliptio (89%), which was found at all transects. One additional species, triangle floater *Alasmidonta undulata*, was collected in benthos.
- Living Eastern pearlshell was collected only near transect 9 in 2012.
- Living pocketbook and yellow lampmussel were collected in both rivers but were concentrated in the lower part of the rivers (Fig. 3).
- Living floater was collected at Lewis Marina and transect 12; these were new records for northern New York; 92% were collected in the ponds (Fig. 2) that were drained when the dam was removed in 2009.
- Distribution of triangle floater, cylindrical papershell, and fluted shell were more widespread when considering empty shells: empty triangle floater occurred at transects 7, 8, and 13 but only at transect 9 as living; empty cylindrical papershell occurred at transects DC, 12, 13, and 15 but only at transect 8 as living; and living fluted shell was collected at transects 12, 13, and 15 but also as empty shells at two middens in the lower Salmon River.
- Distribution of other species was similar between living and empty shells.

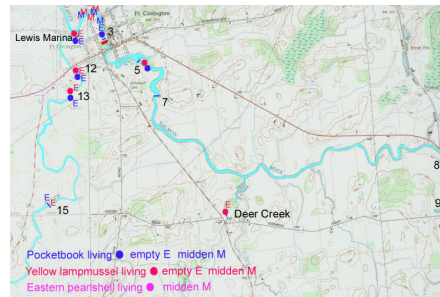


Figure 3. Distribution of Eastern pearlshell, pocketbook, and yellow lampmussel collected as living, empty shells, and shells from middens from 2005-2012. The Fort Covington Dam, removed in 2009, is shown as a red bar. Numbers refer to transects.

- Living mussel distribution was more similar across riffle transects than across glide transects (Fig. 4).
- 87% of live mussels in glide transects was collected in 40% of the available habitat area at the river edges.
- River edges in glides were composed of silt and very fine sand, while the river center was composed of medium and coarse sand (Cooper 2013).
- More mussels were collected on the east shore than on the west shore in glide transects.



Pocketbook (upper pair; female 80 mm SL and male 96.5 mm SL) and yellow lampmussel (female 83.5 mm SL and male 96.5 mm SL) from the Salmon and Little Salmon rivers.

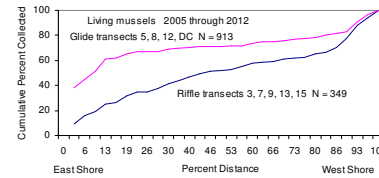


Figure 4. Distribution of five mussels collected in riffle and glide transects, excluding Lewis Marina (138 mussels), for all years combined. East and west refer to the geographical sides of the river.

### Density of living mussels

- Eastern elliptio dominated abundance of living and empty shells (Tables 1 and 2).
- Density of pocketbook and yellow lampmussel ranked 4<sup>th</sup> out of the 13 species collected.

Table 1. Living species collected from survey transects from 2005 through 2012. Mean density is based on a combined transect area of 1308 m<sup>2</sup> in each year. Living triangle floater *Alasmidonta undulata* was collected in benthic samples but not in a transect.

Species	Living	Percent of living	Mean Density N/m <sup>2</sup>
Eastern elliptio <i>Elliptio complanata</i>	1244	88.6	0.12
Eastern lampmussel <i>Lampsilis radiata</i>	61	4.3	0.006
Squawfoot <i>Strophitus undulatus</i>	36	2.6	0.003
Pocketbook <i>Lampsilis ovata</i>	14	0.9	0.001
Yellow lampmussel <i>Lampsilis cariosa</i>	12	0.8	0.001
Creek heelsplitter <i>Lasimigona compressa</i>	10	0.7	0.001
Eastern floater <i>Pyganodon cataracta</i>	7	0.5	<0.001
Fluted shell <i>Lasimigona costata</i>	10	0.7	<0.001
Elktoe <i>Alasmidonta marginata</i>	5	0.4	<0.001
Floater <i>Pyganodon grandis</i>	3	0.2	<0.001
Eastern pearlshell <i>Margaritifera margaritifera</i>	1	0.1	<0.001
Cylindrical papershell <i>Anodontaoides ferussacianus</i>	1	0.1	<0.001
Total	1404		

Table 2. Abundance of articulated empty shells from both rivers from 2005 through 2012, except for former reservoir (2009 only) and ponds (2009 and 2010, Cooper 2011). There were 20 middens in the Salmon River and 17 middens in the Little Salmon River. Forty-four shells of *Pyganodon* sp. from ponds were unidentified to species and are not included in the total.

Species	Little Salmon River		Former reservoir	Ponds	Total	
	Transects	Middens				
Eastern elliptio	1125	790	1247	3139	25	6326
Eastern lampmussel	21	79	120	49	2	271
Squawfoot	178	11	78	51	0	318
Pocketbook	8	63	6	0	0	77
Yellow lampmussel	46	72	9	2	1	130
Creek heelsplitter	3	0	0	1	0	4
Eastern floater	26	0	14	36	307	383
Fluted shell	35	11	44	0	0	90
Elktoe	11	0	8	0	0	19
Floater	0	0	0	1	20	21
Triangle floater	3	4	1	0	0	8
Eastern pearlshell	0	2	0	0	0	2
Cylindrical papershell	5	0	0	3	0	8
Total	1461	1032	1527	3284	355	7659

### Population estimates of living mussels within transects

- Eastern pearlshell population was estimated at three mussels in all transects combined but only one living mussel was collected at transect 9 in 2012.
- Pocketbook population was estimated at 45 mussels for all transects combined, but abundance could be greater downriver of transect 3 (Fig. 3) based on collections in two adjacent middens.
- Yellow lampmussel population was estimated at 33 mussels for all transects combined but could be greater in Deer Creek where density (0.3 m<sup>-2</sup>) was an order of magnitude greater than at other transects.
- Population estimates for all species are given in Table 3.

Table 3. Population estimates (and 95% CI) for 12 species collected in the Salmon and Little Salmon rivers from 2005 through 2012. Triangle floater was collected in benthic samples but the population was not estimated.

Species	Population estimate	95% CI
Eastern elliptio	3726	3485-3963
Eastern lampmussel	183	157-214
Squawfoot	108	86-136
Pocketbook	45	33-61
Yellow lampmussel	33	23-47
Creek heelsplitter	30	19-48
Eastern floater	27	16-45
Fluted shell	18	10-31
Elktoe	15	9-25
Floater	9	4-19
Eastern pearlshell	3	0.8-11
Cylindrical papershell	3	0.8-11

## DISCUSSION

- Eastern elliptio dominated the unionid community in the study area, similar to that found in the Neversink River (NY) where it accounted for 80% of the unionid mussels (Strayer and Ralley 1993).
- Species richness for living mussels was 13 which is nearly two times greater than would be expected for the Salmon River drainage area of 1565 km<sup>2</sup> (Strayer 1993).
- Yellow lampmussel was collected in cobble and sandy substrates, unlike the sand only substrate in Maine (Nedau et al. 2000) and New Brunswick (Sabine et al. 2004).
- Population estimates of yellow lampmussel may be an underestimate since more individuals were observed outside of transects than within but relative abundance would remain low if these additional mussels were included in the estimates.
- Pocketbook was collected in sandy areas of riffles and glides but not in cobble-dominated substrates.
- Centers of glide habitats are limiting to adult mussels perhaps due to greater water velocity and unstable coarse sand substrate (Clarke 1981); 60% of available glide habitat was not occupied by adult mussels.



Eastern pearlshell (120 mm SL) collected in 2012 at transect 9 in the Salmon River. The only pearl collected was from Eastern floater (122.5 mm SL) and was 5 mm in diameter.

## ACKNOWLEDGMENTS

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