Molluscan fauna of ephemeral and permanent wetlands in the Chippewa Moraine

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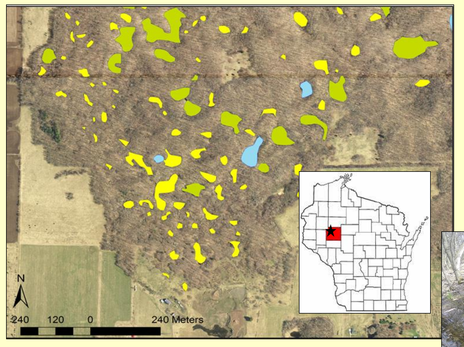

Figure 1: Study location in Chippewa County, Wisconsin. Aerial photograph shows portion of study area. Yellow wetlands are ephemeral ponds, green = vegetated permanent wetlands, and blue = open-water ponds with lacustrine fringe wetlands.

Figure 1b: Typical appearance of wetland from study site with some emergent vegetation

Introduction

- Ephemeral ponds are well-known for containing specialized aquatic invertebrates, including fingernail clams (Sphaeriidae). Less is known about other molluscan fauna, including snails. In addition, it is unclear whether adjacent permanent wetlands may contain similar fauna.
- We surveyed 58 permanent wetlands and ephemeral ponds in the Chippewa Moraine Scientific Natural Area (**Fig. 1**) over the course of two years in order to assess patterns in mollusk diversity and species composition.

Methods

- Mollusks were captured in Surface Activity Traps (SATs), which were generally set on the bottom of wetlands for a 24-hour period three times per season (**Fig 2**).
- Each trap was filtered in the field and preserved in ethanol buffered with a 5% borax solution.
- Identification and taxonomy was based on the online key created by Perez and Sandland.
- Partial remains were tallied to represent a minimum number of individuals (e.g. the higher count of right vs. left valves).

Figure 2a: SAT placed in the wetland for collecting macroinvertebrates Traps would remain in position for 24 hours before being collected.

Figure 2b: Underwater view of typical ephemeral pond substrate. Note the sphaeriid clam with it's foot extended in the middle right.

Table 1: Summary of mollusks recovered from SATs during sample period.

Site Type	# Traps	*Gyraulus deflectus*	*Stagnicola elodes*	*Planorbella pilsbryi*	*Physa cf. acuta*	*Cipangopaludina chinensis*	Aquatic Snails Total	Sphaereid bivalves	Terrestrial gastropods
Ephemeral (N=40)	240	659	307	47	4	4	1022	1556	46
Avg/Trap/Site		2.06	1.09	0.24	0.01	0.01	3.42	5.15	0.13
Permanent (N=18)	157	192	37	72	0	0	305	969	39
Avg/Trap/Site		1.24	0.19	0.48	0	0	1.92	3.47	0.32
Wilcoxon Rank Sum Test	P =	0.636	**0.0123**	**0.043**	0.352	0.246	**0.027**	0.204	**0.003**
Welch 2-Sample T-Test	P =	0.206	**0.002**	0.330	0.163	0.094	**0.034**	0.229	0.119

Results

- Ephemeral ponds contained significantly more mollusks than permanent wetlands, including significantly more snails (**Table 1**).
- Three species of pulmonated (air-breathing) snails were represented. *Stagnicola elodes* (**Fig. 3**) were significantly more abundant in ephemeral ponds, while those in the genus *Planorbella pilsbryi* (***Fig. 4***) were more abundant in permanent wetlands. Those of the genus *Gyraulus deflectus* (**Fig. 5**) were equally abundant in both wetland types.
- Sphaeriids were not significantly more abundant in ephemeral ponds. While terrestrial gastropods appeared more often in traps from permanent wetlands. These terrestrial snails were heavily degraded, but most were of the genus *Vertigo*.
- Four juveniles of the invasive Chinese Mystery Snail (*Cipangopaludina chinensis*, **Fig. 6**) were encountered in three different ephemeral pond samples during the sample period, however, no adult *C. chinensis* were ever found during the full five-year survey span of these ponds.

Figure 3: *Stagnicola elodes* (photo by C. Lynum, UW-LaCrosse)

Figure 4: *Planorbella pilsburyi* (photo by C. Lynum, UW-LaCrosse)

Figure 5: *Gyraulus deflectus* (photo by C. Lynum, UW-LaCrosse)

Figure 6: Comparison of typical juvenile hydrobiid gastropods to the invasive C chinensis (photo by C. Lynum, UW-LaCrosse)

Discussion

- Previously reported ecological preferences of *S. elodes* (calm water, varied substrates), *P. pilsbryi* (oligotrophic, lacustrine), *G. deflectus* (generalist) are supported by these data.
- The wetlands in the study were part of a vast mosaic, and it is likely that tiny molluscan larvae are well-distributed on waterfowl.
- Many of the permanent wetlands contained habitat areas that had ephemeral water levels.
- Detailed genetics studies necessary to separate effects of dispersal and habitat preference from predation as principal determinants of gastropod abundance.
- Predation of sphaeriid bivalves may be high in both permanent and ephemeral wetlands, as they are an important food resource for fish, ducks, and salamanders.
- SATs are not optimized for mollusks, & rare taxa were likely unsampled, but the mollusk "bycatch" still can provide important ecological data.
- Presence of juvenile *C. chinensis* suggests species can disperse into ephemeral ponds, but unable to survive predation or seasonal desiccation.

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