Spatial, seasonal, and diel distribution patterns of *Hemimysis anomala*

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Image source http://zoology.fns.uniba.sk
Distribution of *Hemimysis anomala* by haplotype

Based on Audzijonyte et al., 2008
Distribution of *Hemimysis anomala* in North America

Marty et al., 2009
Based on Audzijonyte et al. (2008) and Brooking et al. (2010)
UNLOCK THE LEGEND...NEW YORK STATE CANAL SYSTEM

Image source http://www.eriecanal.org
What are the within-lake and within-canal distributions of *Hemimysis* in the Finger Lakes, and do these distributions allow us to infer the invasion route of *Hemimysis*?

Photos: Kevin Colton
Lake sites

Canal sites

Present
Absent

Present
Absent

Lake Ontario
Oswego Canal
Erie Canal
Oneida Lake
Keuka Outlet
Seneca-Cayuga Canal

L13
C1
C2
C3
C4
C5
C6-C10
L15
L1
L2
L3
L4
L5
L6
L7
L8
L9
L10
L11
L12
C11
C12
C13
C14

Modified from Brown et al. 2011
What is the distributions of *Hemimysis* in the Finger Lakes, and from it can infer the invasion route?

- likely established by **jump dispersal**
- most prone to **dispersal vectors after dark**
- canals/lock provide a catalyst/barrier to range expansion
- should spread throughout the Seneca-Cayuga Canal and Cayuga Lake
What are the gender ratios, size distributions, and fecundity patterns from spring until autumn?
$F_{5,12} = 38.67, P < 0.001$

Abundance (ind./m$^3$)

Date

5 May  7 Jun  6 Jul  10 Aug  10 Sep  12 Oct

Surface temperature (°C)

Brown et al. 2011
Trends in length broadly follow age structure.

Brown et al. 2011
Two punctuated periods of reproduction.

$F_{2,21} = 6.73, P = 0.006$

Brown et al. 2011
What are the seasonal patterns in density, gender, size, and fecundity?

- maximum seasonal density > 2500 ind./m³
- patchy dispersion
- two distinct reproduction periods
- overwintering population exclusively adults
- juveniles dominated during the summer and autumn
How does the density and vertical position of *Hemimysis* vary?
Sunset 19:50

$X^2 = 3.00$

$P = 0.223$

$X^2 = 6.00$

$P = 0.199$

$X^2 = 6.00$

$P = 0.199$

Sunrise 04:29
How does the density and vertical position of *Hemimysis* vary?

Night densities were greatest at the surface (i.e., 0-0.5 m). Juveniles appeared at dusk, slightly before adults, and remained into the dawn longer. Volumetric densities were nearly an order of magnitude greater in the horizontal net tows compared to the Schindler-Patalas traps.
Conclusions and Future Studies

*Hemimysis* has expanded its range to the Finger Lakes, likely from jump dispersal. Continued jump dispersal and passive dispersal downstream will assist *Hemimysis* in reaching additional inland lake and river systems. The potential for spread can change with time of year, time of day, location in a lake/river, and location within the water column. Future studies are investigating how migration is regulated by the presence of predators.
Potential impacts of Invasions of *Hemimysis* are associated with

1) declines in the abundance and diversity of native zooplankton.
2) altered levels of primary production.
3) impacts on fish communities.

Ketelaars et al. 1999; Borcherding et al. 2006
The position of *Hemimysis* in the Food Web
**Experimental Hemimysis**

- **Diet Composition**
  - % zooplankton
  - % algae

**Wild Hemimysis**

- **Diet Composition**
  - % detritus
  - % zooplankton
  - % phytoplankton

*H. anomala Size*
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