Non-Native Rotifer *Brachionus leydigii* Detected in Lake Erie's Western Basin

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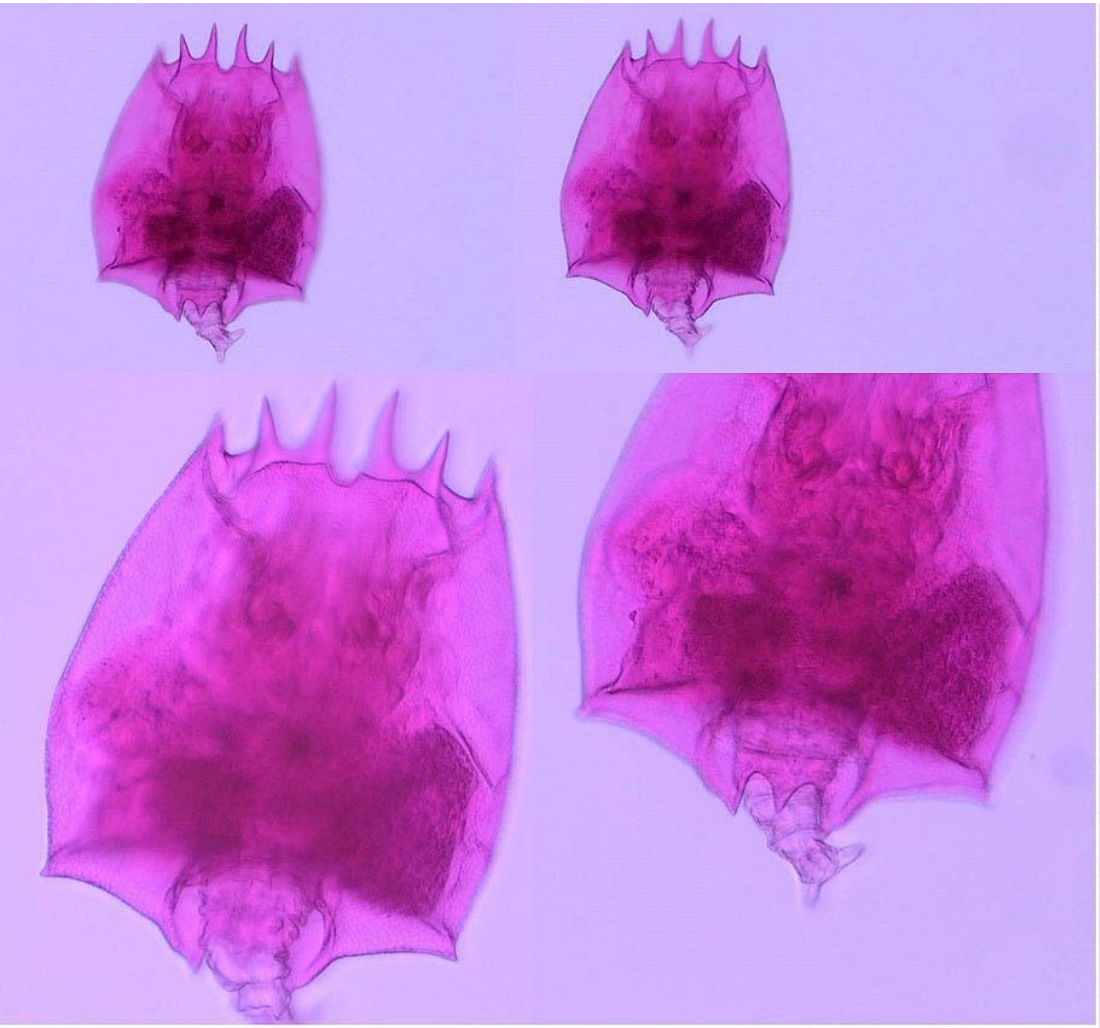
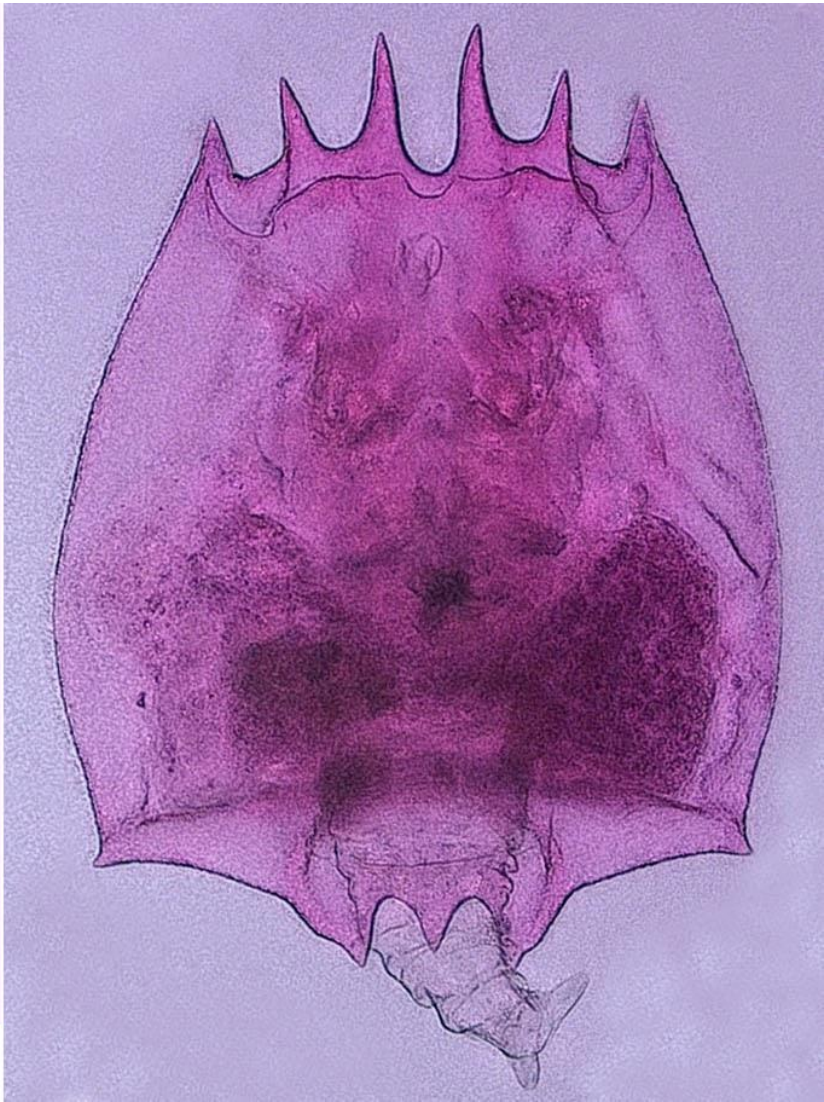


Brachionus leydigii var. *tridentatus* Zernov, Lake Erie, Western Basin



Introduction to Rotifera: The "Wheel Animals"

- **Rotifera-** a phylum of microscopic invertebrates
- 2 Classes: Pararotatoria & Eurotatoria
- 2 Subclasses: Bdelloidea & Monogononta
- Loricate & Illoricate rotifers
- Metazoans
- High reproduction rates
- Aquatic or limoterrestrial
- Over 1,800 named species world wide
- As much as 75% of species are littoral
- Occupy important position in the aquatic food web
- Can reach high densities in plankton

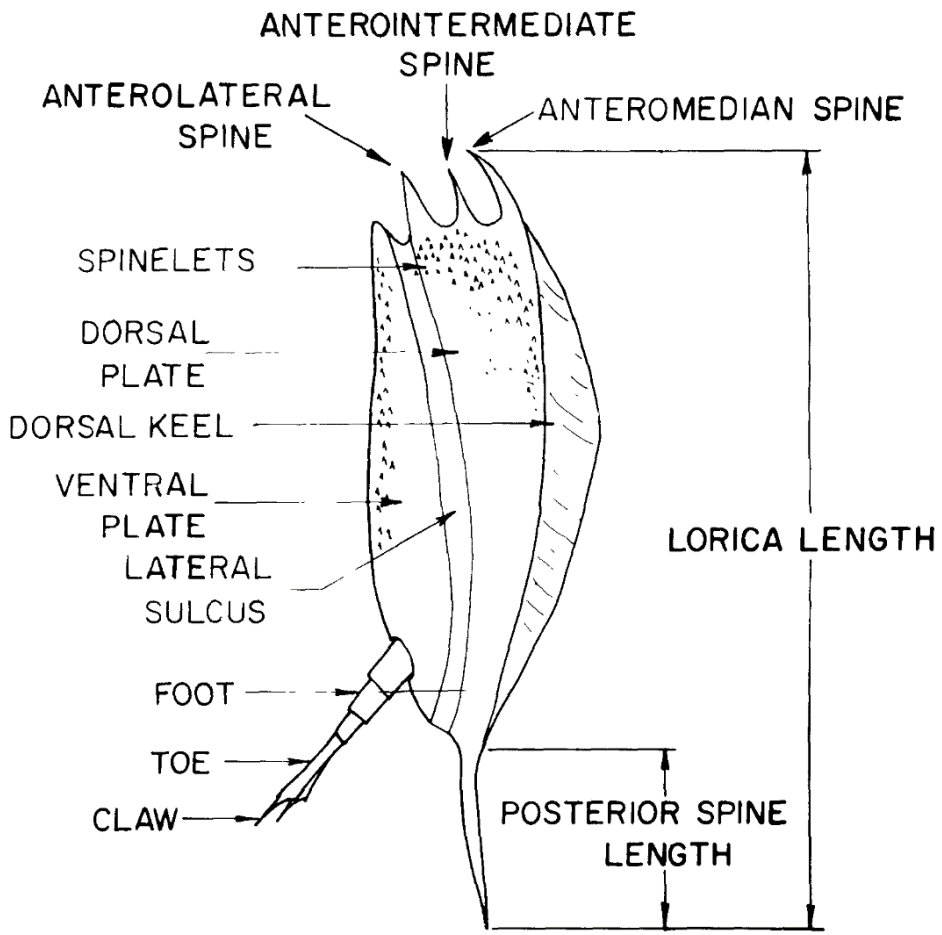


Figure 2. Generalized loricate rotifer.

(Wallace et al., 2006)

(Stemberger, 1979)

Diversity of Great Lakes *Brachionus* Species

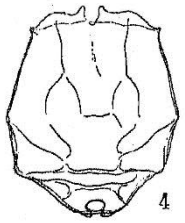


Рис. 4. Brachionus angularis, ty forma rotundus.

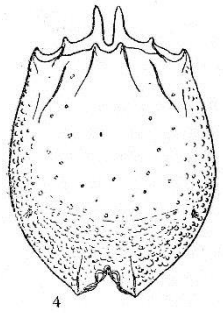


Рис. 4. *Brachionus bennini* — проекция панцыря.

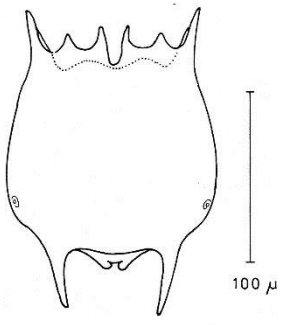
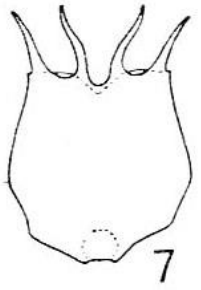
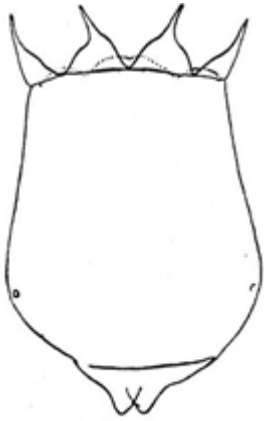


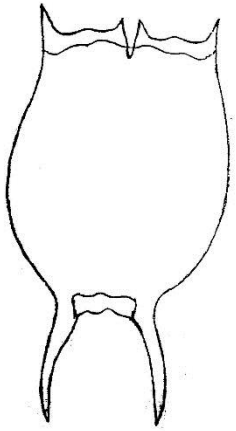
Fig. 2:
Brachionus bidentatus ANDERSON, 1889
a) Dorsal lorica, total length 187 µm, *B. bidentatus* ANDERSON.



7. Br. budapestinensis.



Brachionus calyciflorus



3. *B. caudatus.*

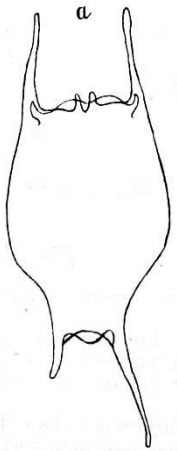


Fig. 424.
a Schizocerca diversicornis (Original).

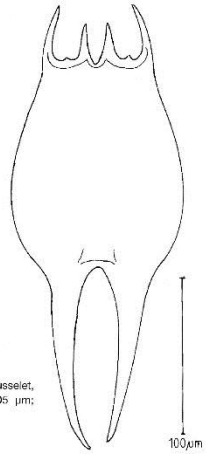
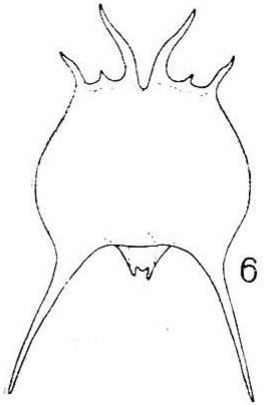
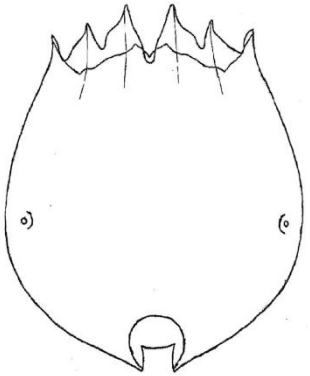


Abb. 4: *Brachionus havanensis* Rousselet, 1911: a – Pz. ventral, G.-Lg. 305 µm;



6. Br. quadridentatus.



9. *Brachionus rubens,*

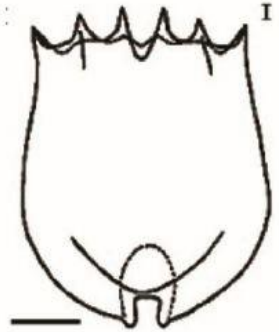


Fig. 6. *B. urceolaris* (Müller), I) dorsal view, Scale bar: 50 µm.

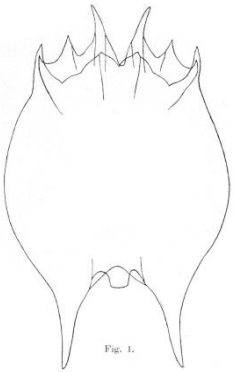
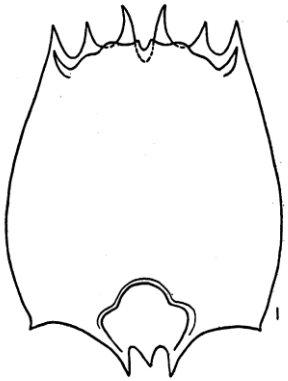
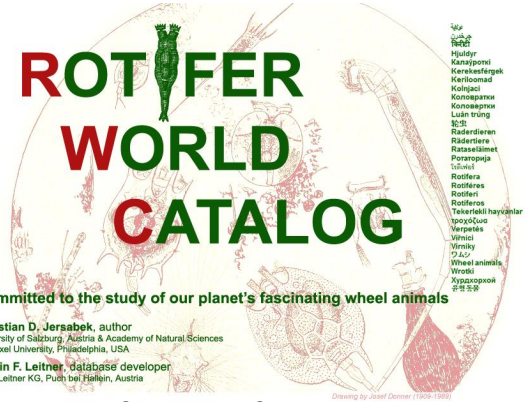


Fig. 1. *Brachionus variabilis* n. sp.





(Sketches from Rotifer World Catalog)

Brachionus leydigii var. *tridentatus* (Zernov, 1901)

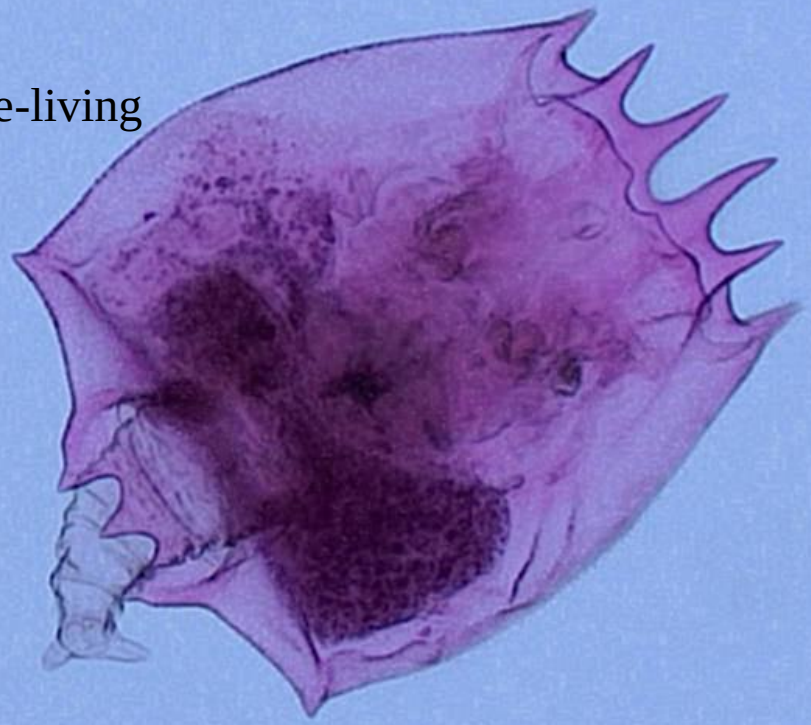
- Class: Eurotatoria
- Subclass: Monogononta
- Member of a large diverse family (*Brachionidae)* of loricate rotifers
- 6 forms or varieties of *B. leydigii* are known
- Capable of both sexual and asexual reproduction
- Planktonic
- Cold stenothermic
- Filter feeding
- Euryhaline (Fontaneto et al., 2006)
- Approximately 200-290µm (Koste, 1978)

Listed by GLANSIS as:

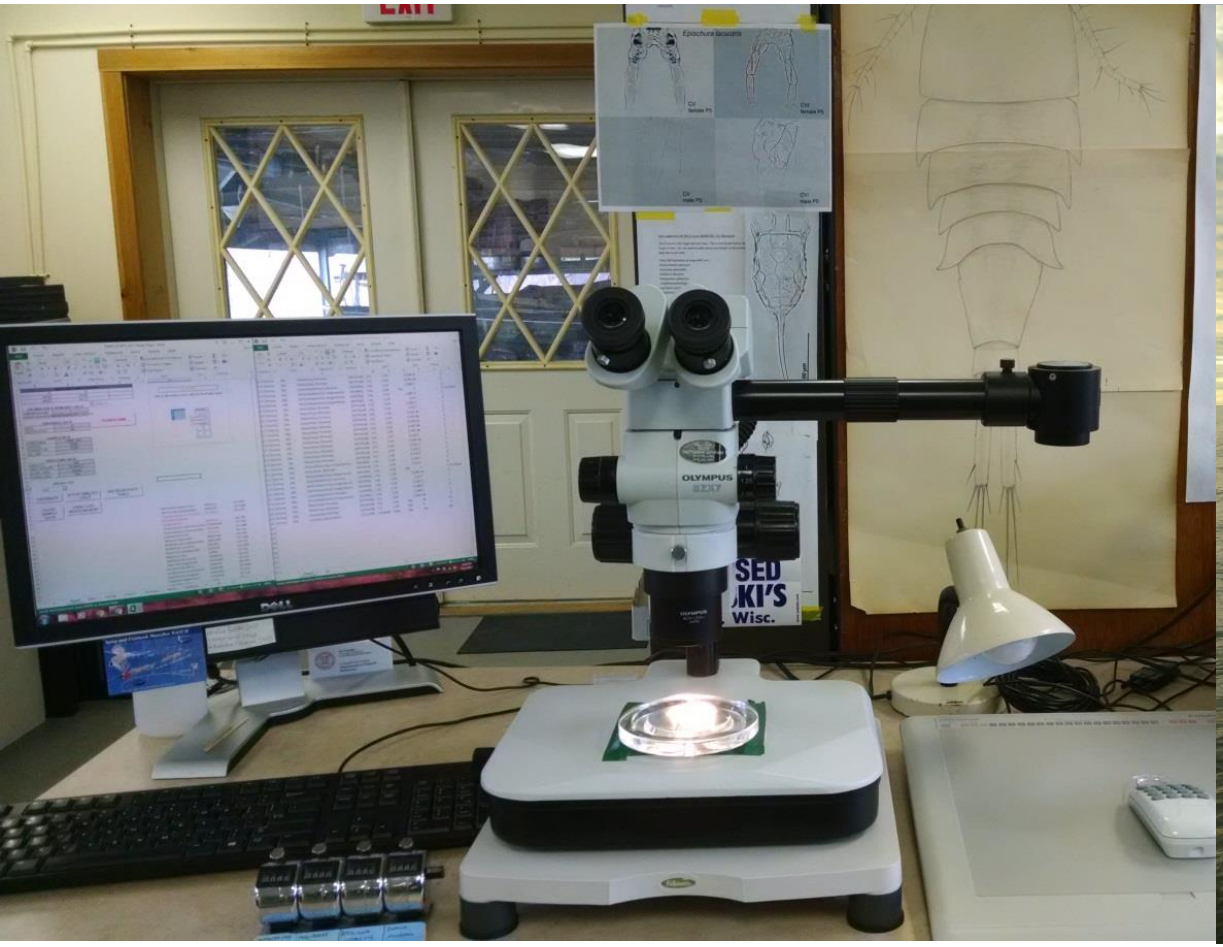
- Having a high probability of introduction to the Great Lakes
- Having a moderate probability for establishment if introduced to the Great Lakes

Brachionus leydigii var. *tridentatus* Native Range

- The native range of this species is not well understood
- *B. leydigii* has been reliably reported from Europe, Asia, and Australia
- Reports from North America are old, sparse, and may be questionable (Kofoid ,1909; Ahlstrom, 1934; Ahlstrom, 1940)
- *B. leydigii* is typically considered an Eastern Hemispheric species (Jersabek, Personal Communication)
- *B. leydigii* has not been previously reported free-living in the Laurentian Great Lakes



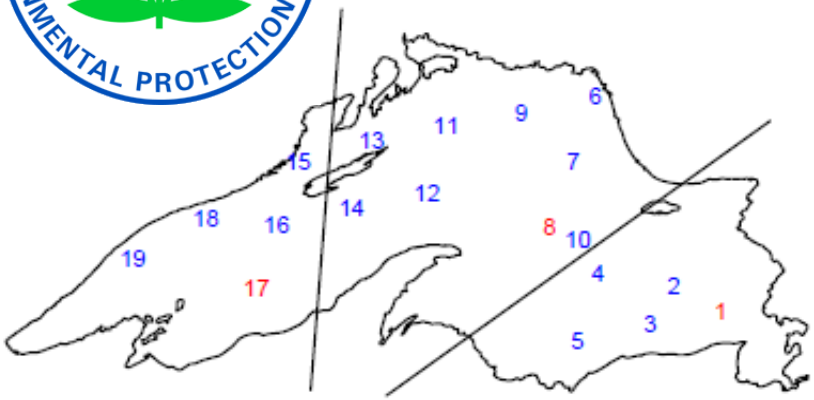
Detection of *Brachionus leydigii* in Western Lake Erie

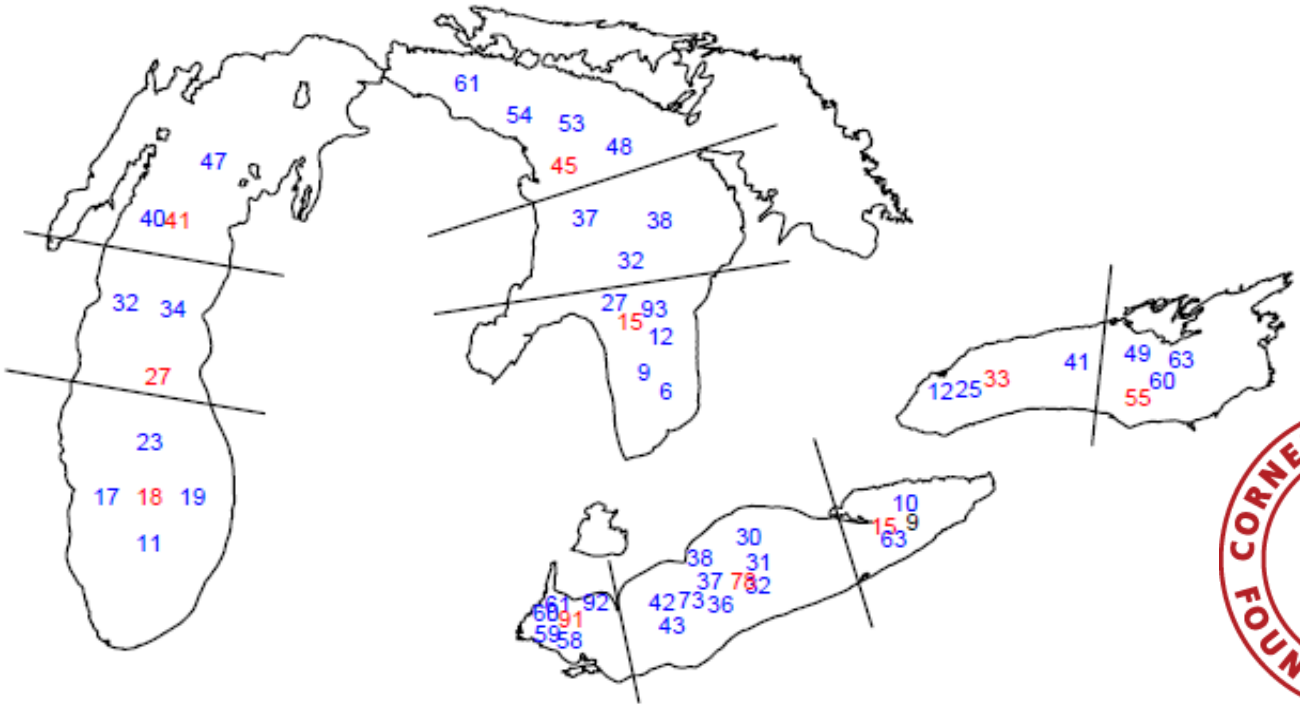


- Detection of *B. leydigii* in Western Lake Erie was made as part of a U.S. EPA GLNPO long-term biological monitoring program and underscores the need for regular monitoring efforts.

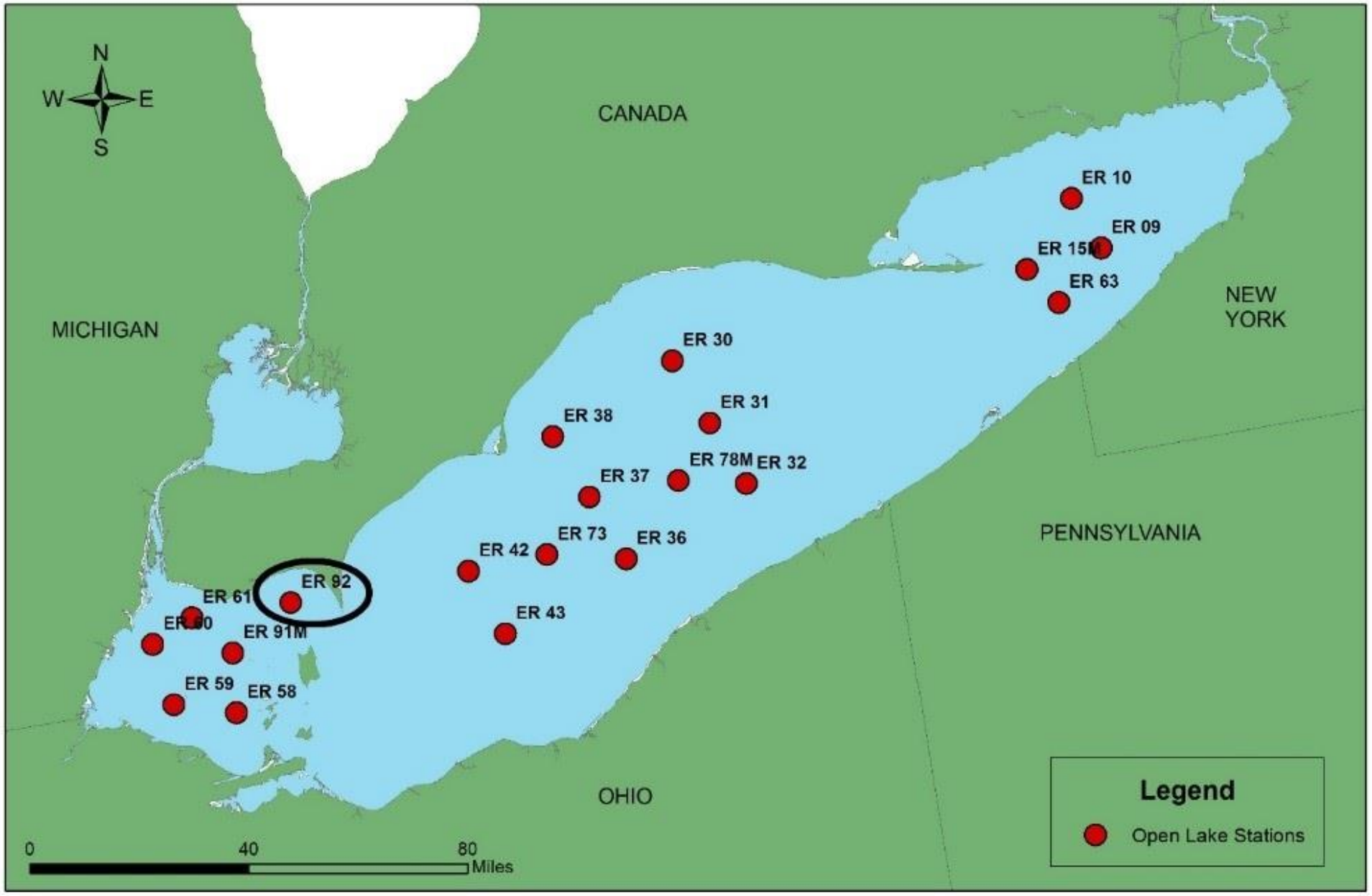
- *B. leydigii* was detected in a Lake Erie sample collected April 4th, 2016

Great Lakes Biological Monitoring Stations





Lake Erie Biological Monitoring Stations

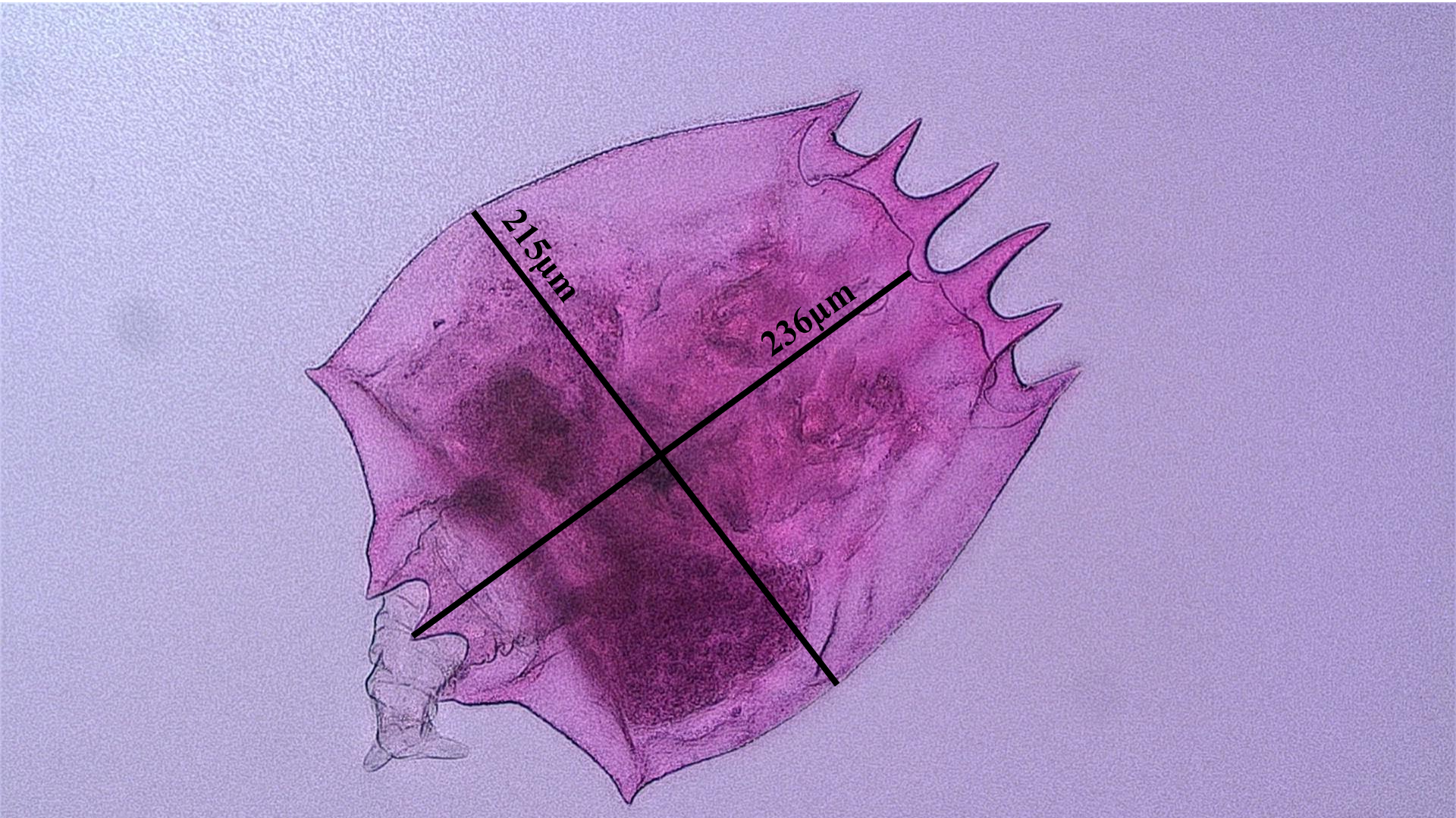


Collection and Specimen Information

- **Date:** April 4th 2016
- **Region:** Western Basin Lake Erie
- **Location:** ER 92
- **Net:** 153µm vertically towed

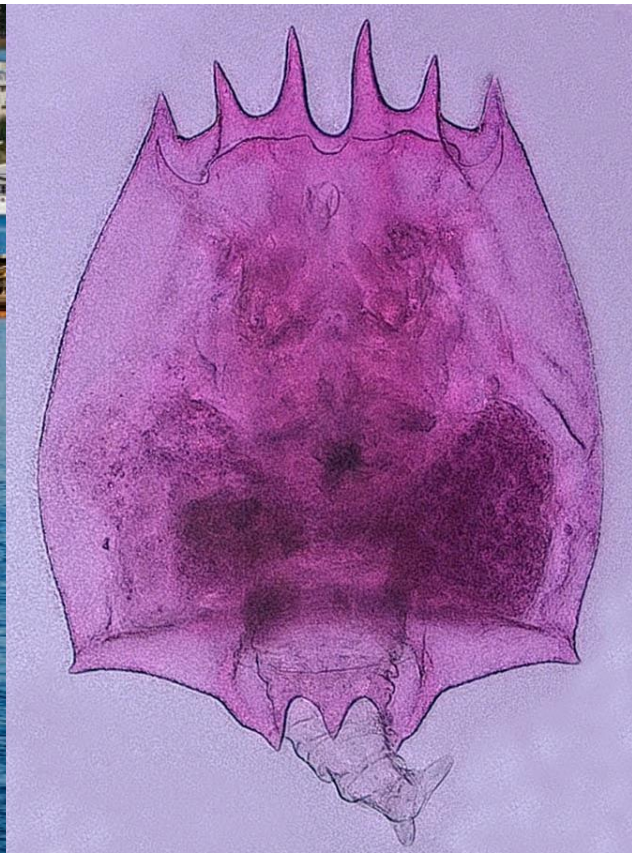
- **Depth:** 11m
- **Temperature:** 5.3°C
- **CHL-A:** 3.62µg/L
- **Density :** Undetermined

- **Individual(s):** 1
- **Sex:** Female
- **Condition:** Viable
- **Length:** 236µm
- **Width:** 215µm

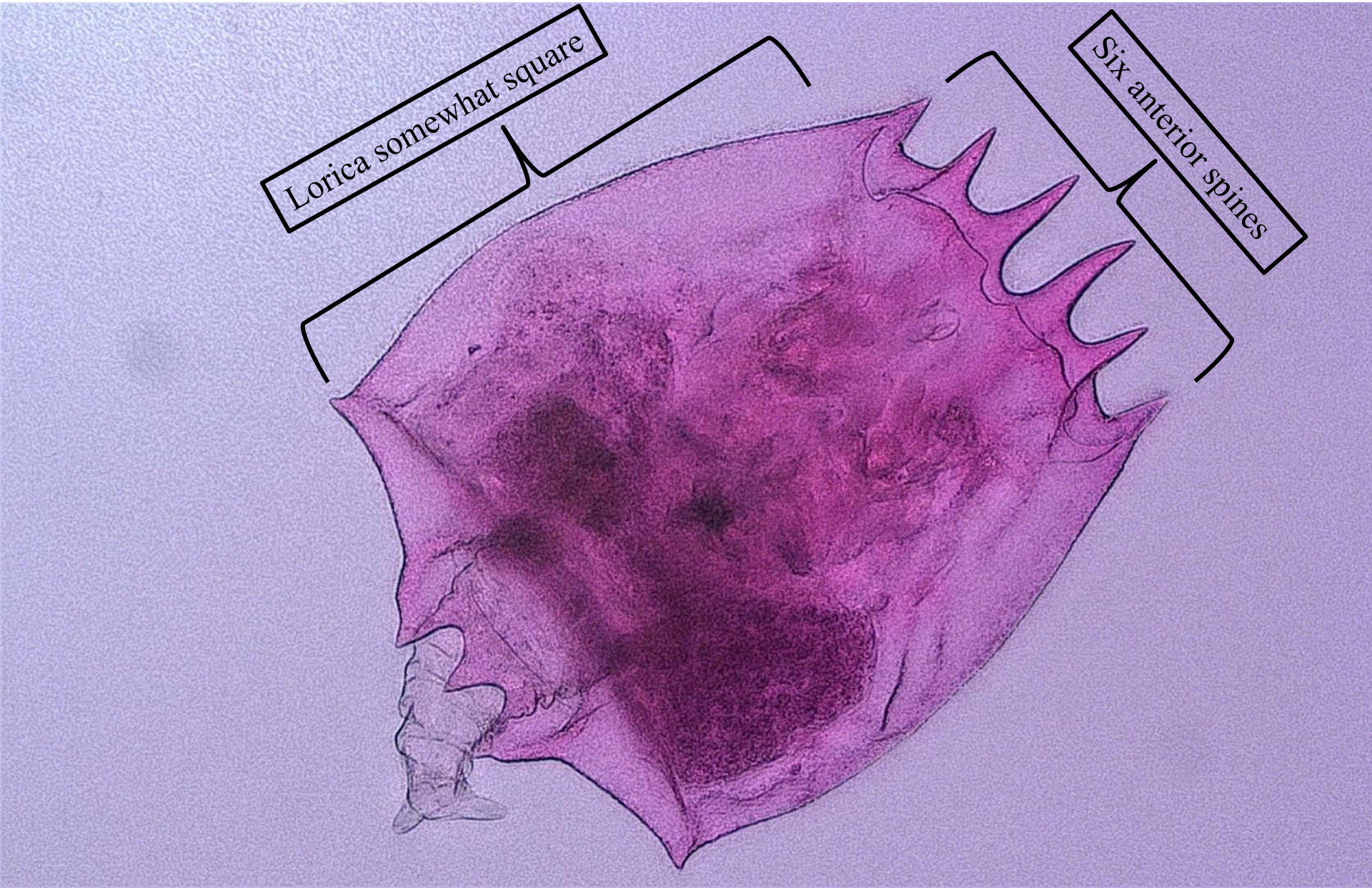


Possible Introduction Methods

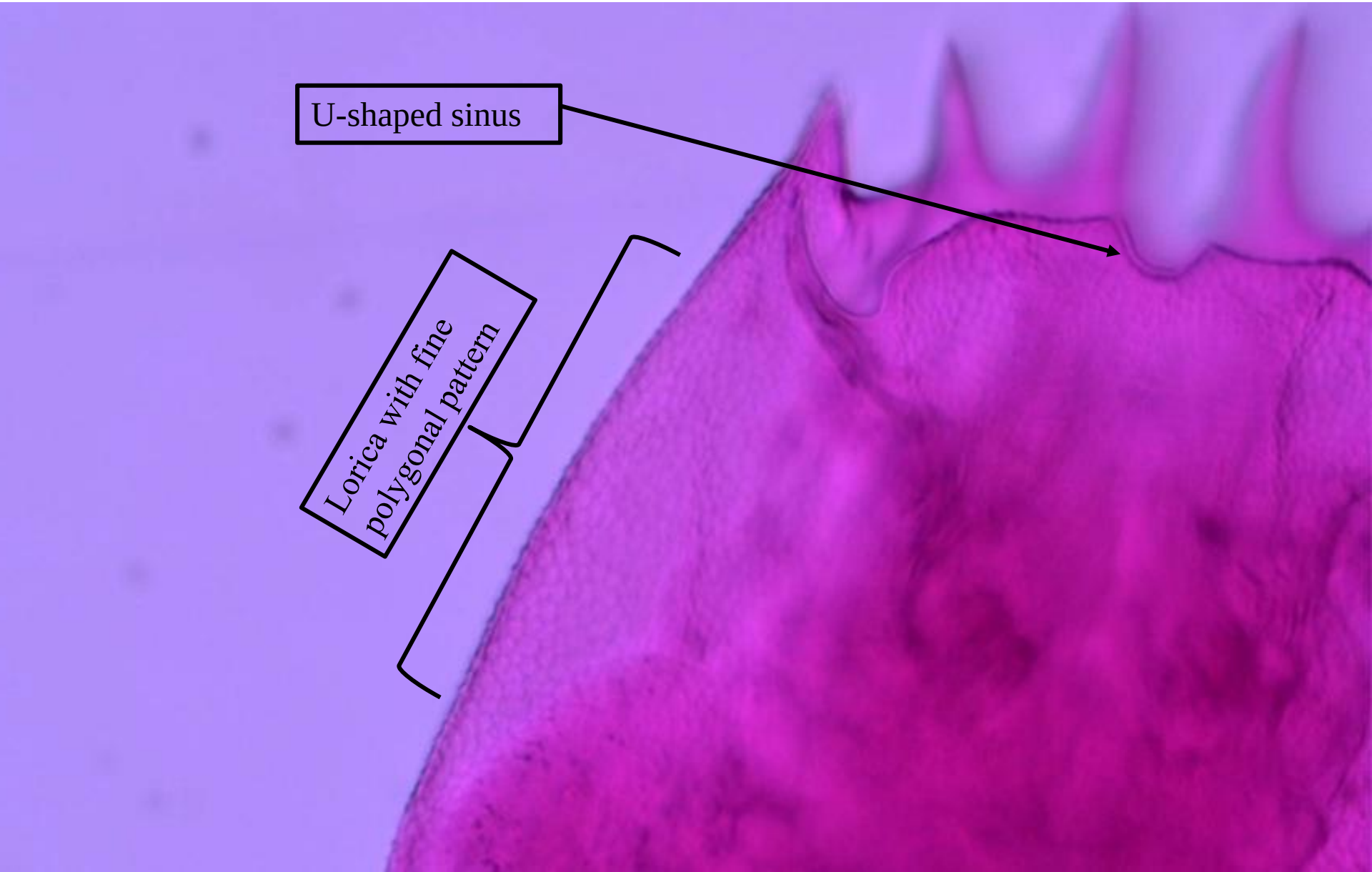
- The introduction mechanism of *B. leydigii* into Lake Erie is unknown but is likely related to ships ballast
- Bailey et al. (2005a) successfully hatch *B. leydigii* from resting eggs collected from the ballast sediment of 4 transoceanic NOBOB vessels
- Bailey et al. (2005b) collected a single specimen of *B. leydigii* from the upper wing ballast tanks of a ship in Hamilton Harbor



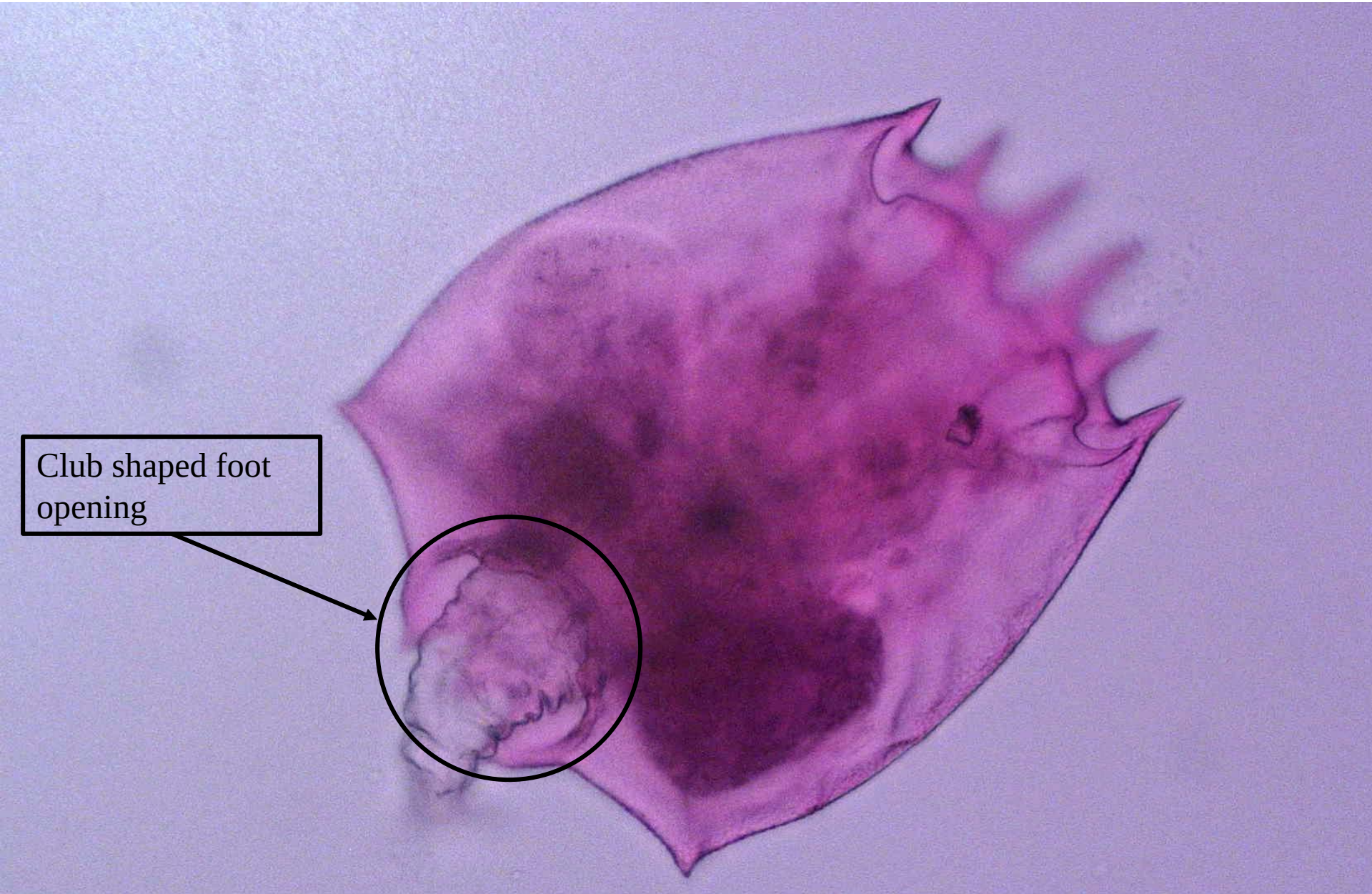
Morphology of *Brachionus leydigii* var. *tridentatus*: Dorsal Plate



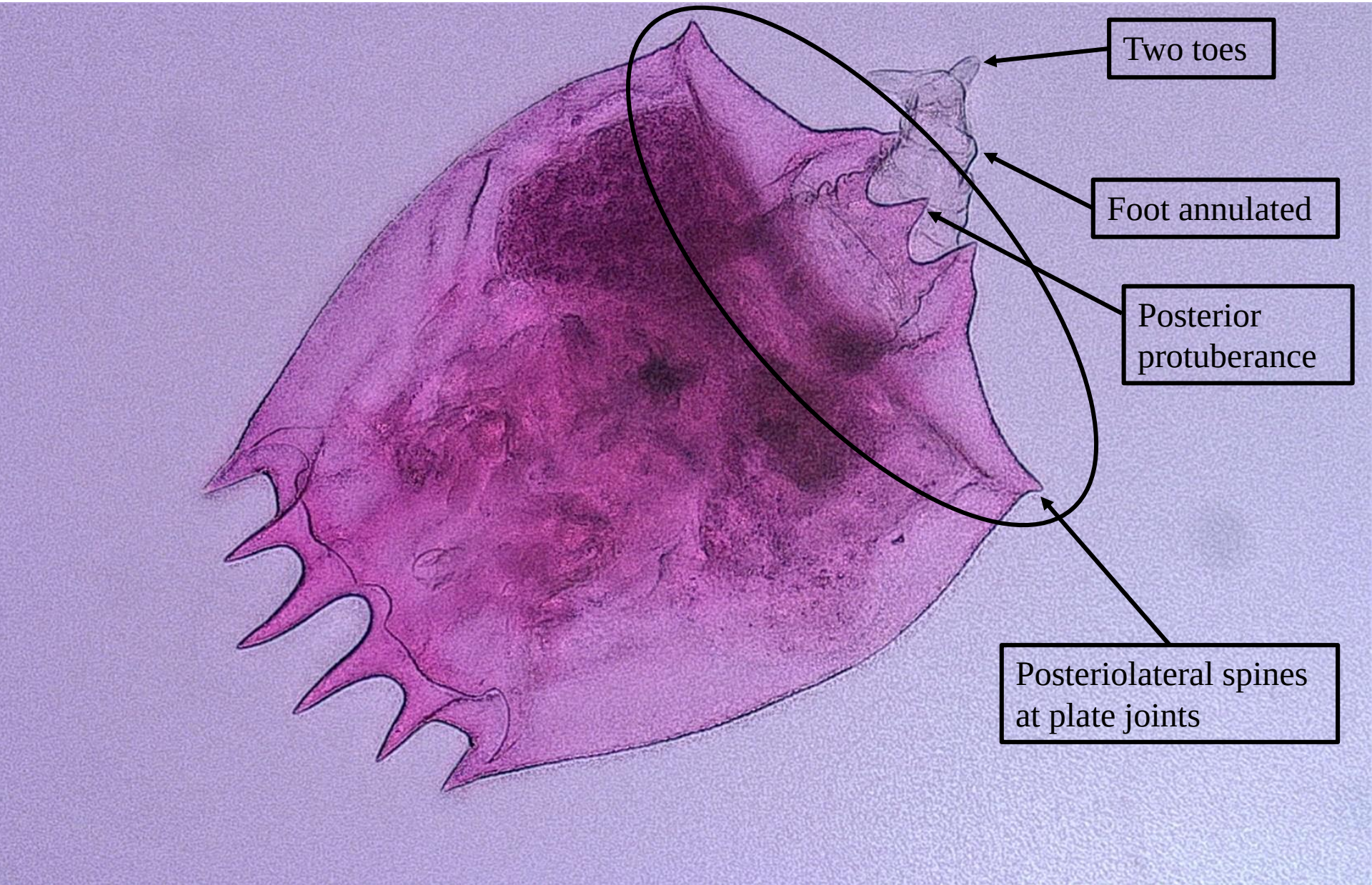
Morphology of *Brachionus leydigii* var. *tridentatus*: Ventral Plate



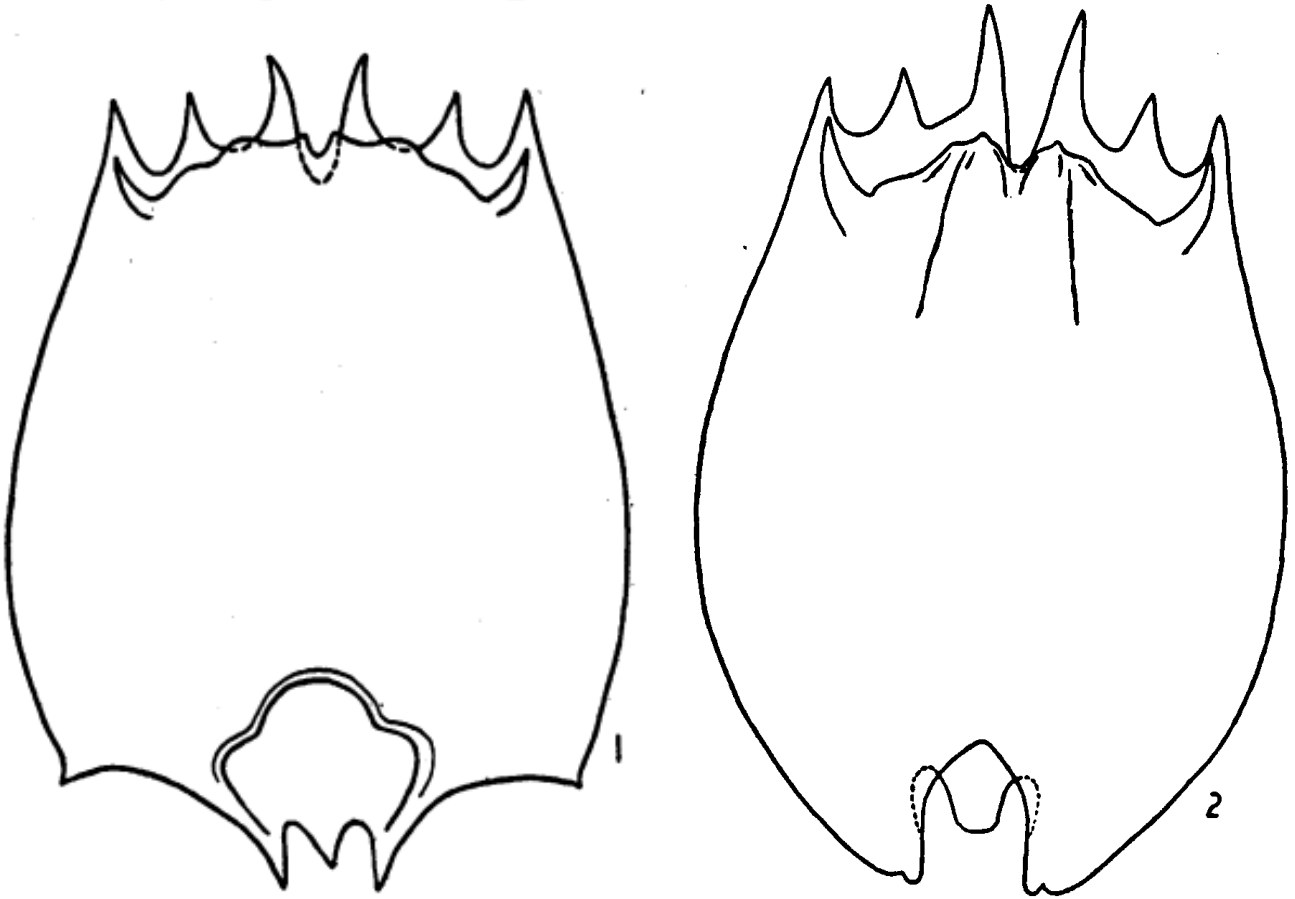
Morphology of *Brachionus leydigii* var. *tridentatus*: Ventral Plate



Morphology of *Brachionus leydigii* var. *tridentatus*: Basal Plate & Foot



Brachionus leydigii Comparison with *Brachionus variabilis*



B. leydigii var. *tridentatus* *B. variabilis*

(Sketches from Ahlstrom, 1940)

- (1) *B. leydigii* var. *tridentatus* in ventral view with pointed posterior protuberance, species not previously reported from the Great Lakes.

- (2) *B. variabilis* in ventral view with round or flat posterior protuberance, previously reported and native to the Great Lakes.

Expert Taxonomic Confirmations of *Brachionus leydigii* Collected from Lake Erie

- **Dr. Robert Wallace**
  Professor of Biology, Ripon College 300 West Seward Street
  Ripon, WI, 54971, USA

- **Dr. Leszek Bledzki**
  Senior Research Associate, Mount Holyoke College,
  Department of Biological Sciences, Clapp Laboratory, 50
  College Street, South Hadley, MA, 01075, USA

- **Dr. Christian Jersabek**
  Researcher and Lecturer, University of Salzburg, Department of
  Organism Biology, Kapitelgasse 4-6, 5020 Salzburg, Austria

For More Information on this Finding and General Information About *Brachionus leydigii* var. *tridentatus*:

Brachionus leydigii

EPA confirms non-native invertebrate species in the Great Lakes

***Brachionus leydigii* recently discovered in Lake Erie**

(August 14, 2017) U.S. Environmental Protection Agency's Great Lakes National Program Office has confirmed the presence of a new non-native species in the western basin of Lake Erie. The tiny organism is a non-native invertebrate rotifer, a type of zooplankton. This finding is the result of a cooperative agreement between EPA and Cornell University researchers as part of EPA's long-term biology monitoring program in the open waters of the Great Lakes. Cornell researchers detected the rotifer species, *Brachionus leydigii*, in samples collected in spring 2016. Only one specimen (a female) was found.

According to the U.S. Fish and Wildlife Service's rapid risk screening process, the ecosystem risk from *Brachionus leydigii* is uncertain due to lack of documented introductions of this species. The climate-matching analysis results indicate a high climate match, as the Great Lakes climate is very similar to the climate in native ranges of *B. leydigii*.

B. leydigii is able to tolerate a wide range of temperature and salinity conditions, appearing in both marine and freshwater environments. The natural distribution of *B. leydigii* is not well known. It has been most often reported in parts of the eastern hemisphere, including Europe, Asia and Australia. The species can handle cold temperatures and overwinter (diapause in sediments).

Related Information

- *Brachionus leydigii* Frequently Asked Questions
- Great Lakes Biology Monitoring Program

The following links exit the site EXIT

- USGS' Nonindigenous Aquatic Species database
- NOAA's Great Lakes Aquatic Nonindigenous Species Information System database

EPA Contacts

Glenn Warren

Fact Sheet - Wheel anim

Secure | https://nas.er.usgs.gov/queries/greatlakes/FactSheet.aspx?SpeciesID=54&Potential=Y&Type=2&HUCNumber=

GLANSIS
GREAT LAKES AQUATIC NONINDIGENOUS SPECIES INFORMATION SYSTEM

Brachionus leydigii Cohn, 1862

Common Name: Wheel animal

Synonyms and Other Names:

Brachionus quadratus Rousselet, 1889, *Brachionus reticulatus* Kertész, 1894, *Brachionus quadratus rotundus* Rousselet, 1907, *Brachionus quadratus tridentatus* Zernov, 1901

Jersabek, C.D., H. Segers, and P.J. Morris, . An illustrated online catalog of the Rotifera in the Academy of Natural Sciences of Philadelphia (version 1.0: 2003-April-8). [WWW database] URL http://rotifer.acnatsci.org/rotifer.php

Identification: *Brachionus leydigii* is a nearly square rotifer, with a body divided into three dorsal, ventral, and basal plates. The anterior dorsal margin has six spines of nearly equal length, with median spines slightly longer and curving somewhat ventrally. Small spines are usually present at the joint of the dorsal and basal plates. A large circular or club shaped foot opening is visible on the dorsal surface. The body wall of *B. leydigii* is firm and slightly raised toward the center (Leasi 2012).

Size: Total length 220-280 µm; maximum width 165 µm

Native Range: Afrotropical, Australian, Oriental, and Palearctic biogeographical regions (Segers 2007)

This species is not currently in the Great Lakes region but may be elsewhere in the US. See the point map for details.

Ecology: Rotifers live mainly among aquatic vegetation in the littoral zone of lakes, ponds, rivers, canals, pools, and other small water bodies. Due to the absence of respiratory organs, this species uses its entire body surface to respire and is therefore unable to live in anaerobic conditions (Sladecek 1983). Most communities contain 50 to 500 individuals per liter, with the densest population reported in unpolluted water reaching 5,800 individuals per liter (Smith 2001). *Brachionus ledygii* filter feeds on small material such as bacteria and detritus and is able to selectively filter particles by size with a corona of cilia surrounding its mouth (Wallace 2002). Experiments on the rotifer composition among different lakes types suggest that *Brachionus* spp. thrive primarily in eutrophic environments and are largely absent from oligotrophic and mesotrophic areas (Maemets 1983, Sladecek 1983).

With large population sizes and high turnover rates, rotifers are significant contributors to lake food webs (Herzig 1987, Starkweather 1987, Walz 1997). Additionally, rotifers are the first food of fish fry and are eaten by a variety of invertebrate predators, leading to the assimilation of their energy into higher trophic levels (Wallace 2002). Rotifers may also play a role in microplankton community structure, although the magnitude of their importance is unknown (Arndt 1993, Berninger et

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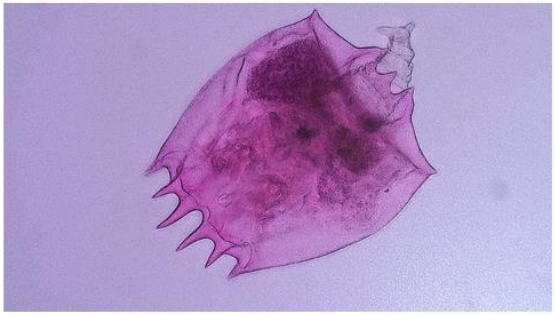
https://nas.er.usgs.gov/queries/greatlakes/FactSheet.aspx?SpeciesID=54&Potential=Y&Type=2&HUCNumber=

Brachionus leydigii
(a rotifer)
Rotifers
Exotic

Collection Info
Point Map
Fact Sheet
Animated Map



J. Connolly (Cornell University)

Brachionus leydigii Cohn, 1862

Common name: a rotifer

Synonyms and Other Names: *Brachionus quadratus* Rousselet, 1889; *Brachionus reticulatus* Kertész, 1894; *Brachionus quadratus rotundus* Rousselet, 1907; *Brachionus quadratus tridentatus* Zernov, 1901

Taxonomy: available through ITIS

Identification: *Brachionus leydigii* is a nearly square rotifer, with a body divided into three dorsal, ventral, and basal plates. The anterior dorsal margin has six spines of nearly equal length, with median spines slightly longer and curving somewhat ventrally. Small spines are usually present at the joint of the dorsal and basal plates. A large circular or club shaped foot opening is visible on the dorsal surface. The body wall of *B. leydigii* is firm and slightly raised toward the center (Leasi 2012).

Size: Total length 220-280 µm; maximum width 165 µm

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ROTIFER WORLD CATALOG

Species – Search the Rot

rotifera.hausdernatur.at/Species/Index/2324

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Search Database - Species

Scientific name:

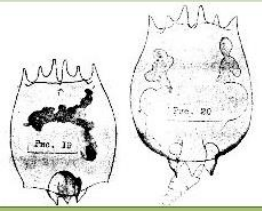
Species: ***Brachionus leydigii* var. *tridentatus* Zernov, 1901**	Valid Name: *Brachionus leydigii* Cohn, 1862
Parent taxa: Genus / Family / Order / Superorder / Subclass / Class ***Brachionus*: Brachionidae: Ploima: Pseudotrocha: Monogononta: Eurotatoria**	Taxonomic / nomenclatural notes: Originally proposed as infrasubspecific variant, made available nomenclaturally at subspecific rank by Bartoš (1959:345) [Ref.15330].
Nomenclatural status: junior subjective synonym of nominotypical taxon Species group name declinable: yes Validity: not valid Taxon Rank: Varietas Availability: available	
Original Combination: *Brachionus quadratus* var. *tridentatus* Original Spelling: *Brachionus quadratus* var. *tridentatus*	Latest Revision: Koste, W (1978): Rotatoria. Die Rädertiere Mitteleuropas. Ein Bestimmungswerk, begründet von Max Voigt. Überordnung Monogononta. 673, 234 pls.

Page last modified on: 29.04.2013 by C.D. Jersabek

Figures | References | Junior Names | Infraspecific Taxa | Observations | Collection Specimens | Ecology & Distribution | Biogeography | Map

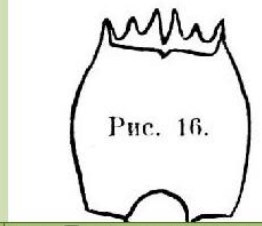
Original description

Zernov, S A (1901): Izvestija Imperatorskogo Obshchestva Lyubitelei Jestestvoznanija, Antropologii i Etnografii pri Moskovskom Universitjete 98 p.31, pl.4, figs.19,20



Literature documentations

Meissner, V (1902): Trudy Saratovskogo obshchestva jestestvoispytatelej i liubitelej jestestvoznanija, Saratov 3



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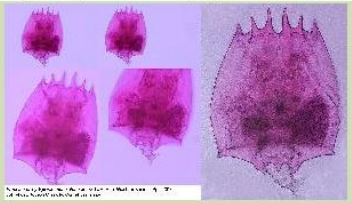
Displaying items 1 - 1 of 7

Observation images

Image courtesy of Joseph Connolly, July 2017



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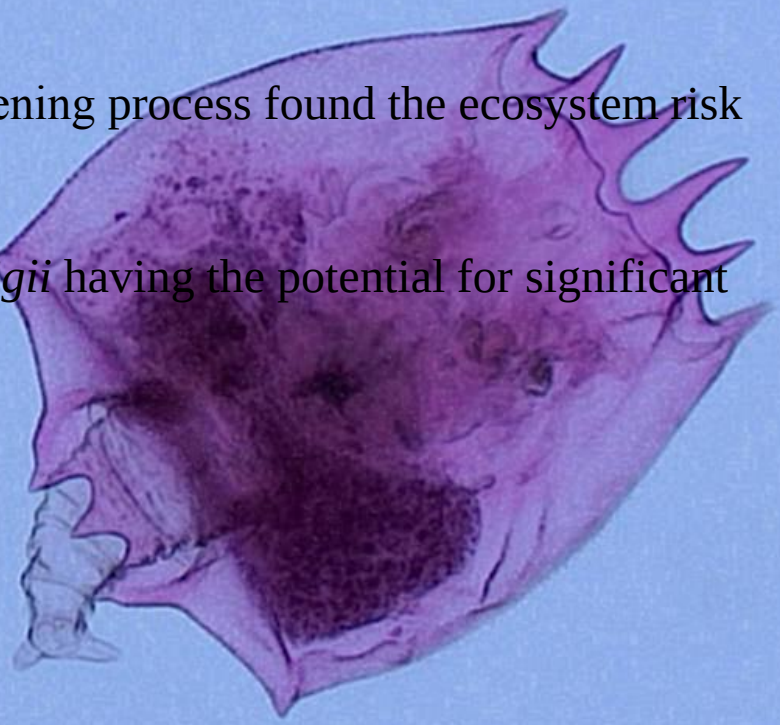
http://rotifera.hausdernatur.at/Species/Index/2324

Conclusions

- Only a single female specimen of *B. leydigii* has been collected from Lake Erie to date
- No evidence of reproduction has yet been observed in Lake Erie
- Establishment status: Unknown
- Introduction method is likely related to ships ballast
- *B. leydigii* is the second non-native plankton species detected in Lake Erie's Western basin since 2014 (Connolly et al., 2017)
- U.S. Fish and Wildlife Service's rapid risk screening process found the ecosystem risk from *B. leydigii* is uncertain
- There is little or no evidence to support *B. leydigii* having the potential for significant environmental or socio-economic impacts
- Continued biological monitoring of Lake Erie is needed and ongoing



Acknowledgements

U.S. FISH & WILDLIFE SERVICE
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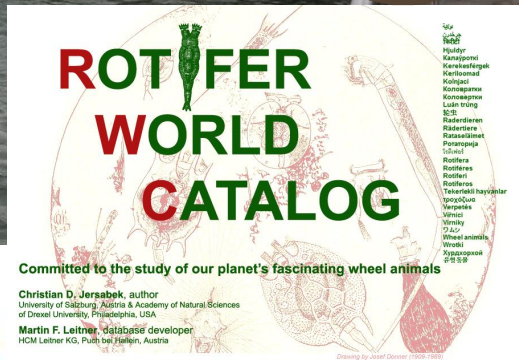
GREAT LAKES AQUATIC NONINDIGENOUS SPECIES INFORMATION SYSTEM



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Questions?