

Zebra Mussels vs Quagga Mussels



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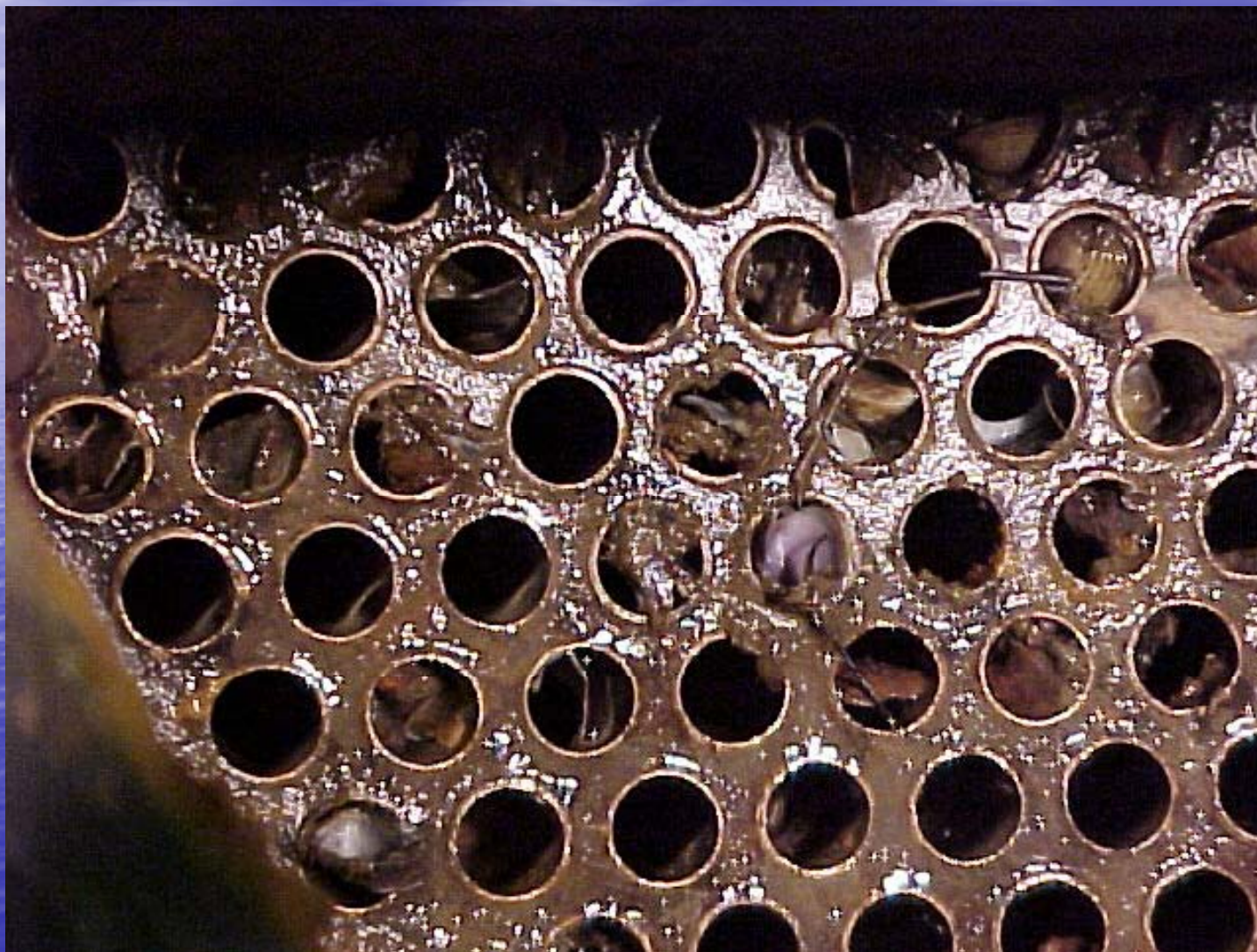
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Tulsa District Zebra Mussel Infestation History

- Jan 1993 ~ W.D. Mayo, R.S. Kerr, and Webbers Falls locks (Ark River)
- June 1993 ~ Chouteau Lock (Verdigris River)
- Jan 1994 ~ Newt Graham Lock (Verdigris River)
- June 2003 ~ Oologah Lake (Verdigris River)
- June 2003 ~ Lynn Lane Lake (Tulsa Water Supply)
- & A.B. Jewell Lake (Tulsa Water Supply)
- Aug 2003 ~ El Dorado Lake, KS (Walnut River)
- July 2004 ~ Kaw Lake (Arkansas River)
- Aug 2004 ~ Cheney Lake, KS (one veliger)(Wichita Water Supply)
- Oct 2005 ~ Keystone Lake (Arkansas & Cimarron Rivers)
- May 2006 ~ OG&E Sooner Lake (water supply)
- June 2006 ~ Skiatook Lake (one adult at dam)
- June 2006 ~ Zink Lake in Tulsa (Arkansas River)
- July 2006 ~ Grand Lake (Grand/Neosho River)(none found since)
- & GRDA Chouteau Powerplant (water supply)
- Oct 2006 ~ Lake Texoma (ZM on boat at Highport Marina)
- Mar 2007 ~ Lake Texoma (QM shells on boat at Eisenhower Yacht Club)
- Mar 2007 ~ Skiatook Lake (unconfirmed boat f/ Crystal Bay Marina)

Robert S. Kerr Powerhouse ~ 1 May 02



Webbers Falls Powerhouse #2 Strainer ~ 18 Aug 06



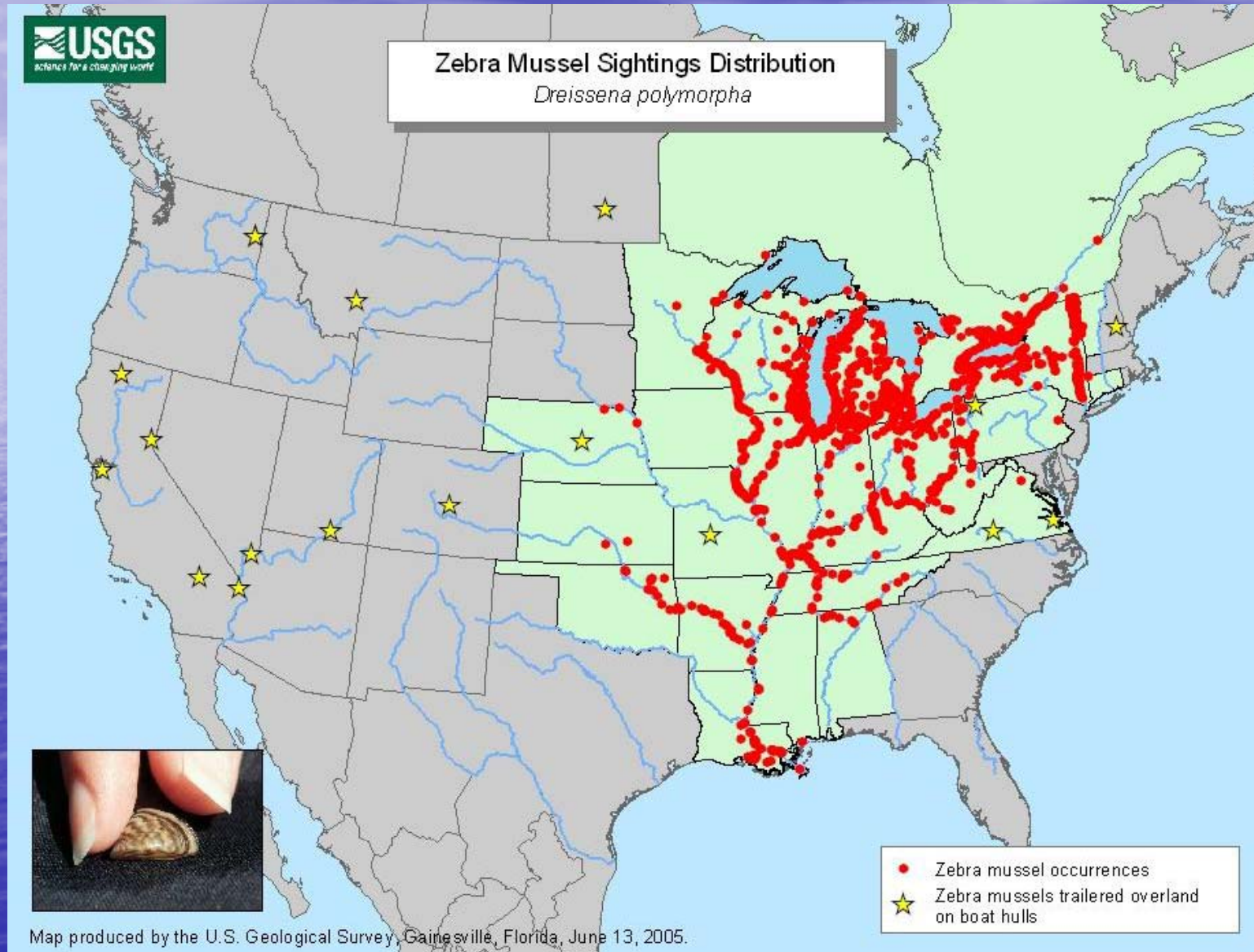
Webbers Falls Powerhouse #2 Strainer ~ 18 Aug 06



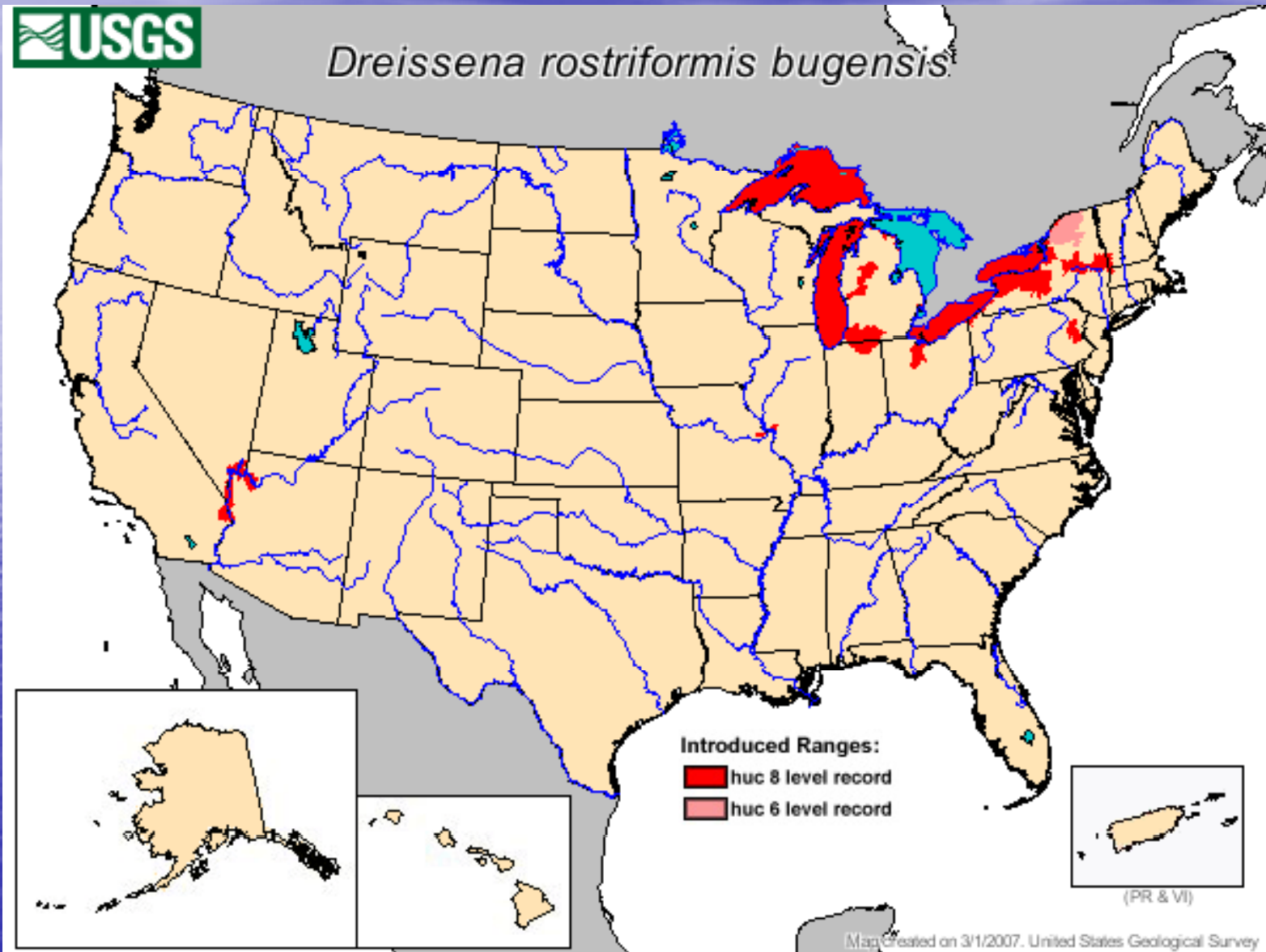
El Dorado Lake ~ 2003 Drawdown



Zebra Mussel Range



Quagga Mussel Range



Physical Differences

Dreissena polymorpha
(Actual size is 15 mm)



Sits flat on ventral side
Triangular in shape
Color patterns vary

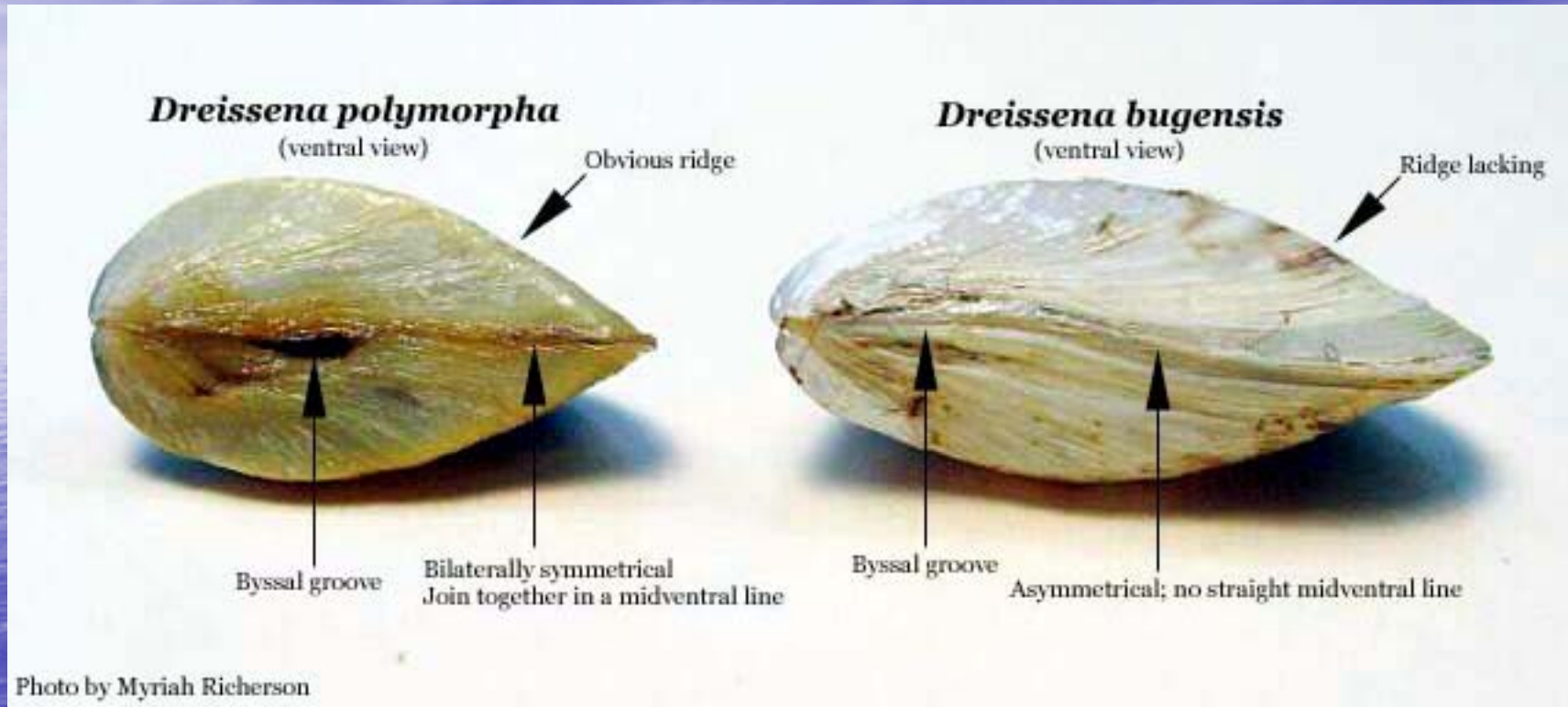
Dreissena bugensis
(Actual size is 20 mm)



Topples over; will not sit flat on ventral side
Rounder in shape
Usually have dark concentric rings on shell
Paler in color near the hinge

Photo by Myriah Richerson

Physical Differences



Zebra Mussel Environmental Tolerances

<i>VARIABLES</i>	<i>HIGH</i>	<i>MODERATE</i>	<i>LOW</i>	<i>VERY LOW</i>
<i>Dissolved Oxygen (ppm)</i>	<i>8 – 10</i>	<i>6 – 8</i>	<i>4 – 6</i>	<i><4</i>
<i>Water Temperature (C/F)</i>	<i>18/64 – 25/77</i>	<i>16/61 – 18/64 25/77 – 28/82</i>	<i>9/48 – 25/77 28/82 – 30/86</i>	<i><8/46 >30/86</i>
<i>Total Hardness (mg CaCO₃/l)</i>	<i>90 – >125</i>	<i>45 – 90</i>	<i>25 – 45</i>	<i><25</i>
<i>Calcium (ppm)</i>	<i>25 – 125</i>	<i>20 – 25</i>	<i>9 – 20</i>	<i><9</i>
<i>pH</i>	<i>7.5 – 8.7</i>	<i>7.2 – 7.5 8.7 – 9.0</i>	<i>6.5 – 7.2</i>	<i><6.5 >9.0</i>
<i>Salinity (ppt)</i>	<i>0 – 1</i>	<i>1 – 4</i>	<i>4 – 10</i>	<i>10 – 35</i>
<i>Conductivity (μ Siemens)</i>	<i>83 – >110</i>	<i>37 – 82</i>	<i>22 – 36</i>	<i>>22</i>
<i>Turbidity (secchi disk cm)</i>	<i>40 – 200</i>	<i>20 – 40</i>	<i>10 – 20 200 – 250</i>	<i><10 >250</i>
<i>Water Velocity (m/sec)</i>	<i>0.1 – 1.0</i>	<i>.09 – 0.1 1.0 – 1.25</i>	<i>.075 - .09 1.25 – 1.5</i>	<i><.075 >1.5</i>
From European & North American Sources			C.O'Neill, NY Sea Grant, Mar 96	

QM Biological Differences from ZM

- Thrive in both warm and cold water.
- More tolerant of deeper water. Have been found at 540'.
- Feed year-round.
- Colonize on finer substrate (sand, clay, etc.)
 - anything but soft mud.
- Excrete more phosphorus than Zebra Mussels, therefore >BOD.
 - May be the reason there are “dead-zones” in Lake Erie.

Lake Michigan

- ZM + QM densities: 2000 = 899/m²
2005 = 7,790/m²
- % by Species: 2000 = 98.3% ZM
2005 = 97.7% QM
- Water Clarity went from 15' to 75'.
- Covering the lake bottom, not just shoreline.
- Fish netting survey netted 0.5# of fish & 600-700# of QM.
- Diporeia decreased from 1,836/m² to 293/m² in the last 5-years.
- 7-year old Whitefish weight decreased from >5# to 1.6# since '88.

100th Meridian Survey of the Top 20 destinations of 213 boaters surveyed at Lake Mead

1. MEAD NV
2. MOJAVE NV
3. POWELL UT
4. HAVASU AZ
5. SAN DIEGO CA
6. PLEASANT AZ
7. CLEAR LAKE CA
8. SHASTA CA
9. PITTSBURGH CA
10. PARKER CA
11. PINEVIEW UT
12. BEAR LAKE UT
13. WILLOW BCH AZ
14. WILLARD BAY UT
15. PARKER AZ
16. ORVILLE CA
17. PARIS CA
18. LONG BEACH CA
19. JORDANELLE UT
20. CAL DELTA CA

Suggested Web Sites

- <http://www.aquaticinvaders.org>
- <http://100thmeridian.org>
- <http://answest.fws.gov>
- <http://nas.er.usgs.gov/zebramussel>
- <http://www.seagrant.noaa.gov>
- <http://www.wes.army.mil>
- <http://www.protectyourwaters.net>
- “Or just search for **zebra mussel** or **quagga mussel**”.

Questions
for G-Pa?

