The Other Clams: Native Freshwater Species in California

Jeanette Howard

Annual 2010 IEP Workshop
May 26, 2010
Non-native mussels in the news

Klondike Lake boat ban aims to keep mussel at bay
May 19, 2009 | Margot Roosevelt and Louis Sahagun
There's an uproar over the infamous freshwater quagga mussel at Klondike Lake, one of the few patches of water in the sprawling Owens Valley open to motorized recreation.

Tiny creatures, big problems for reservoirs
February 22, 2008 | Pete Thomas
It's a spring-like morning at Lake Casitas and bass anglers sense that any day now the quarry they're so passionate about will begin to rise and aggressively feed.
Why are NATIVE mussels interesting?

- Greatest diversity in North America
- Highly endangered
- Links with salmonids and other fishes
- Relatively stationary – continuously record environment
- Long-lived - (> 100 years)
- Provide link between pelagic and benthic environments
- Often largest biomass in benthic environment
# North American Mollusk Fauna

The North American mollusk fauna is the most diverse freshwater molluscan fauna in the world. The table below summarizes the diversity in terms of families, genera, and species for Gastropoda and Bivalvia:

<table>
<thead>
<tr>
<th></th>
<th>Gastropoda</th>
<th>Bivalvia</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Families</td>
<td>14</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>Genera</td>
<td>85</td>
<td>58</td>
<td>143</td>
</tr>
<tr>
<td>Species</td>
<td>601</td>
<td>344</td>
<td>945</td>
</tr>
</tbody>
</table>

Most diverse freshwater molluscan fauna in the **WORLD**
Species at risk by group

- **Freshwater Mussels**: 69% (63% Critically Imperiled (G1), 6% Presumed/Possibly Extinct (GX/GH), 10% Imperiled (G2), 1% Vulnerable (G3))
- **Crayfishes**: 69% (41% Critically Imperiled (G1), 23% Presumed/Possibly Extinct (GX/GH), 14% Imperiled (G2), 1% Vulnerable (G3))
- **Stoneflies**: 43% (36% Critically Imperiled (G1), 5% Presumed/Possibly Extinct (GX/GH), 12% Imperiled (G2), 0% Vulnerable (G3))
- **Freshwater Fishes**: 37% (29% Critically Imperiled (G1), 1% Presumed/Possibly Extinct (GX/GH), 11% Imperiled (G2), 6% Vulnerable (G3))
- **Amphibians**: 36% (28% Critically Imperiled (G1), 2% Presumed/Possibly Extinct (GX/GH), 14% Imperiled (G2), 2% Vulnerable (G3))
- **Flowering Plants**: 33% (25% Critically Imperiled (G1), 2% Presumed/Possibly Extinct (GX/GH), 10% Imperiled (G2), 6% Vulnerable (G3))
- **Gymnosperms**: 24% (18% Critically Imperiled (G1), 1% Presumed/Possibly Extinct (GX/GH), 6% Imperiled (G2), 8% Vulnerable (G3))
- **Ferns/Fern Allies**: 22% (16% Critically Imperiled (G1), 1% Presumed/Possibly Extinct (GX/GH), 5% Imperiled (G2), 10% Vulnerable (G3))
- **Tiger Beetles**: 19% (13% Critically Imperiled (G1), 1% Presumed/Possibly Extinct (GX/GH), 5% Imperiled (G2), 8% Vulnerable (G3))
- **Butterflies/Skippers**: 19% (13% Critically Imperiled (G1), 1% Presumed/Possibly Extinct (GX/GH), 5% Imperiled (G2), 8% Vulnerable (G3))
- **Reptiles**: 18% (14% Critically Imperiled (G1), 1% Presumed/Possibly Extinct (GX/GH), 4% Imperiled (G2), 9% Vulnerable (G3))
- **Dragonflies/Damselsflies**: 18% (14% Critically Imperiled (G1), 1% Presumed/Possibly Extinct (GX/GH), 4% Imperiled (G2), 9% Vulnerable (G3))
- **Mammals**: 16% (12% Critically Imperiled (G1), 1% Presumed/Possibly Extinct (GX/GH), 4% Imperiled (G2), 9% Vulnerable (G3))
- **Birds**: 14% (10% Critically Imperiled (G1), 1% Presumed/Possibly Extinct (GX/GH), 4% Imperiled (G2), 9% Vulnerable (G3))

Percent of Species

**Source:** *Precious Heritage* (2000) © TNC, ABI
Lonely on the Western Frontier
Conservation Status

Percentage imperiled

Williams & Neves 1995
Freshwater mussel shells historically made into mother of pearl buttons
Western Species

Western pearlshell
*Margaritifera falcata*

Floater
*Anodonta sp.*

Western-ridged mussel
*Gonidea angulata*
Currently recognized Western Species:

- *Anodonta beringiana* – Yukon floater (Middendorff 1851)
- *Anodonta californiensis* - California floater (I. Lea 1852)
- *Anodonta dejecta* - Woebegone floater (Lewis, 1875)
- *Anodonta kennerlyi* - Western floater (I. Lea 1860)
- *Anodonta nuttalliana* - Winged floater (I. Lea 1838)
- *Anodonta oregonensis* – Oregon floater (I. Lea, 1838)
- *Gonidea angulata* – Western ridged mussel (I. Lea 1838)
- *Margaritifera falcata* – Western pearlshell (Gould, 1850)

(Based on Turgeon et al., 1998. Names of Mollusks)
Freshwater Mussel Life Cycle
Lampsilis subangulata – Shinyrayed pocketbook
Described by Isaac Lea in 1840
Super conglutinate lure discovered in 1994
What they do:

- Improve water quality
- Act as conveyer belts – transport nutrients from water column to benthos
- Influence macroinvertebrate community
- Stabilize substrate

What is potentially lost as their numbers decline?
Current Project Objectives

Develop understanding of distribution, species diversity and abundance of freshwater mussels at historical sites throughout California.
Methods: Historical Distribution

Museum Collections
Smithsonian (Washington DC)
Academy of Natural Sciences (Philadelphia)
California Academy of Sciences (SF)

Published and gray literature records
Methods: Current Status

Field Surveys:
- Snorkel
- Scuba
- Timed searches
- At least 5 geomorphic units
Results: Historical Records

400 total historical records (pre 1995):
- 152 Cal Academy, San Francisco
- 53 Smithsonian, Washington DC
- 40 Academy of Natural Sciences, Philadelphia
- 153 Published
- 2 Personal communication
Results: Historical Records

400 total historical records yet only 114 separate historical collection sites (multiple records from individual sites)
## Results: Historical Records

### Oldest records:

<table>
<thead>
<tr>
<th>Date</th>
<th>Data Source</th>
<th>Species</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1877</td>
<td>Smithsonian</td>
<td><em>Anodonta nuttaliana</em></td>
<td>Sierra Valley</td>
</tr>
<tr>
<td>1892</td>
<td>Cal Academy</td>
<td><em>Anodonta wahlamatensis</em></td>
<td>Mountain Lake, San Francisco</td>
</tr>
<tr>
<td>1897</td>
<td>Cal Academy</td>
<td><em>Gonidea angulata</em></td>
<td>Russian River near Wall Springs near Forestville</td>
</tr>
</tbody>
</table>
Results: Historical Sites
Results: Historical Sites

Freshwater Ecoregions

- Anodonta
- Gonidea
- Margaritifera
- All Genera
- A & G
- A & M
- G & M
Results: Historical sites Delta region
Results: Field Surveys

The bar chart shows the number of sites in different freshwater ecoregions. The ecoregions are: Colorado, Lahontan, N. California, Sacramento, and S. California. The chart tracks species presence as follows:

- Anodonta
- Gonidea
- Margaritifera
- All Genera
- A & G
- A & M
- G & M
- None

The y-axis represents the number of sites, ranging from 0 to 50. The x-axis lists the freshwater ecoregions.
Results: Field Surveys

[Bar chart showing the distribution of sites across different freshwater ecoregions: Colorado, Lahontan, N. California, Sacramento, S. California. Each ecoregion is segmented by different types of freshwater mussels: Anodonta, Gonidea, Margaritifera, All Genera, A & G, A & M, G & M, None.]
Results: Field Surveys Delta region
Results

Historical Sites
Results

Historical Sites

Current Sites Surveyed

Mussels Found
Recap

- 400 historical records of mussels in CA (35 records too general to find sample rivers/sites)

- 114 historical sites

- 104 sites surveyed, including 59 historical locations

- Mussels founds at 50% of sites (n=54)

- Declining abundance at historical sites
Thank You

Joseph Furnish, USFS
Karen Mock, Utah State University
Jayne Brim Box
Laurie Bushman
Jordan Gold
Steve Novotny
Maria Ellis
Laurie Haley
Report and data available. Please contact Jeanette Howard at jeanette_howard@tnc.org