Quagga and Zebra Mussel Survey Training

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Description

- freshwater (< 3 ppt)
- small (< 5 cm or 2 in)
- banded or solid color pattern
- external fertilization
  - (quaggas spawn - 9 to 20 C)
  - (zebras spawn - 12 to 20 C)
- free-floating larval stage (called “veligers”)
- filter feed on phytoplankton

Great Invaders

- early maturation
  - mature by end of first year
- high fecundity
  - produce up to 1 million eggs, about 3% survival
- adaptable
  - wide physiological tolerance range
- colonize a variety of habitats
  - rivers, lakes, ponds
- dispersal mechanism
  - planktonic veligers, adults attach to hard substrates

Vectors

- ballast water
- water currents
- boats
- bait buckets
- snorkeling gear

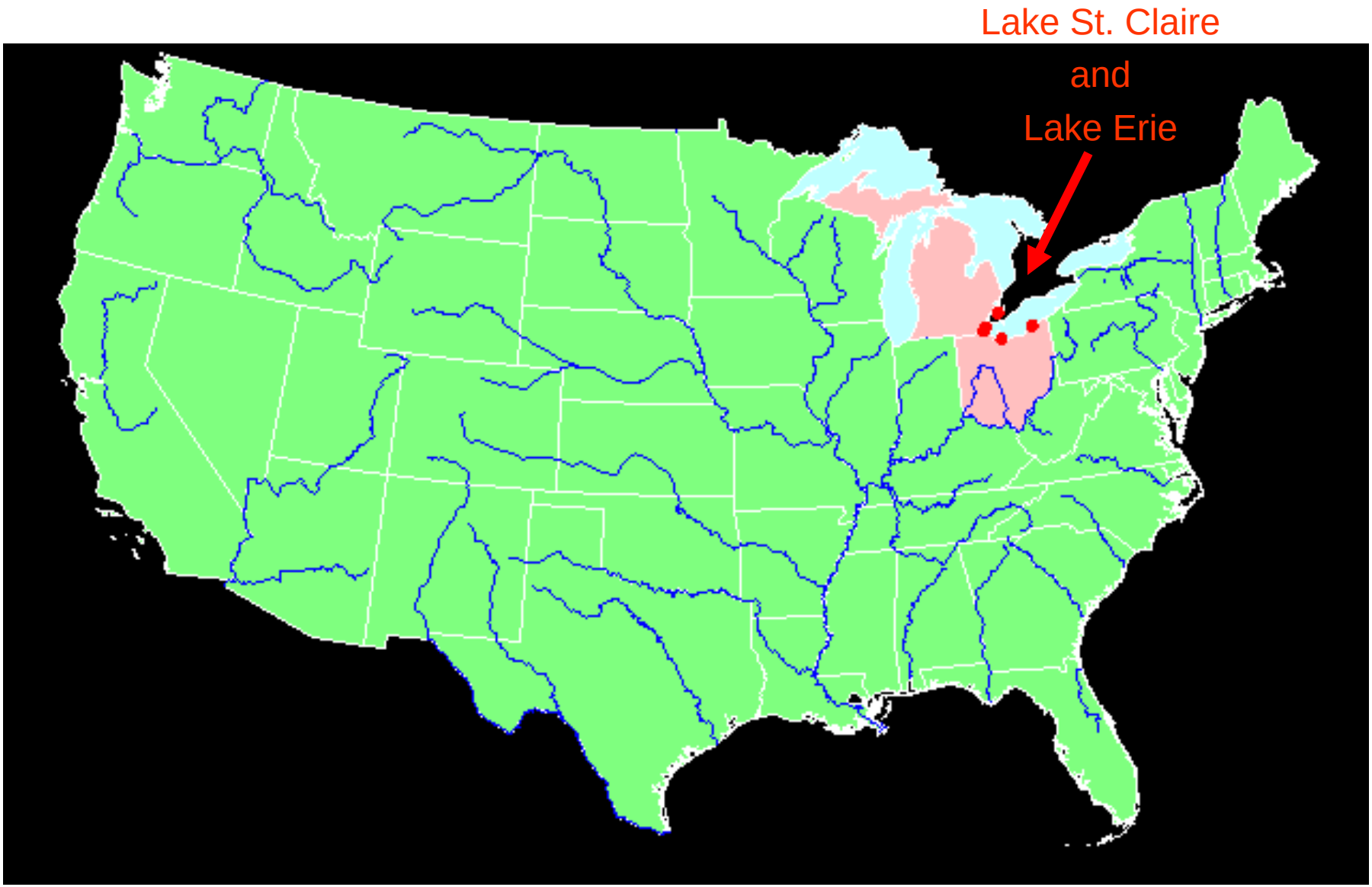
Veligers can survive in bilge water, cooling systems, or other small pools of water, or flow downstream

Adults attach to boats, anchors, line, and vegetation

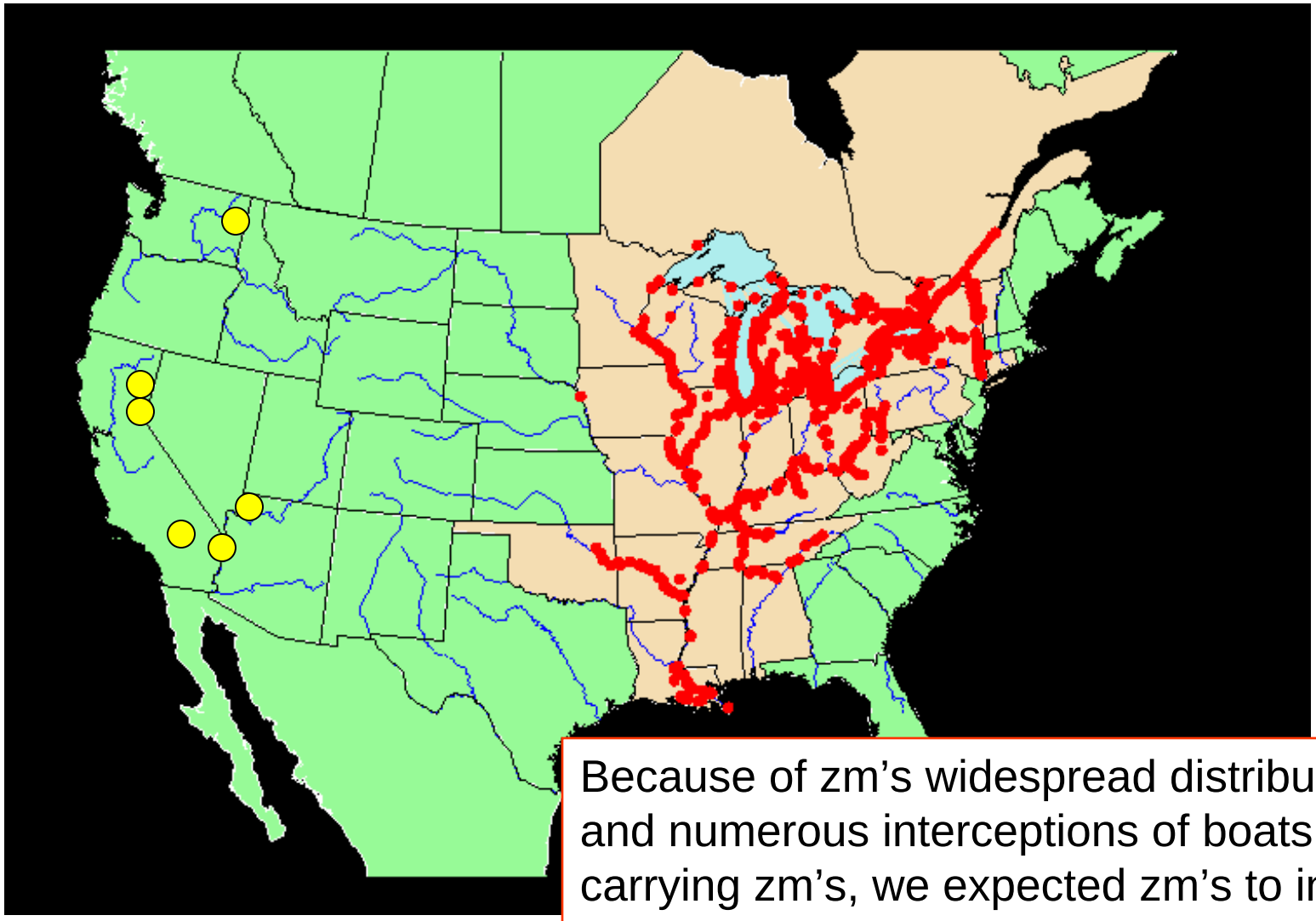
Distribution

- native to Ukraine and Russia
  - Black and Caspian sea drainages
- invaded Europe
  - late 1700s - early 1800s, via developing canal systems
- invaded North America
  - late 1980s, via ballast water
  - quickly spread throughout Great Lakes, Mississippi River drainage, and neighboring lakes.

1988 – Zebra Distribution



2006 – Zebra Distribution



Because of zm's widespread distribution and numerous interceptions of boats carrying zm's, we expected zm's to invade the West before quaggas.

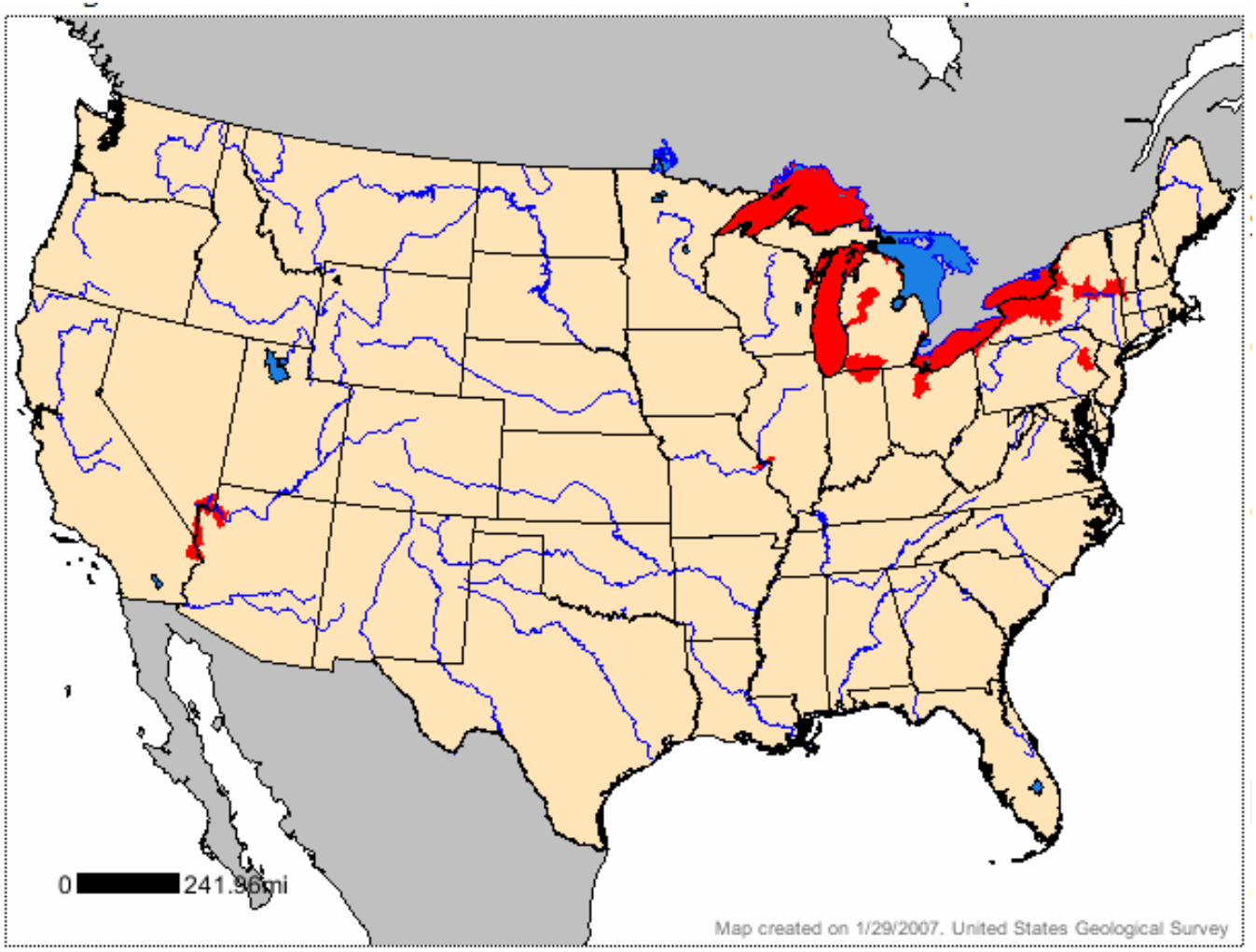
Location of Ag Inspection Stations where boats carrying zebra mussels (usually dead) were intercepted.

Examples of Contaminated Vessels

In 2000, the vessel “Tax Return” was intercepted. The trim tabs could not close because of encrusted zebra mussels. The hauler was ordered to decontaminate before launching. Instead, it is was abandoned in Stockton, CA. Since then, DFG detained and decontaminates all intercepted vessels.

The new owner of this vessel thought his boat was clean. Mechanics found mussels in the drive shafts. This boat was to be launched in Lake Mead.

2007 – Quagga Distribution



Jan 6 – Lake Mead, Jan 17 – L Havasu

Ecological Impacts

Filtration

- decrease in phytoplankton
  - impacts planktivores, filter feeders, and some larval fish
- increased water clarity
  - increased plant growth
- may cause algal blooms
  - reject blue-green algae, water quality issue

Shells and Mussel beds

- alter physical structure of substrate
  - change benthic and epibenthic communities

Economic Impacts

- Clogging
  - water intakes
  - trash racks
  - screens
  - boat motors

$40 million/year in maintenance costs to SWP facilities alone

(DWR draft estimate)

Zebra mussels encrusting various structures

Mussel Maintenance

- facility retrofit
- scrapping
- chemicals
- jet washing
- desiccation

Next Steps

- Delineate population – where are they?
- Determine density - how abundant are they?
- Is eradication possible?
- Containment – prevent spread
- Mitigation – how do we live with them?

What To Look For

Quagga Mussel

vs

Zebra Mussel

Asian Clam

Quagga Mussel

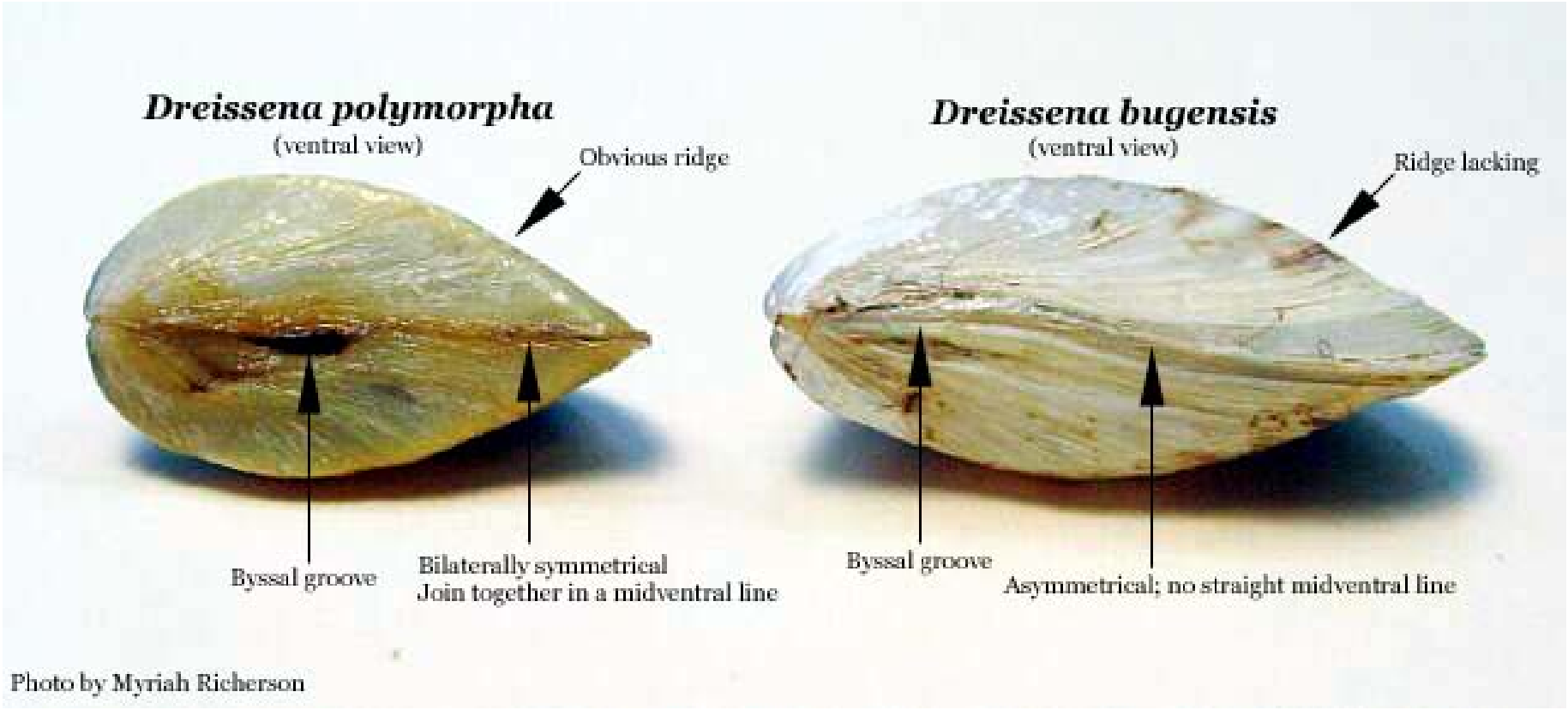
- Color pattern
  - – black, cream, or white bands
  - – pale or completely white
  - – dark concentric rings; paler in color near the hinge
- Size – 1 cm (.5 in) to 4 cm (1.5 in)
  - – feels like sunflower seed or small pebble
- Attached to substrate, but can be in silty or sandy areas

Zebra Mussel

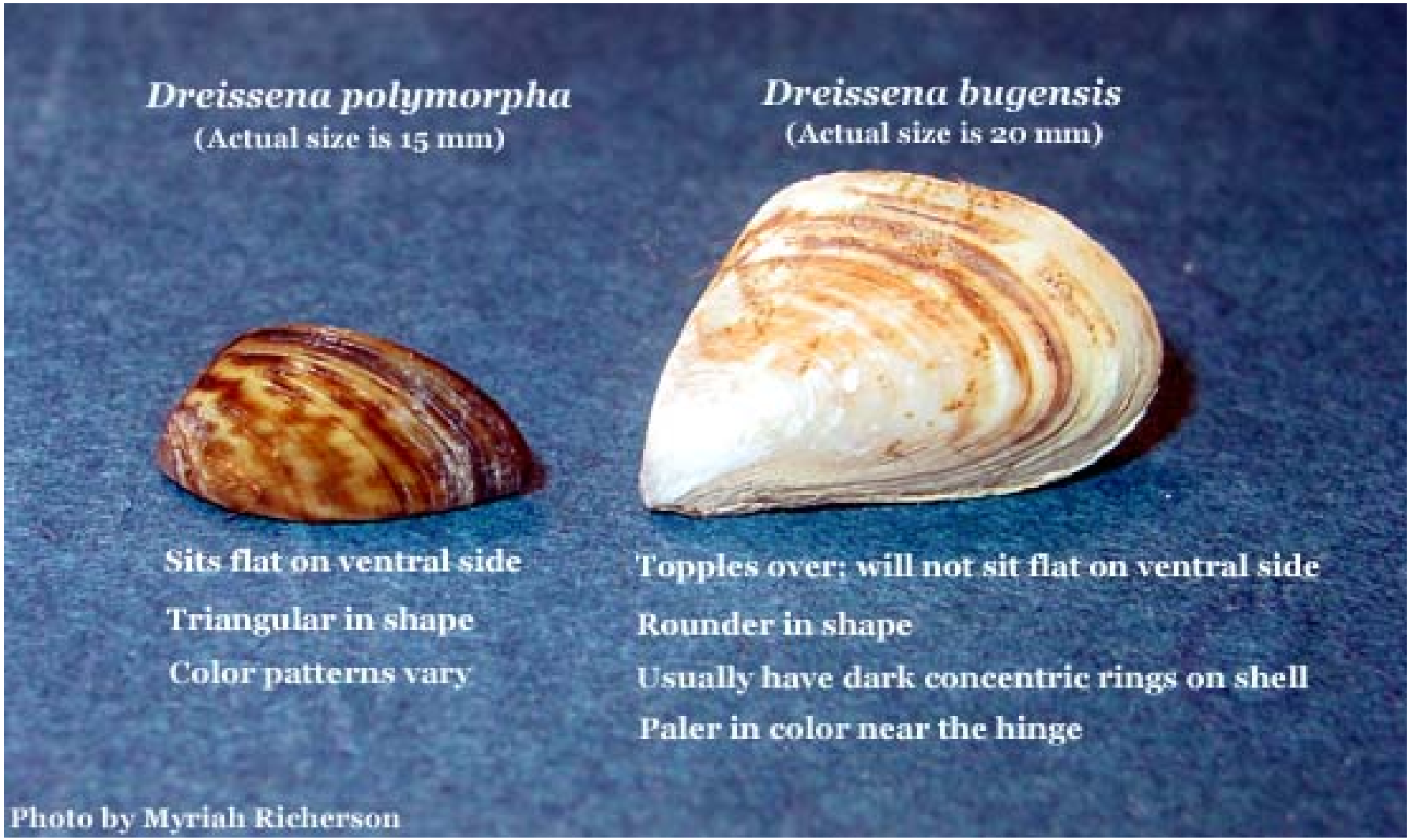
- Color pattern
  - brown or cream bands
  - solid color
- Size – 1 cm (.5 in) to 5 cm (2 in)
- Attached to substrate with “byssal threads”

Byssal threads

Quagga vs Zebra



Quagga vs Zebra



Do not confuse quagga and zebra mussels with:

Asian clam

- Color pattern
  - – brown with white patch at hinge
- Size – 1 cm (.5 in) to 4 cm (1.5 in)
- Loose in silty, sandy, or rocky areas;
- Shell
  - – thick, fan-shaped, symmetrical
  - – concentric ridges

- This exotic clam is very common in California. Popular as a “bait clam”.
- Its presence indicates habitat is good for quaggas and zebras.

What To Look For

Young populations will have **small individuals**

What To Look For

Young populations will have **low densities**
(1 mussel per foot; no or small clusters)

What To Look For

Attached onto hard and soft surfaces

May be in sandy or silty areas

What To Look For

Feel for **attached pebbles**, will pivot at point of attachment

Feel for **bumpy or gritty** surface on smooth objects

Tactile and visual search of boat docks and ramps, mooring lines, cables/chains, buoys, cement, rocks, aquatic vegetation, woody debris