

St. Louis River estuary as possible *Dreissena veliger* source to western Lake Superior

Jon Barge, Chelsea Hatzenbuhler, Anne Cotter, Joel Hoffman, Christy Meredith, Greg Peterson, Sara Okum, Erik Pilgrim, Barry Wiechman, and Anett Trebitz U.S. EPA Office of Research and Development, Great Lakes Toxicology and Ecology Division (Duluth MN) and Watershed and Ecosystem Characterization Division (Cincinnati OH)

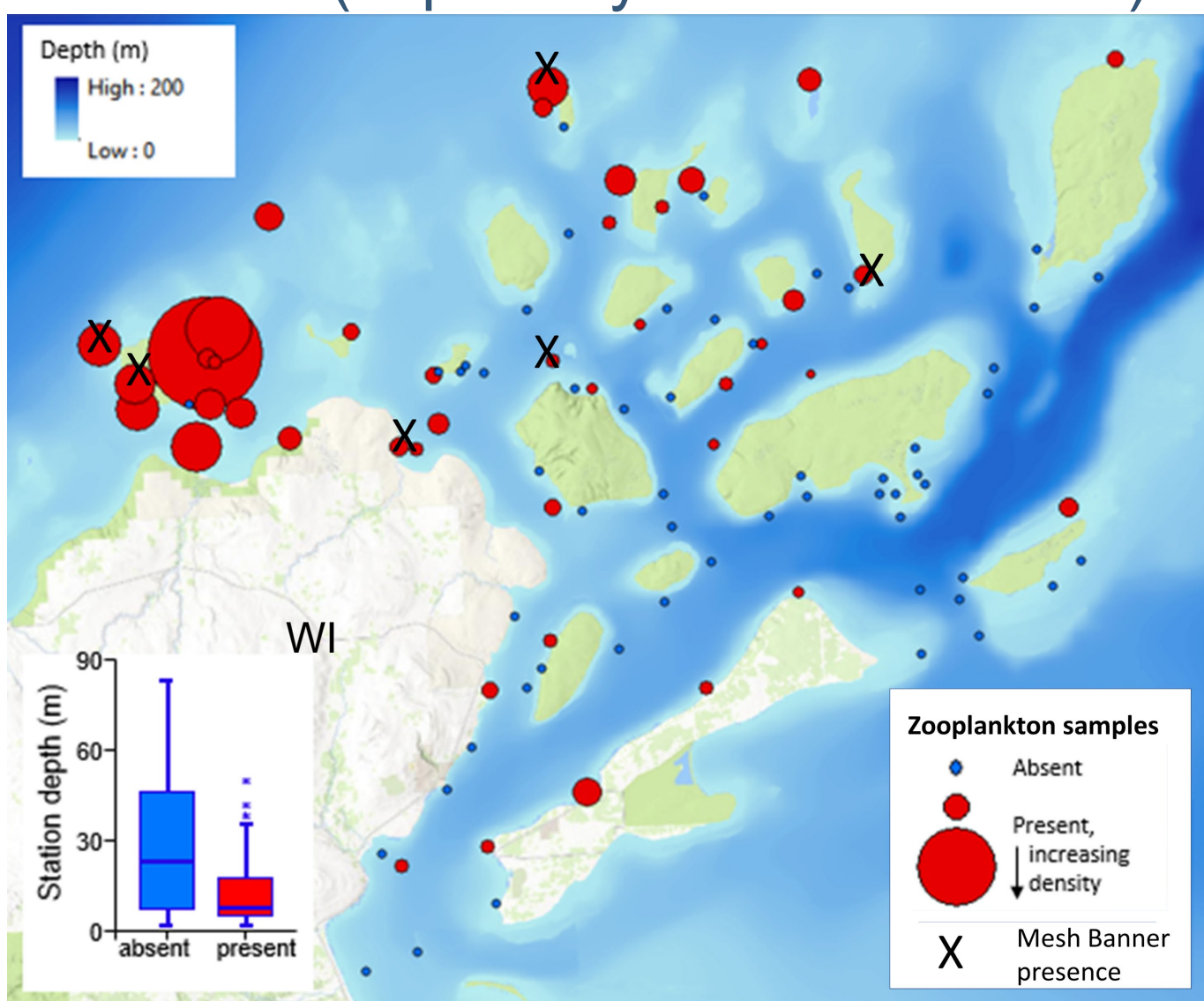
Jonathan Barge | Barge.Jonathan@epa.gov | 218.529.5141

Background

In 2017 EPA conducted early detection case study in western Lake Superior around the Apostle Islands (APIS) addressing concerns over adult *Dreissena* finds on shipwrecks & native mussels by Nat'l Park Service

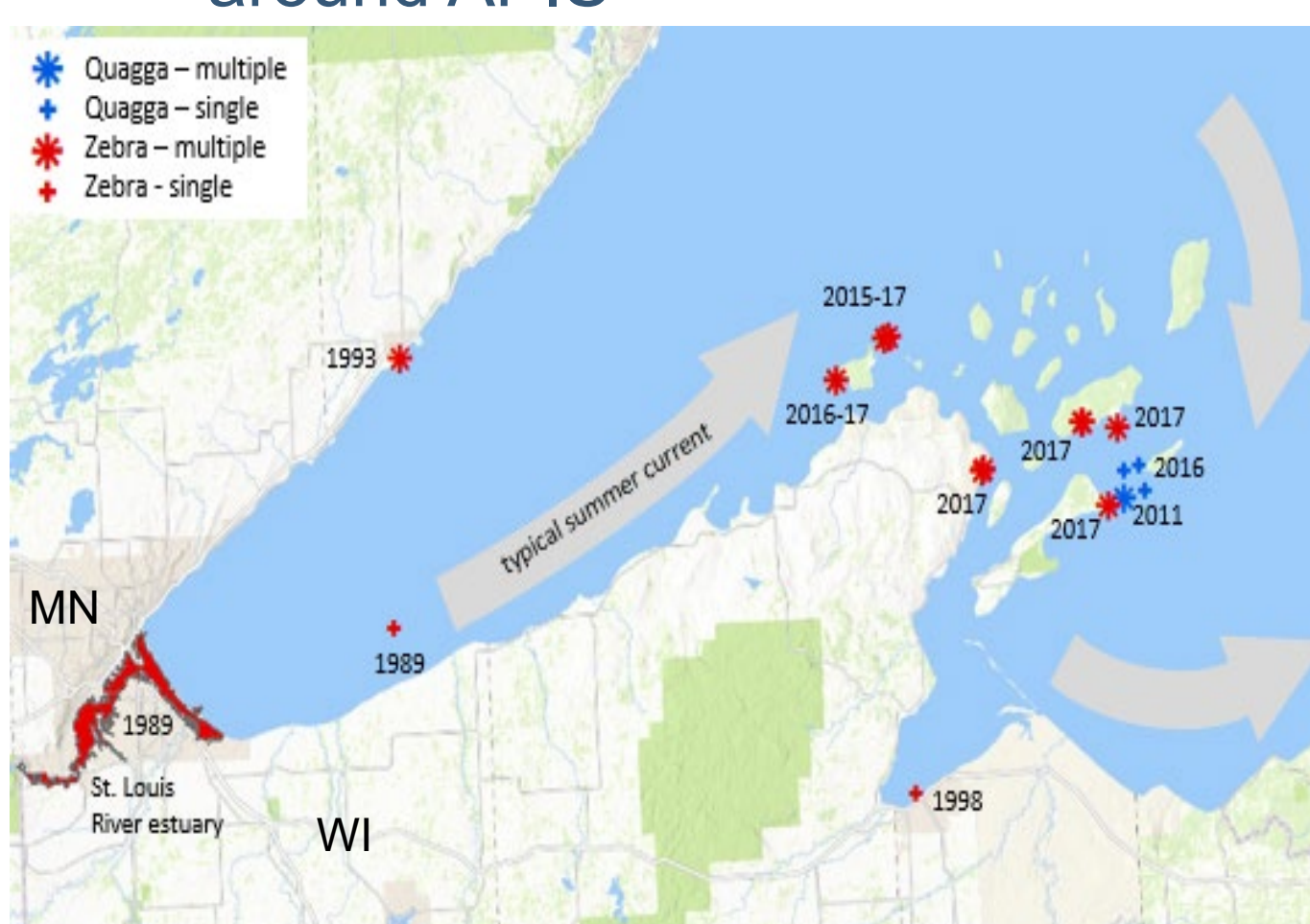
Results:

- No settled juvenile or adult *Dreissena* on passive gears
- Dreissena veligers* present in 44% of zooplankton samples albeit in low densities
- Finds primarily along NW side of islands (especially around Sand Is.)



Conclusions:

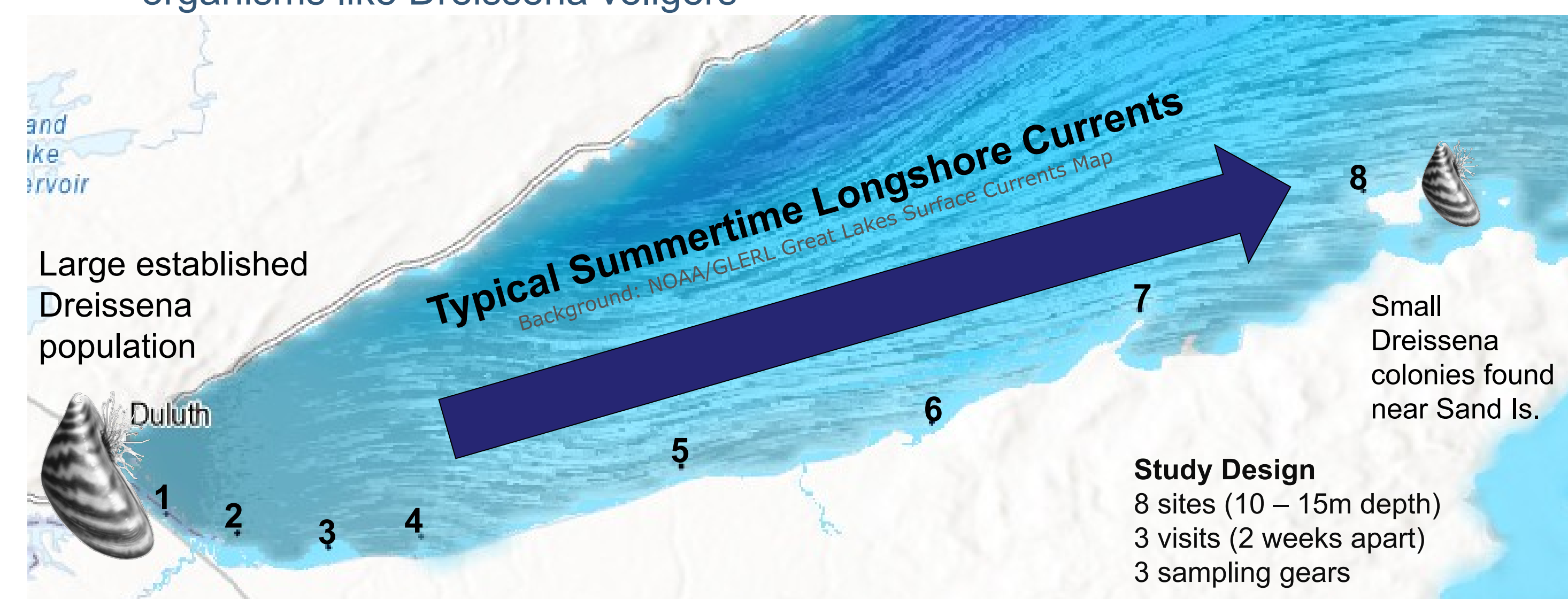
- Low veliger densities suggest adult *Dreissenid* populations are low and detected veligers may not have originated in APIS
- APIS detections point to possible transportation from longshore surface currents
 - St. Louis River Estuary (SLRE) has largest and most established *Dreissena* population in Lake Superior
- Typical summer surface currents transport water from SLRE around APIS



Survey Overview, Design, & Methods (2019 W. Lake Superior south shore survey)

Objectives: Follow up 2017 survey by determining concentration gradient and detection of *Dreissena veligers* along south shore (SLRE to APIS)

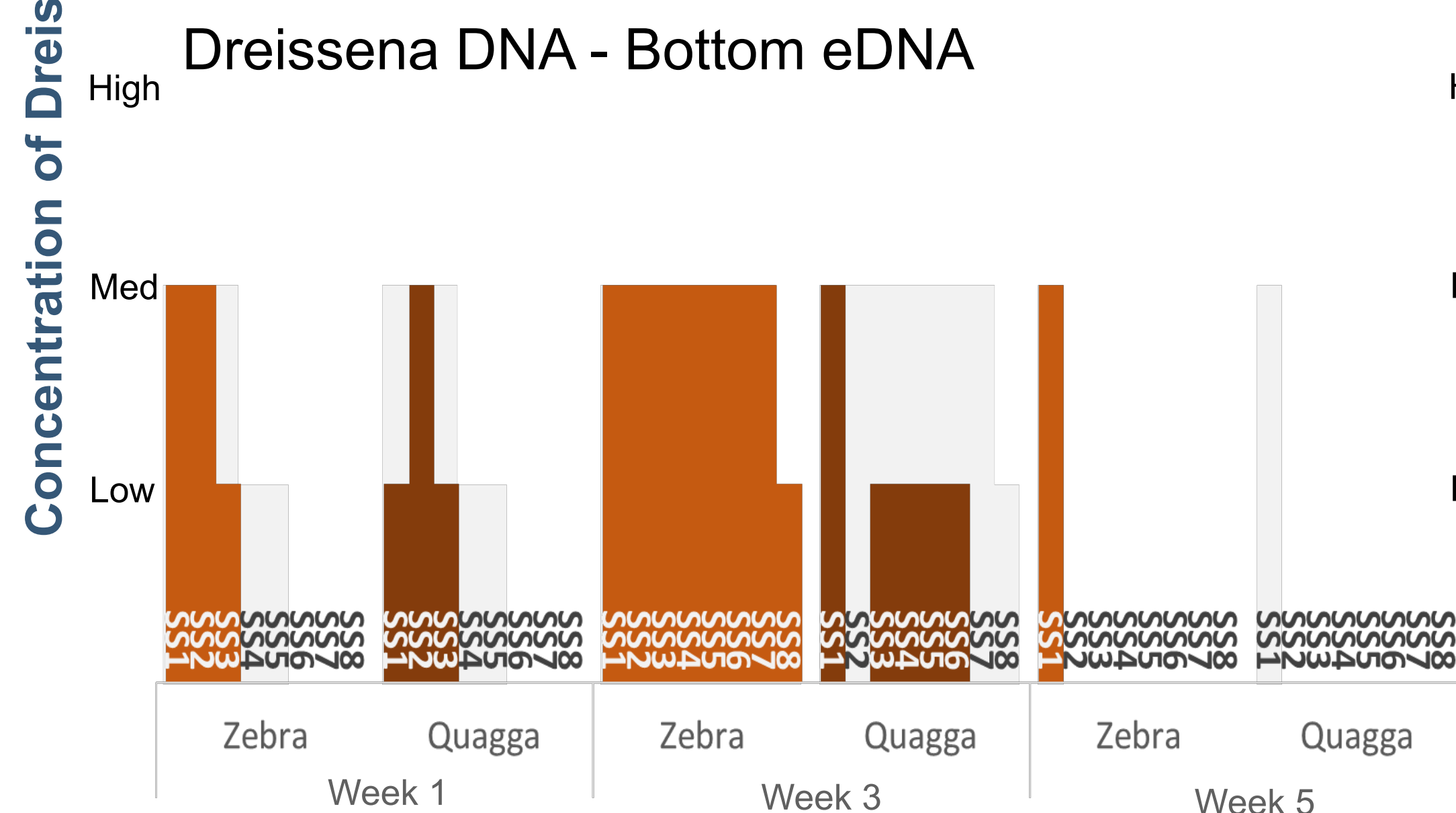
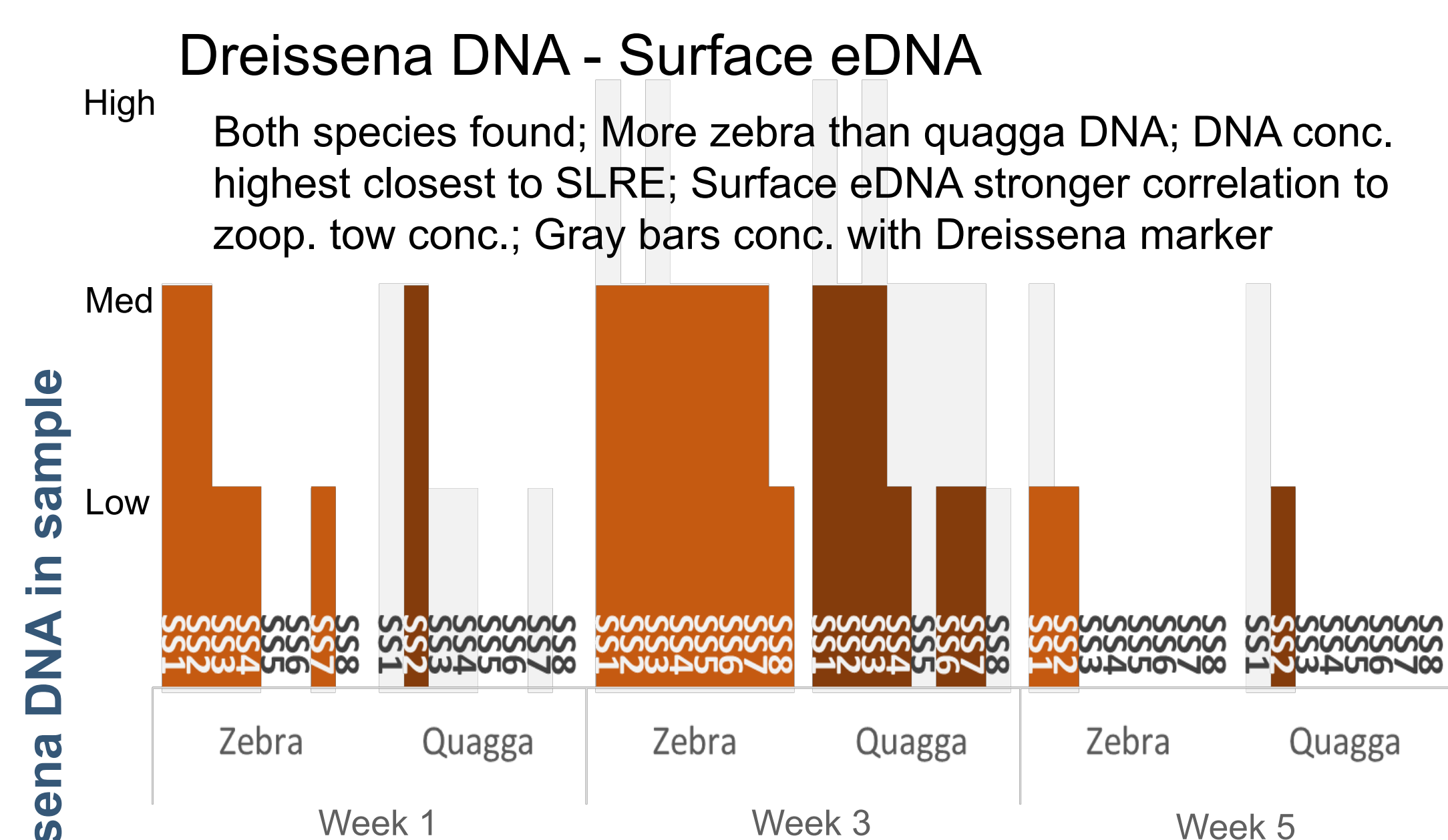
- Evaluate if SLRE is a potential veliger source of APIS *Dreissena* and determine if a gradient of decreasing detection exists
- Evaluate modified methods for increased probability in detecting low abundance organisms like *Dreissena veligers*



Findings (qPCR results)

PCR based DNA Concentration:

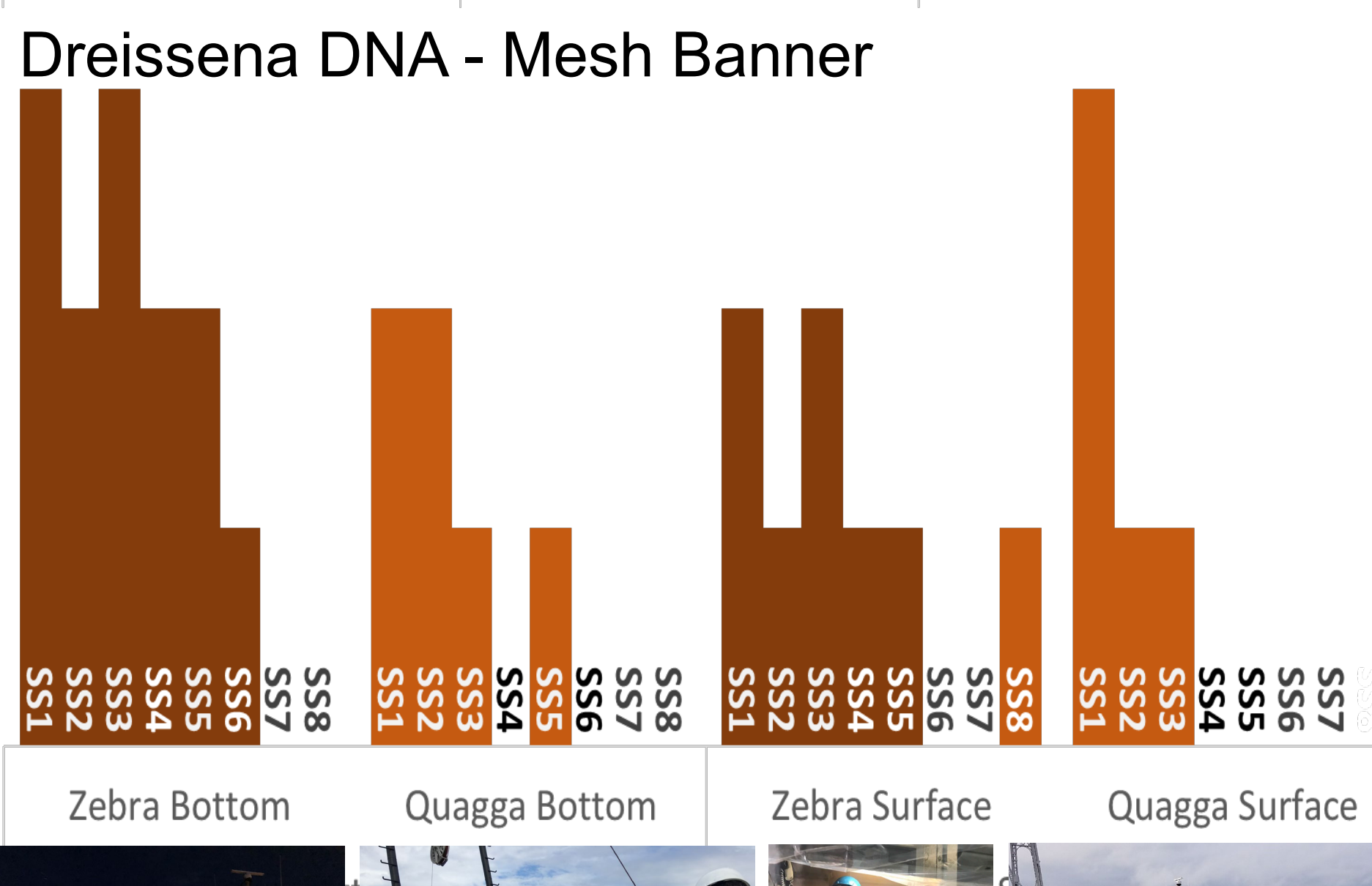
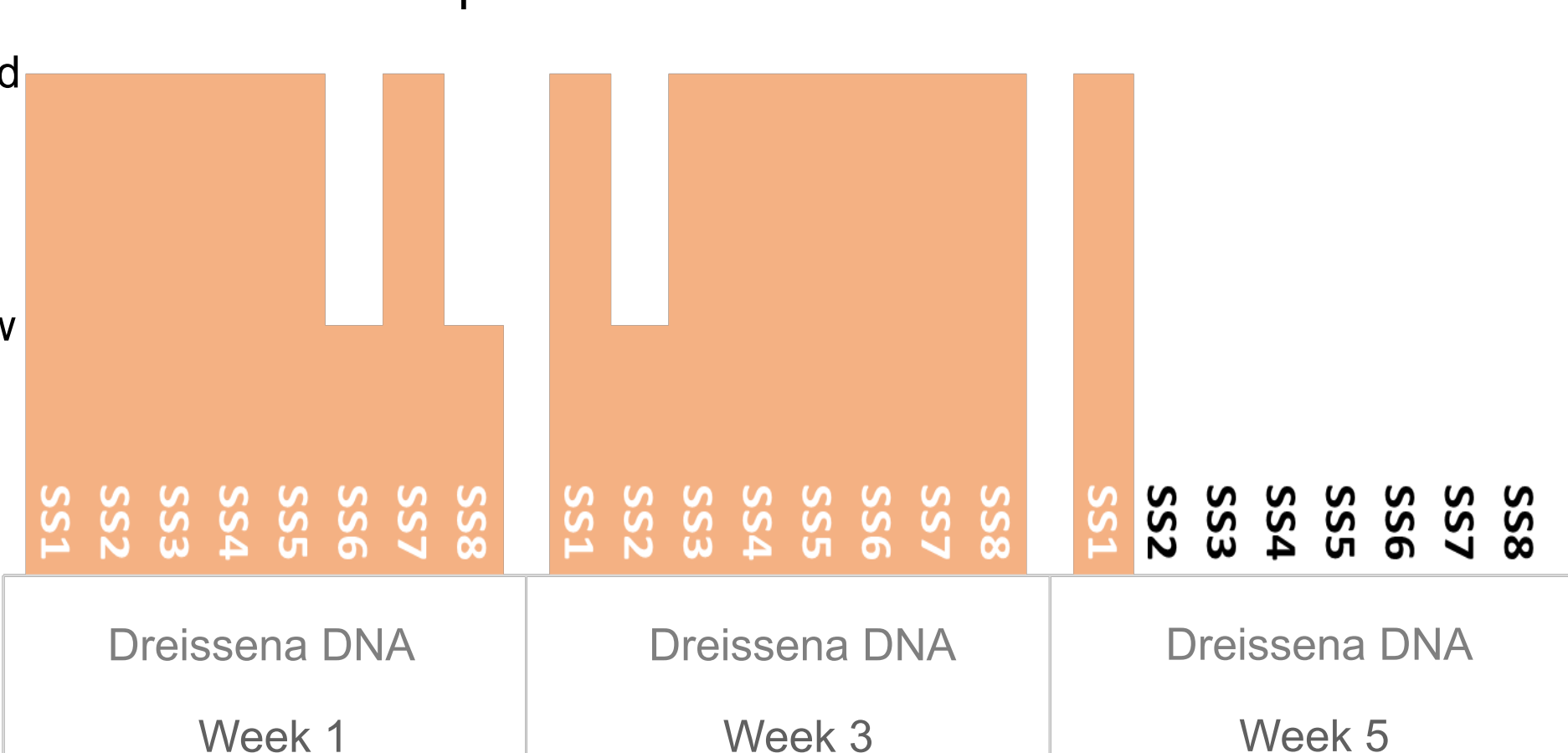
- Detection of target DNA with qPCR (45 total cycles)
- Fewer PCR cycles to detect target = higher DNA concentration in sample



DNA concentration: High=DNA detected < 29 PCR cycles; Med=DNA detected 29-37 cycles; Low=DNA detected 38-40 cycles

Dreissena DNA - Zooplankton EtOH

Assessing EtOH preservative = minor inconsistencies w/ Zoop tows (i.e. wk1-SS6); Bottom mesh provided better detection

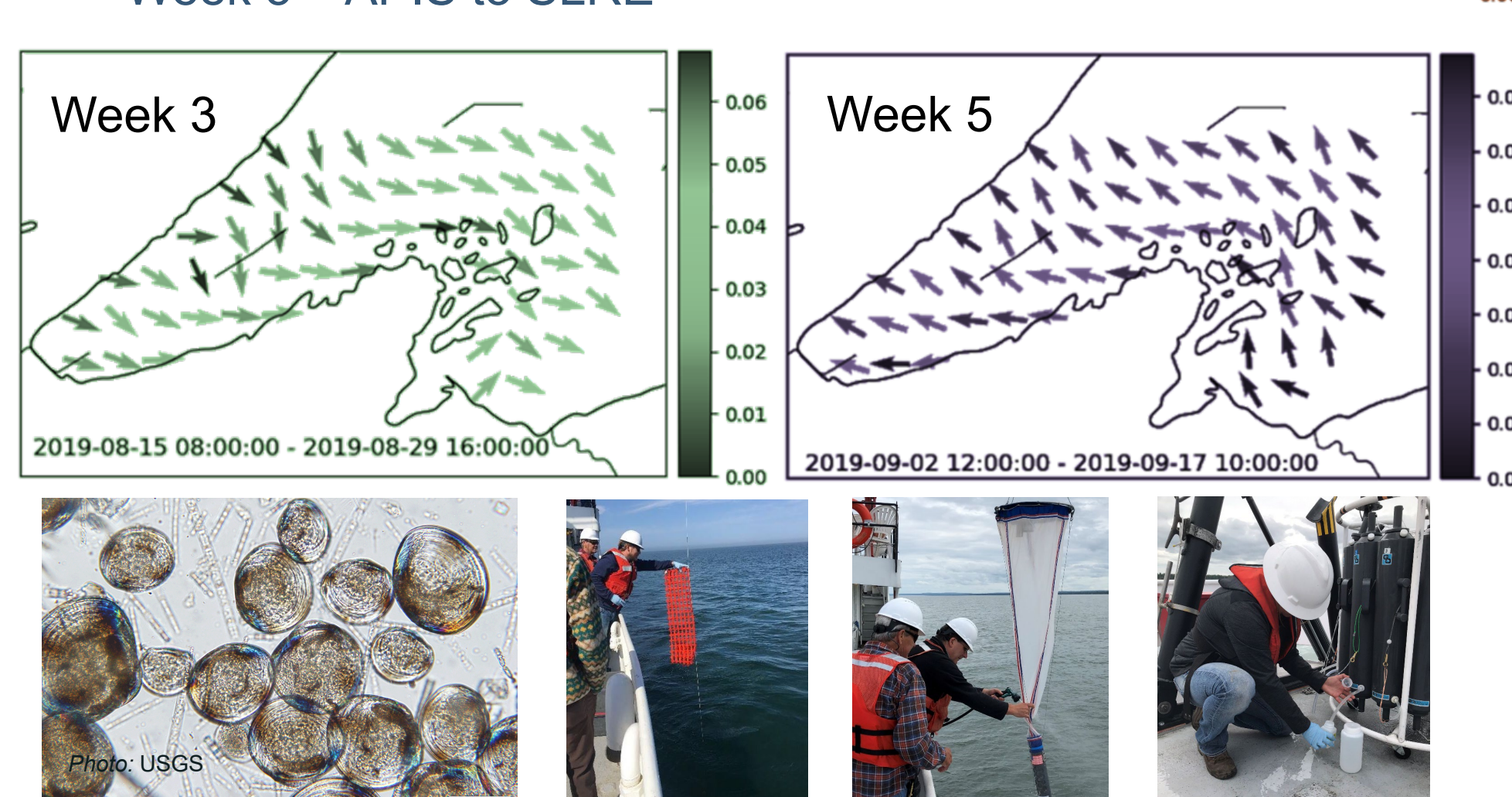


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Environmental Conditions

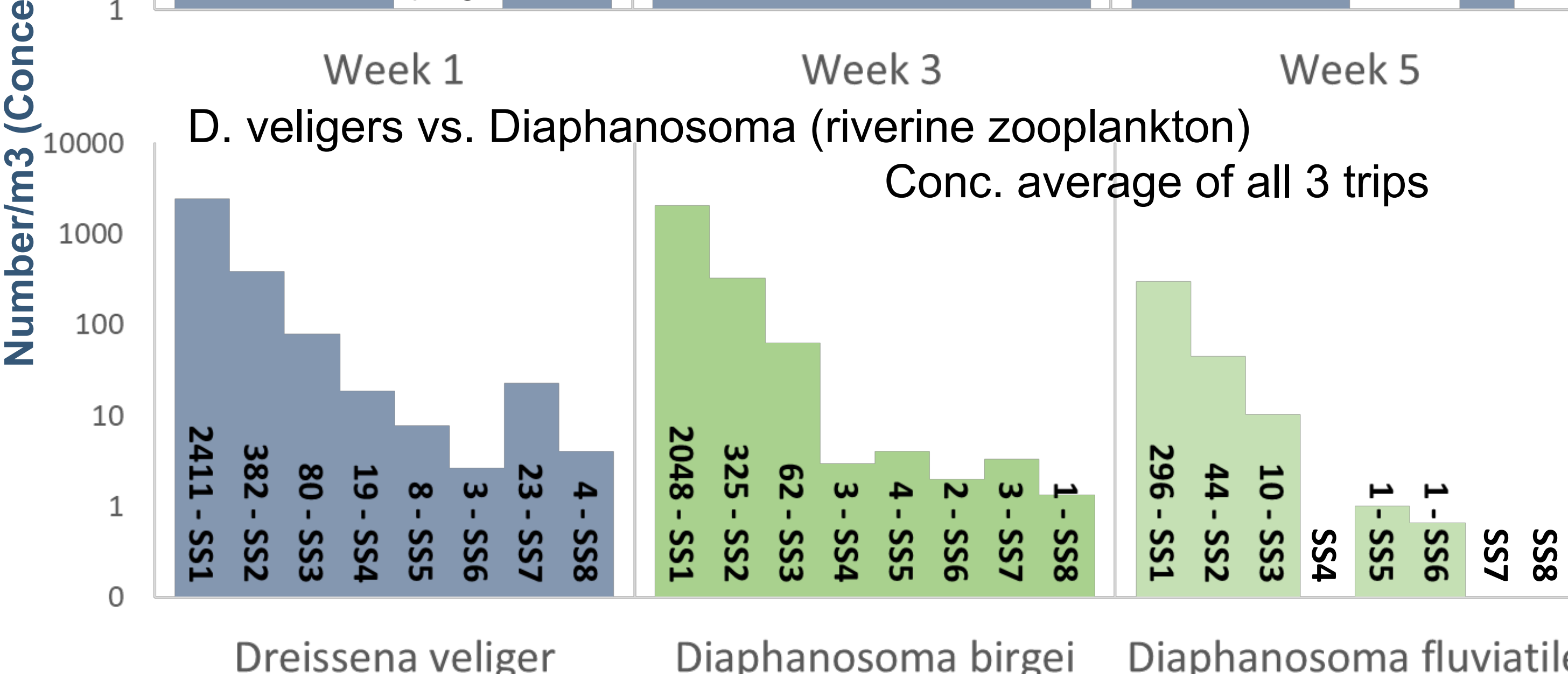
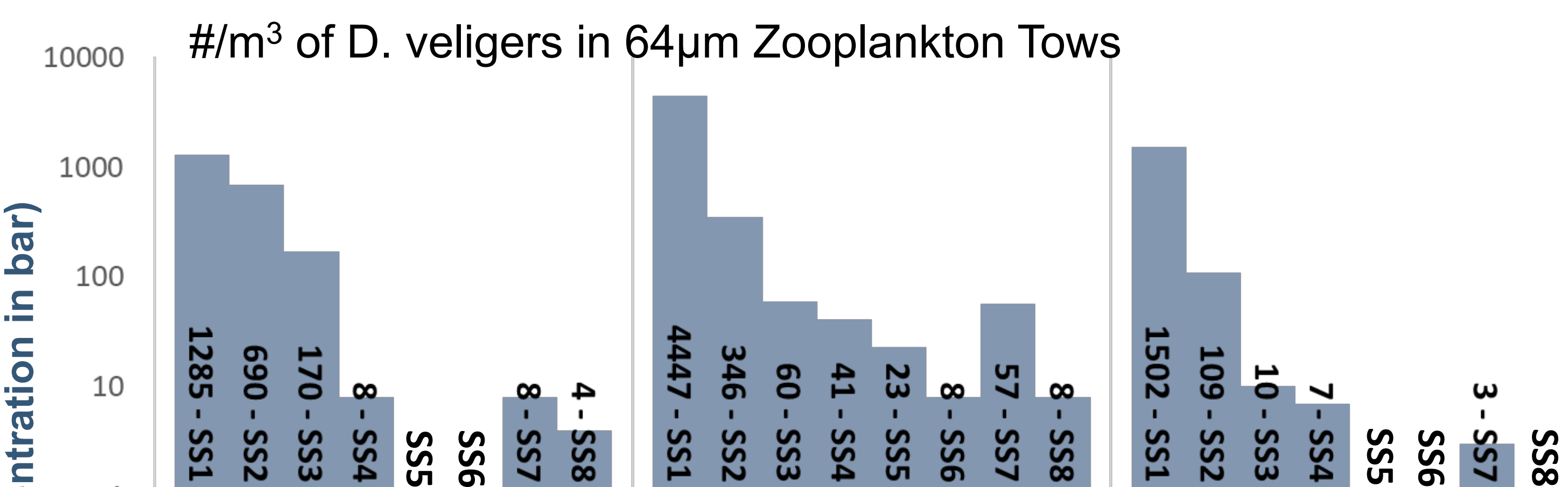
Surface current patterns leading up to each sampling week (time averaged velocity; 2wks prior to sampling)

- Week 1 – SLRE to APIS
- Week 3 – SLRE to APIS
- Week 5 – APIS to SLRE



Findings (Zooplankton Tows)

Veliger concentration: decreasing concentration of veligers from SLRE to APIS; Pattern similar to non-open-lake SLRE species like *D. birgei*



Conclusions

- Consistent decrease in *D. veliger* concentration along south shore in zooplankton enumeration
- Diaphanosoma* species (invasive to SLRE – riverine) follow similar trends as *D. veligers*
- Zebra mussel eDNA found more consistently and in greater concentration w/ eDNA
- Surface eDNA more consistent with zoop. tows than bottom eDNA
- Environmental factors play large role in detection (wk5 currents & eDNA)