Vertical Distribution of Walleye (*Sander vitreus*) in Lake Erie: Ecological and Management Implications

A.M. Gorman*[1], R. Kraus[2], C. Knight[1], C. Vandergoot[1], M. Faust[1], Y. Zhao[3], L. Gutowski[4], T. Hayden[2], C. Krueger[5]

1 Ohio Department of Natural Resources

2 USGS science for a changing world

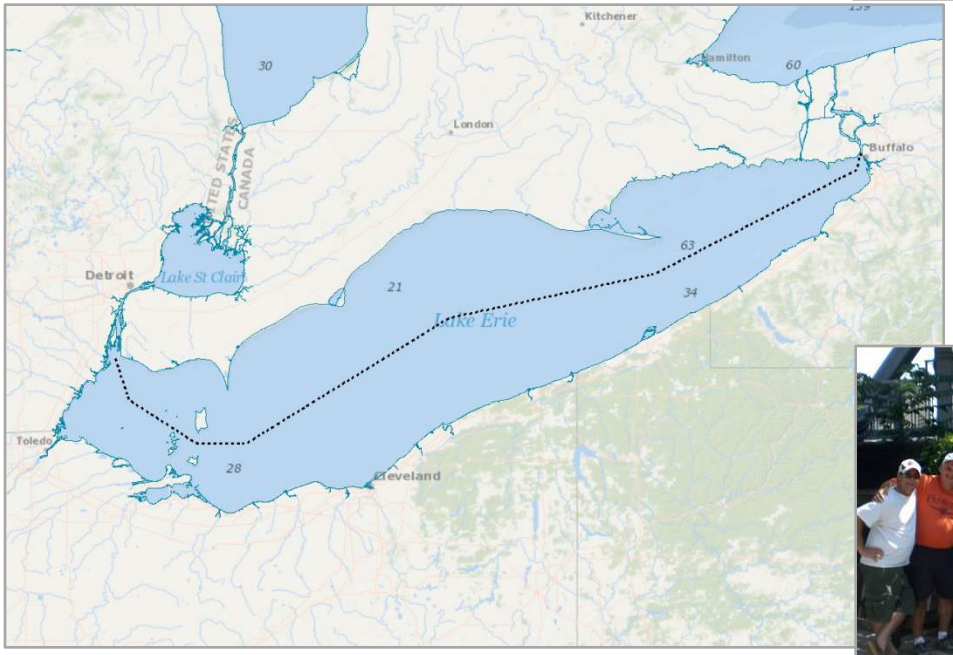
3 Ontario Ministry of Natural Resources

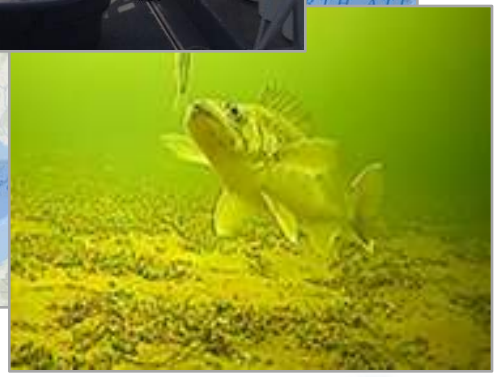
4 Carleton University

5 Michigan State University

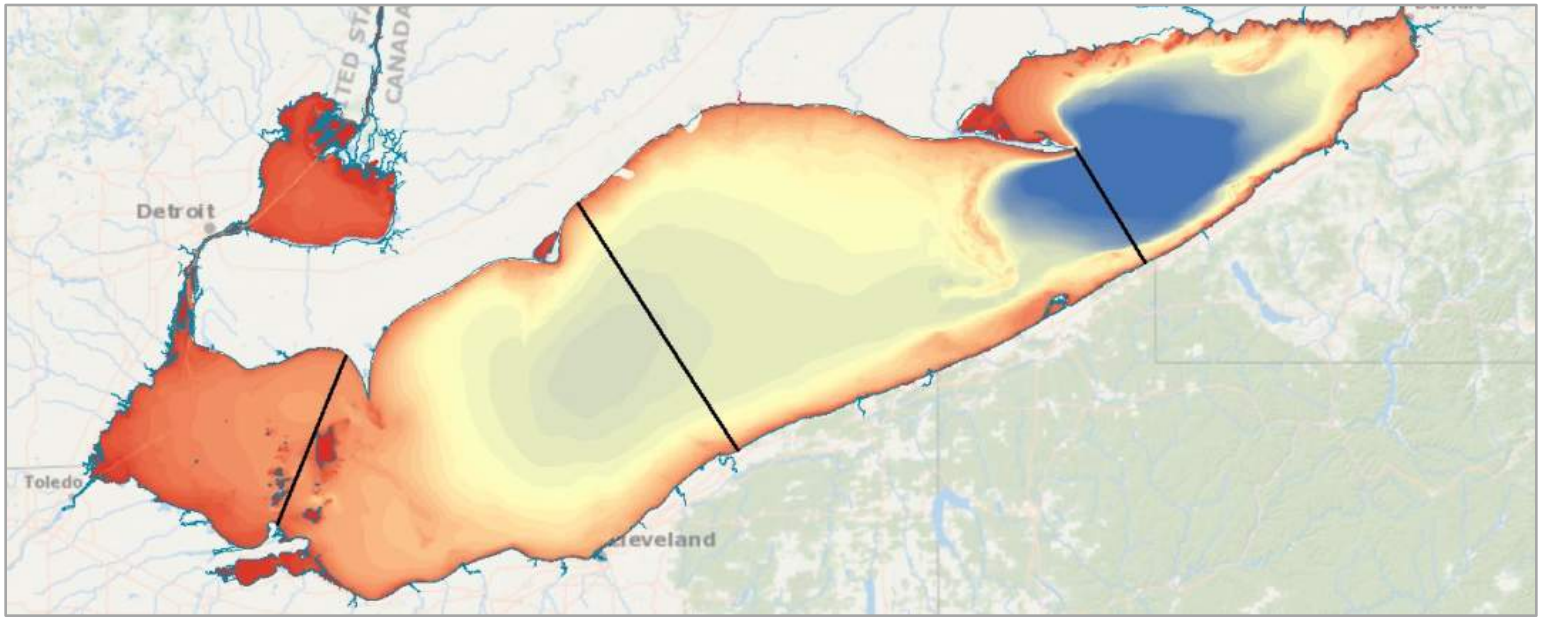
Lake Erie Walleye

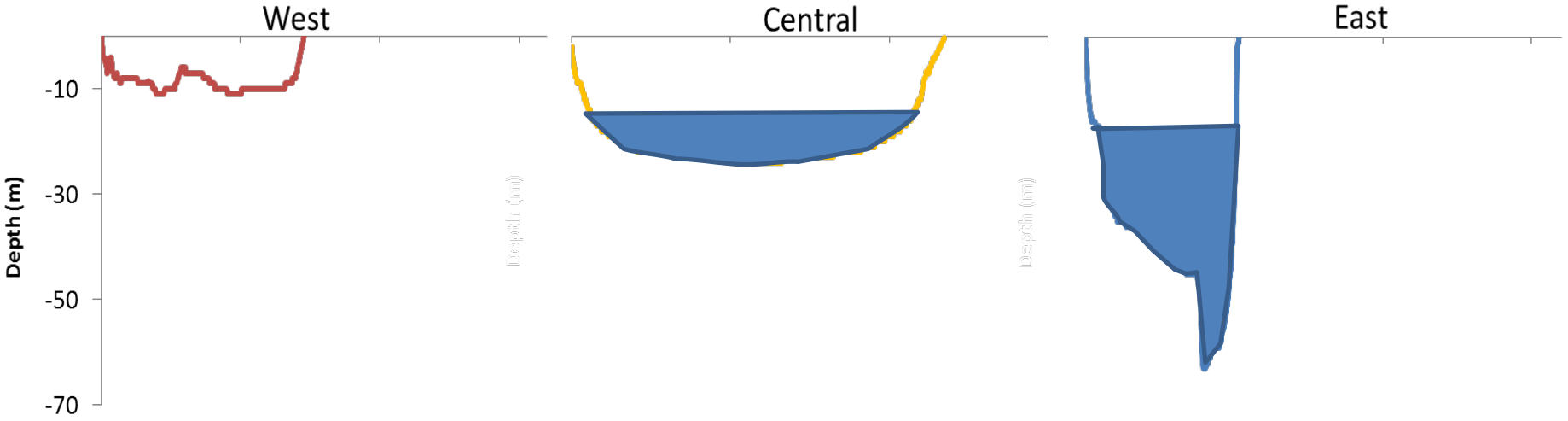
- Native Percid
- Naturally-reproducing
- Top predator



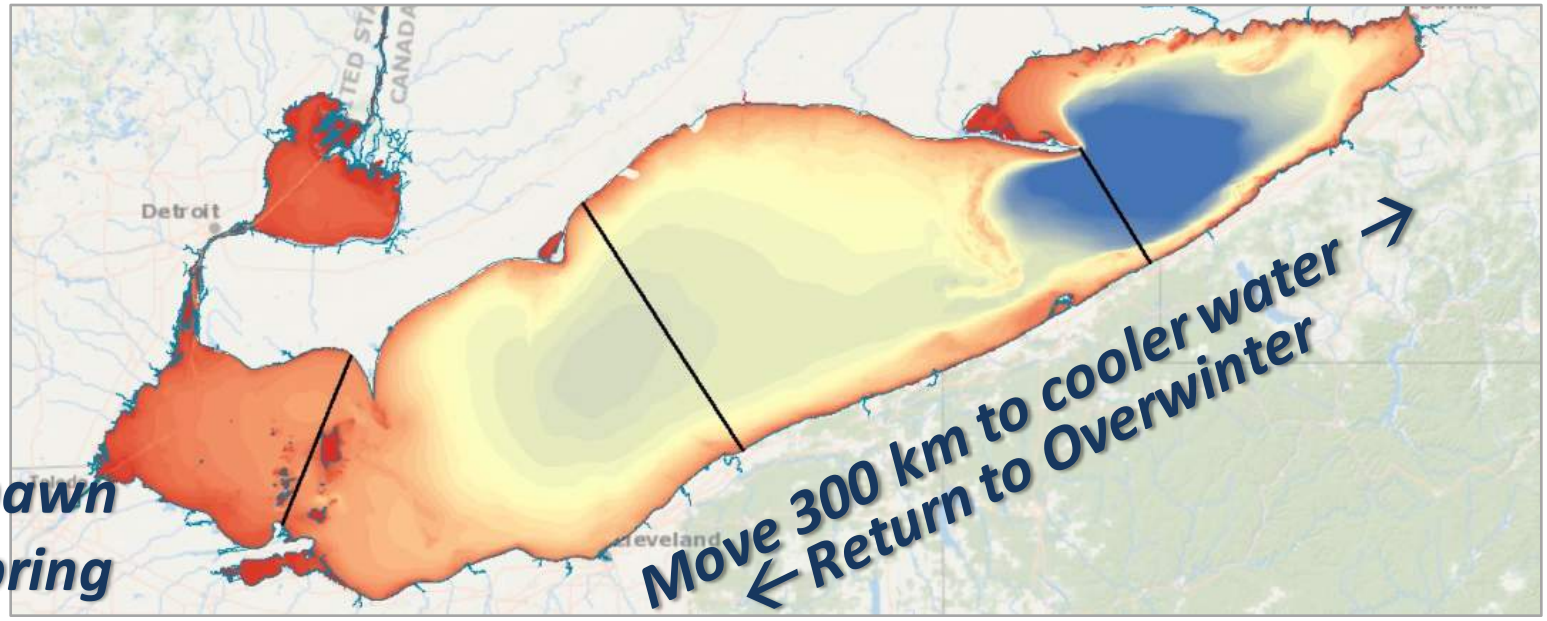


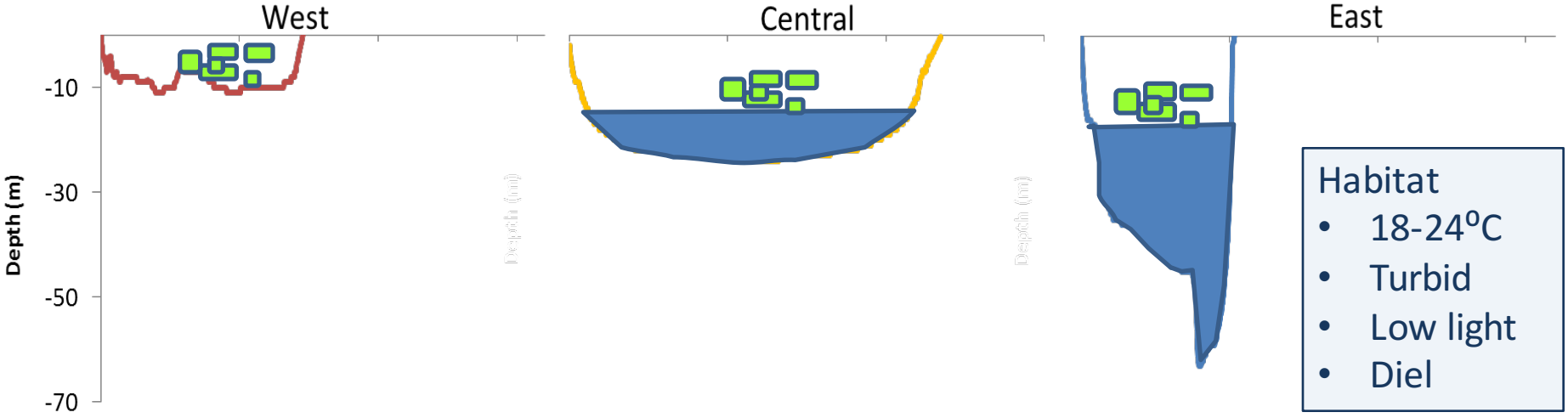
Lake Erie


Detroit
Toledo
Cleveland


West
Central
East
Depth (m)
-10
-30
-50
-70

Lake Erie


Detroit
Cleveland
Spawn
Spring
Move 300 km to cooler water
Return to Overwinter


West
Central
East
Depth (m)
-10
-30
-50
-70
Habitat
• 18-24°C
• Turbid
• Low light
• Diel

Objectives

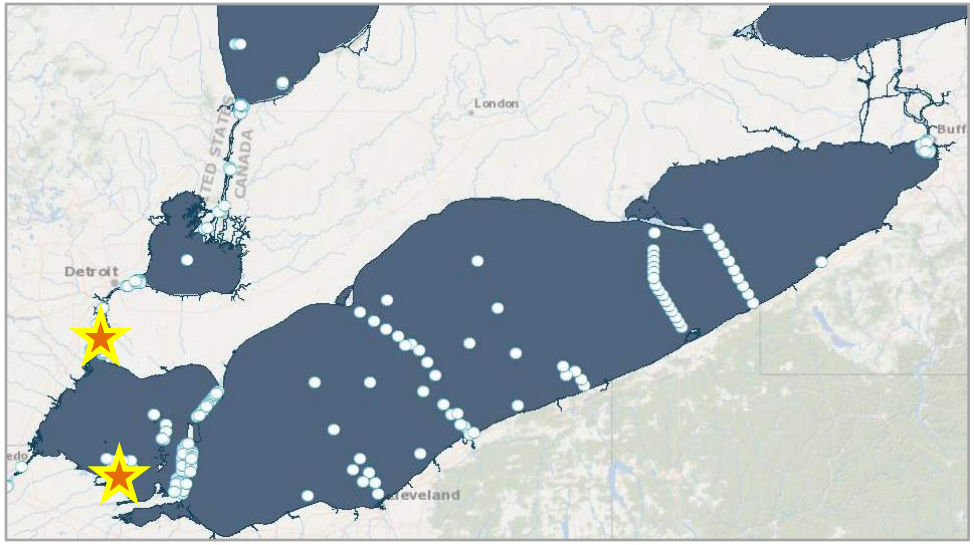
1) Quantify *seasonal* and *geographic* changes in the vertical habitat use of walleye using pressure-sensing acoustic telemetry.

2) Describe *diel* changes in vertical habitat use relevant to gill net surveys of walleye.

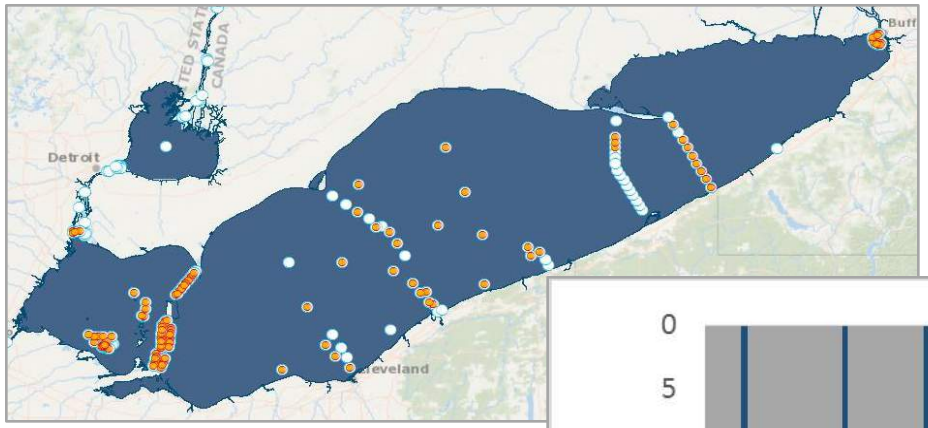
3) Contrast *tagging* results with walleye occurrences in *gill net surveys* as a function of *depth*.

Acoustic Telemetry

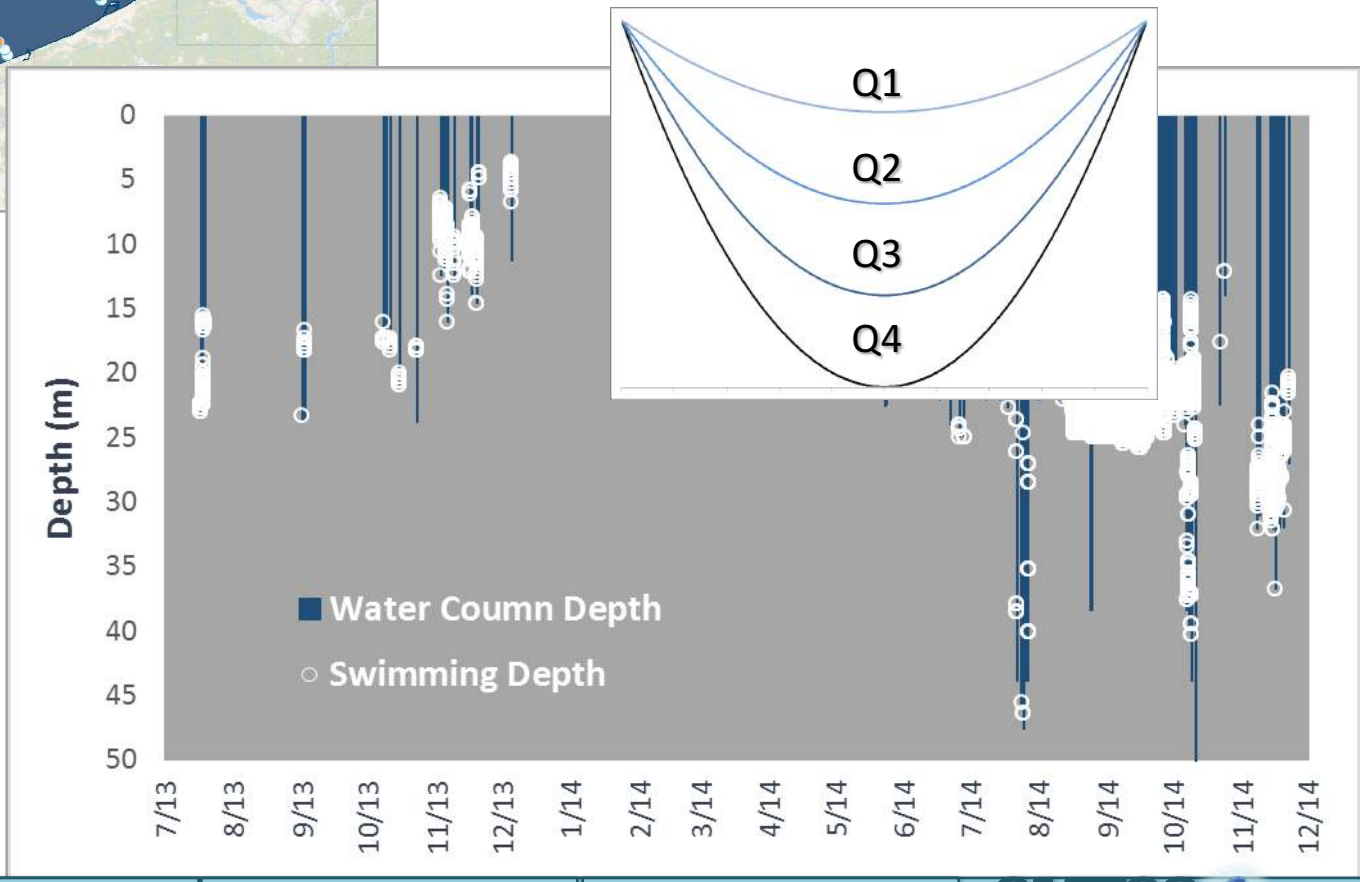
- ~50 mature adults tagged, 2012 & 2014
- Vemco V16, pressure-sensing 69kHz
- GLATOS



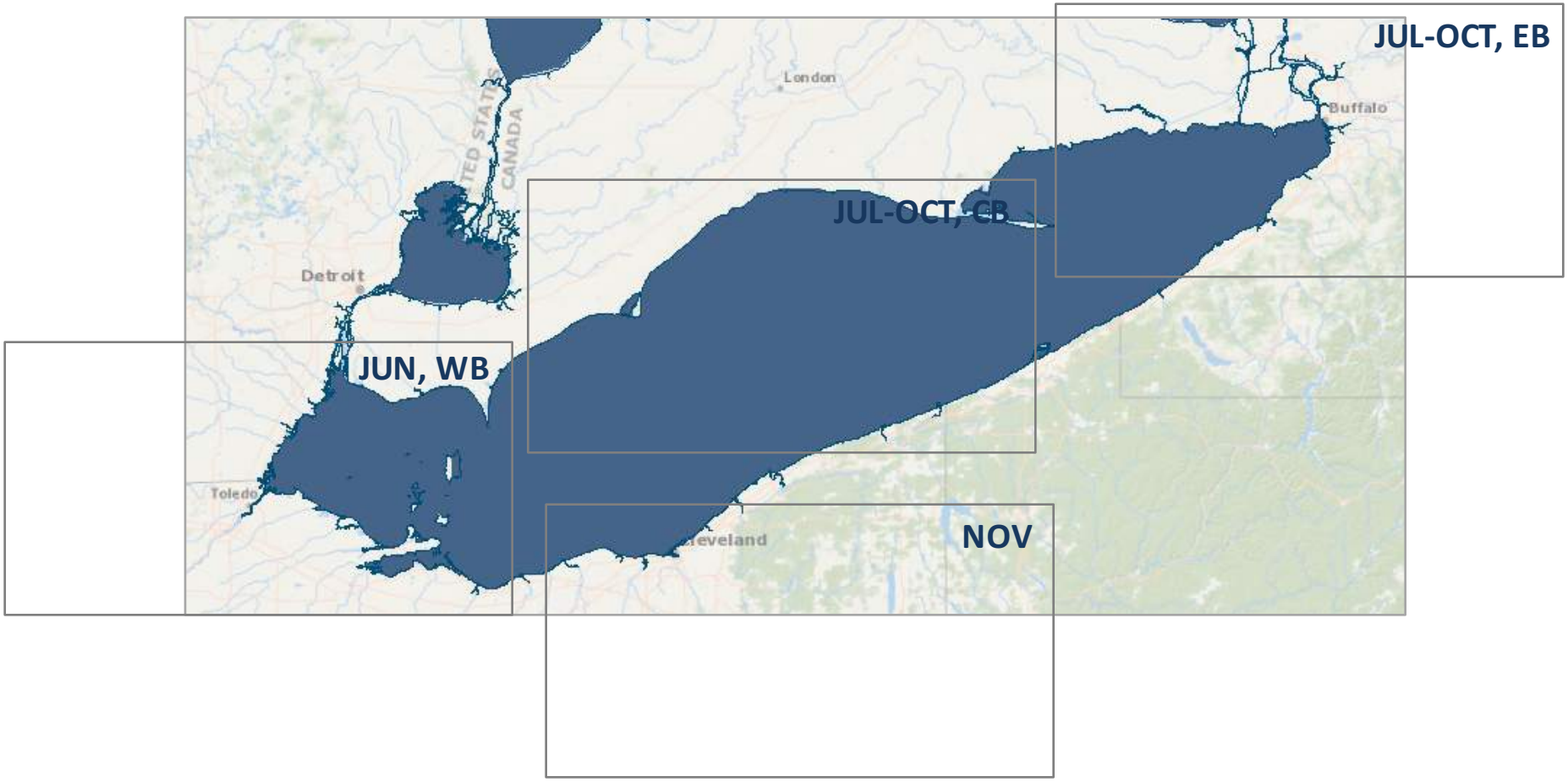
Vertical Distribution
Seasonal & Geographic



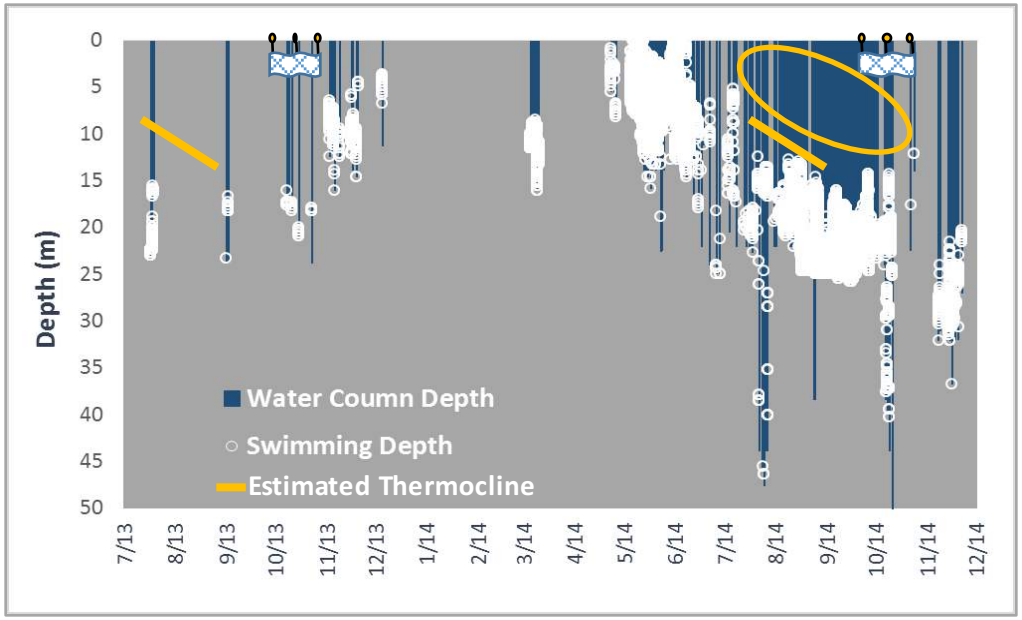
- 171 receivers
- > 97K observations, 20 fish



Vertical Distribution
Seasonal & Geographic



Vertical Distribution
Seasonal & Geographic



Unexpected

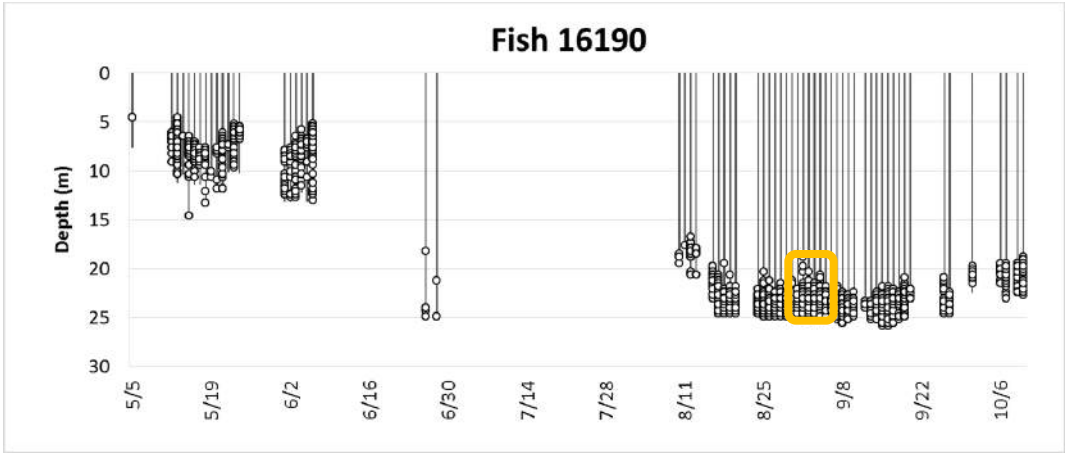
1. **Bottom** at night
   - *Diel movements*
2. **Bottom** in Fall
   - *Gill net data*

Concern

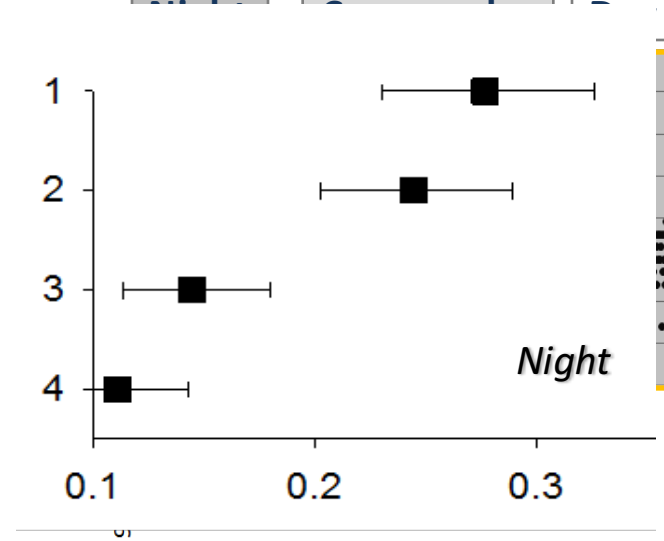
Is the *thermocline* a transmission barrier? NO.

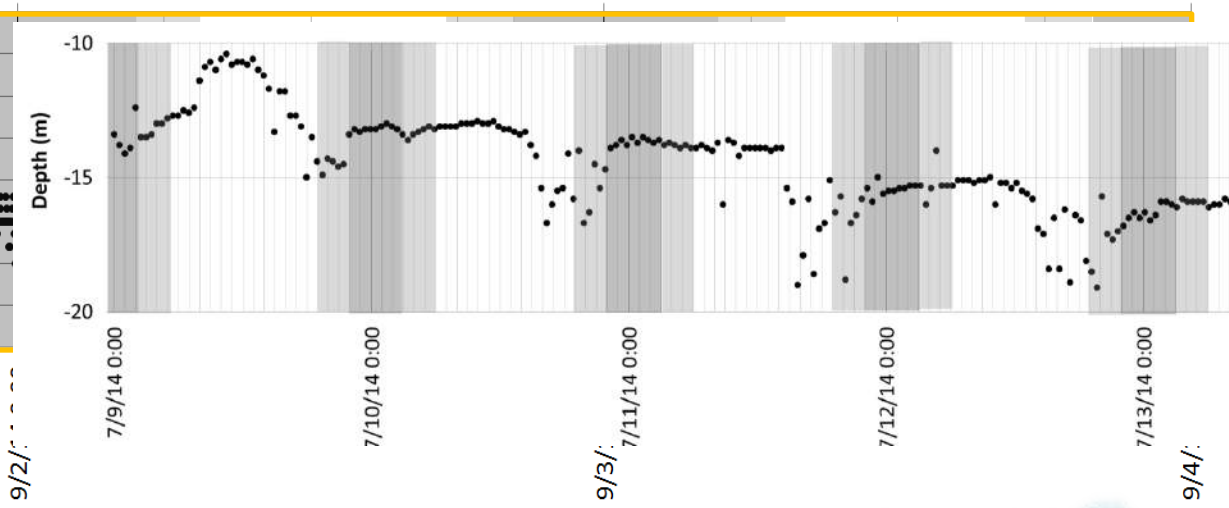
- Few detections in top of water column, even after turnover
- Vertical range test (+/- 0.9 m)

Vertical Distribution
Diel

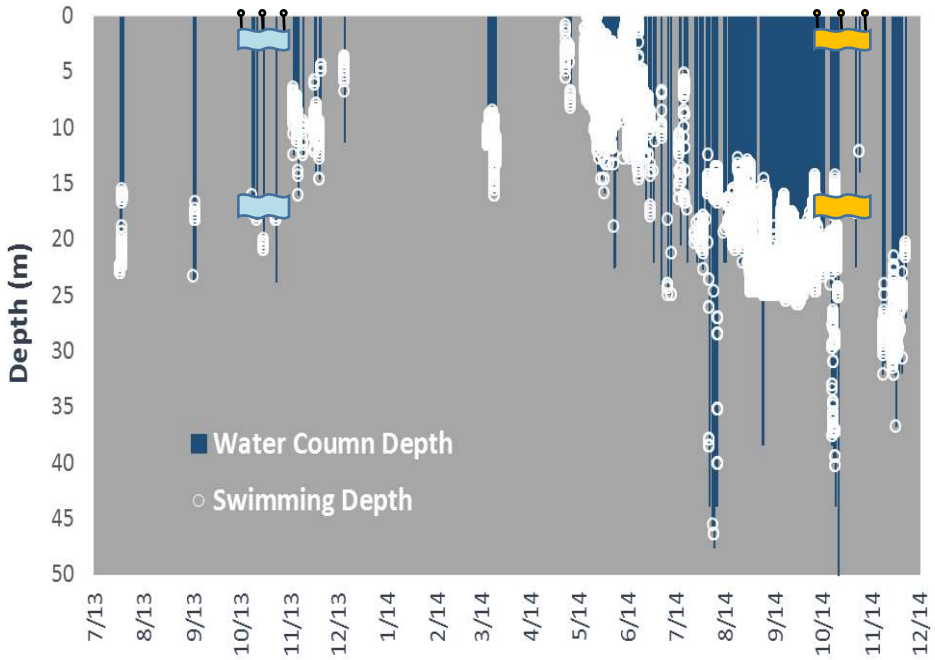


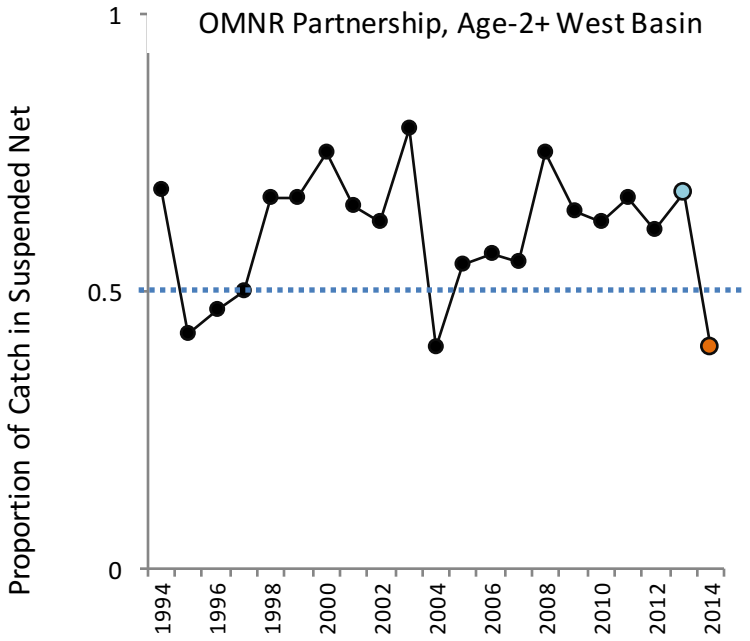
Quartiles - Within Daily Range of Depths Used by Individual Fish





Vertical Distribution in the Fall
Telemetry vs. Gill Nets





Telemetry

- Fall 2013-2014: *bottom-oriented*

In Ohio, we still catch fish in our suspended nets…

Gill nets

- Fall: *suspended* nets catch more adult WAL than bottom nets (except East)
- *Bottom-orientation is not a recent trend*
- 2013: more in suspended
- 2014: more in bottom, NS

Remaining Questions

If Walleye are bottom-oriented and do not move "up" at night, why do we catch them in our suspended nets?

- Are prey fish captured in the gill net acting as **bait**? *(Dartay & Duman, 2014)*; Is this more probable at **night** because of increased foraging activity?
- Is the telemetry only describing behavior of "**large**" fish while gill nets sample age 2+? *(Middel et al., Lake Trout)*
- Are high catches in the suspended nets (i.e. less-preferred habitat) an indication of a **density-dependent habitat limitation**?

Summary

1. Walleye were strongly oriented towards the bottom quarter of the water column even in the fall. [little or no time was spent at the surface]

2. Daily vertical migration occurs but is limited.

3. Gill nets in the surface layer were far more efficient than bottom nets for collecting walleye, BUT behavioral results from telemetry tags do not yet provide an explanation for why this is so.

4. *97K is not enough information to change assessment…*

Acknowledgments

C. Holbrook, T. Binder

Vemco – Dale Webber, Matt Holland, Ainsley Hilliard

GLFC – ICFT travel

OTN – receiver loan, conference organizers

Field crews: