

Lake sturgeon use of natural and navigational channels in a large river system

Assessing the potential for sturgeon-vessel interactions



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Acknowledgements

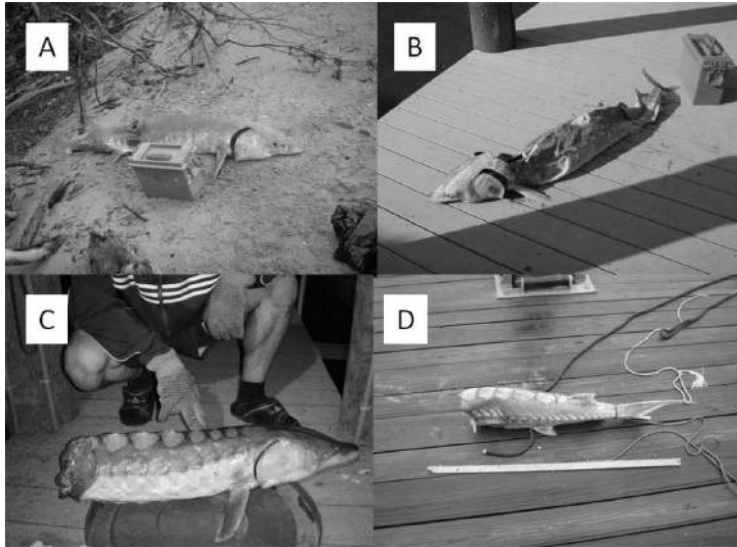
- Matthew Faust
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- Jaquie Craig
- Steven Gray
- Stacy Provo
- Great Lakes Fishery Trust
- Great Lakes Restoration Initiative
- Great Lakes Fishery Commission
- Great Lakes Acoustic Telemetry Observation System (GL ATOS)



Animal-Vehicle Collisions



- One consequence of human-dominated landscapes
- Long-recognized threat to marine animals
- Fish also may be susceptible
- Mortality from collisions may further imperil RTE species or slow their recovery

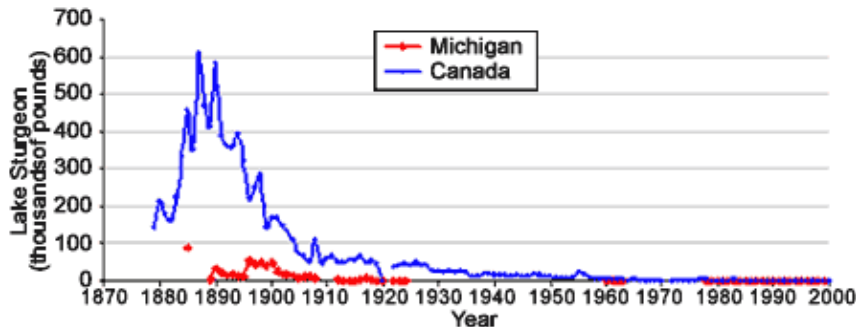


Balazik et al. 2012 (Figure 1, pg. 1063)

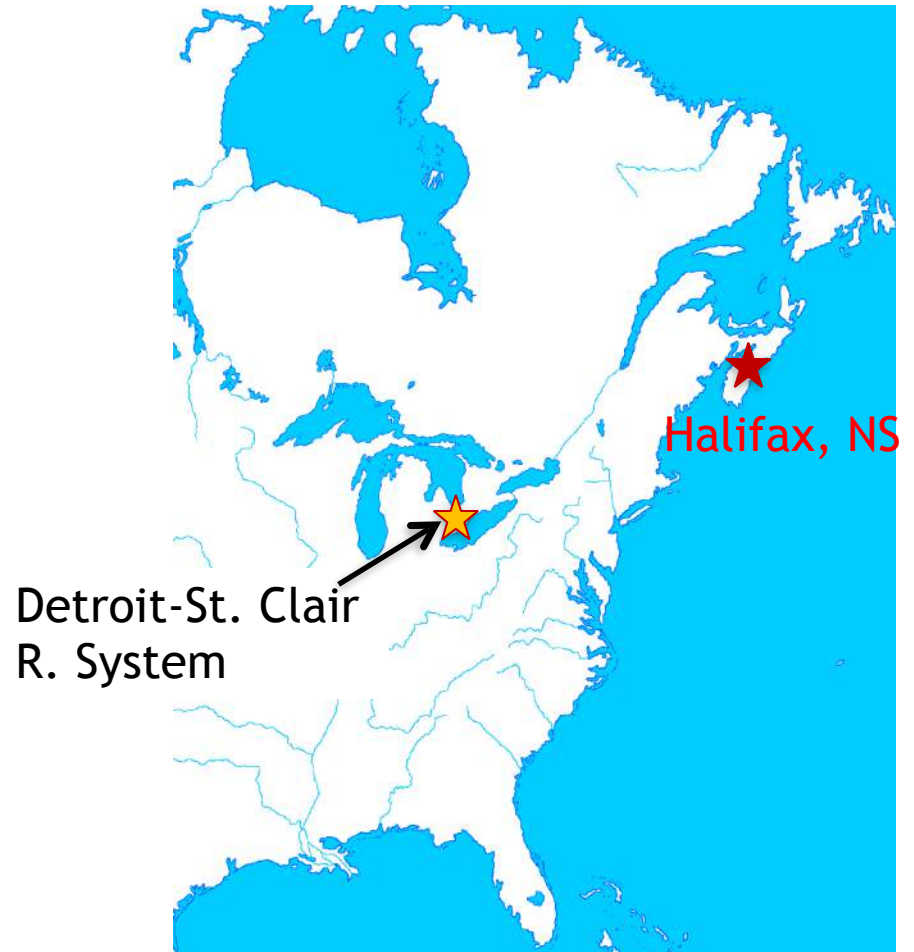
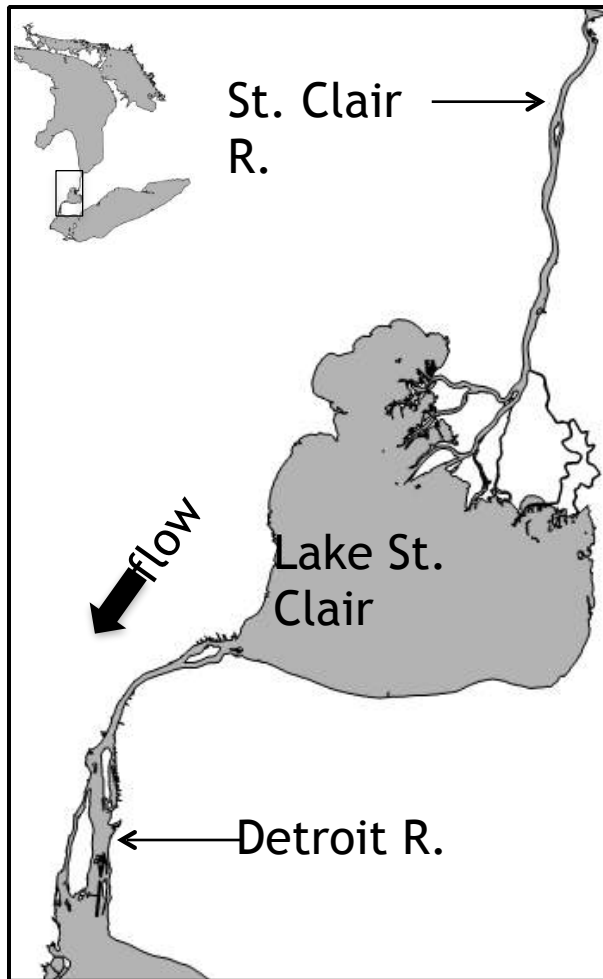
What is the potential for vessel-lake sturgeon interactions in large rivers?



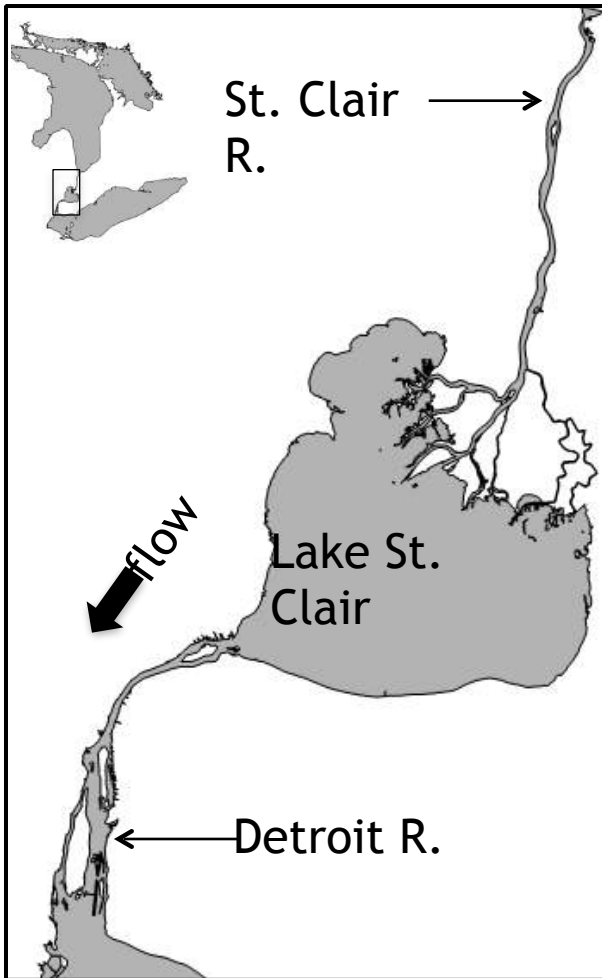
Lake Sturgeon *Acipenser Fulvescens*



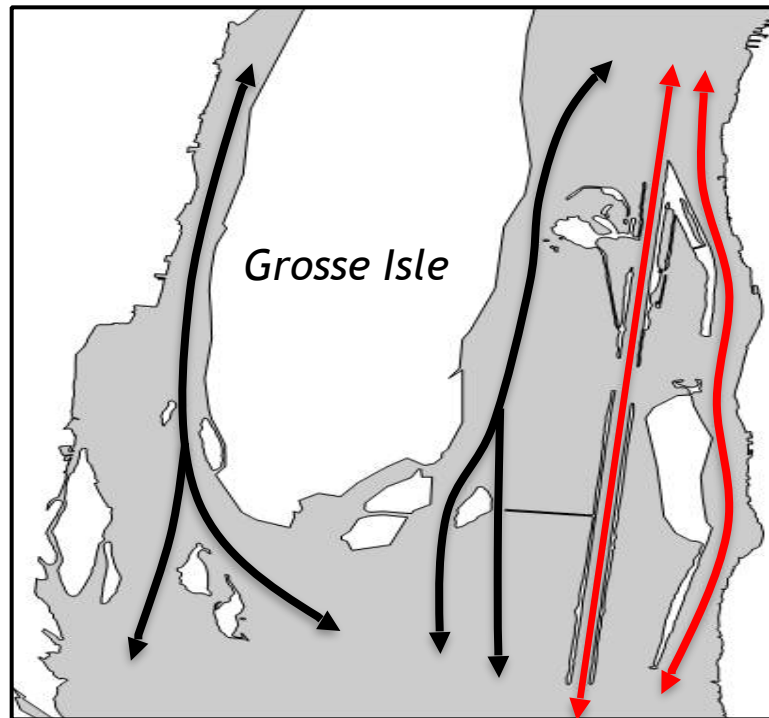
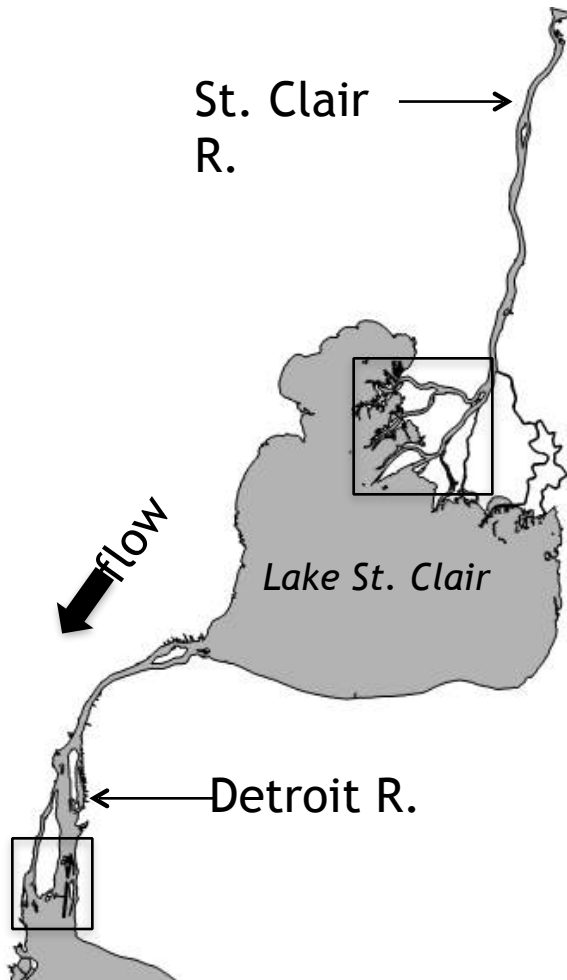
Detroit-St. Clair River System



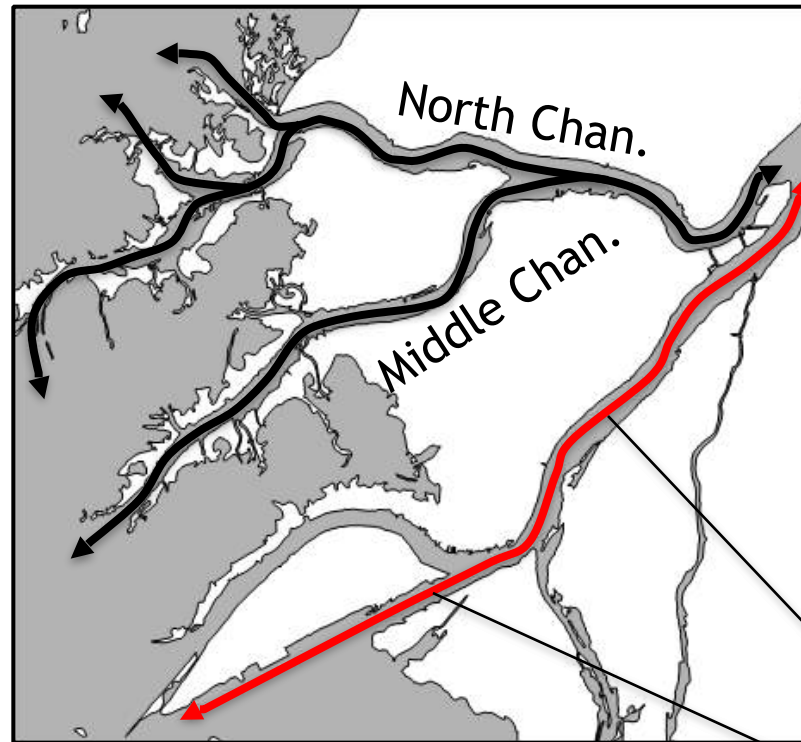
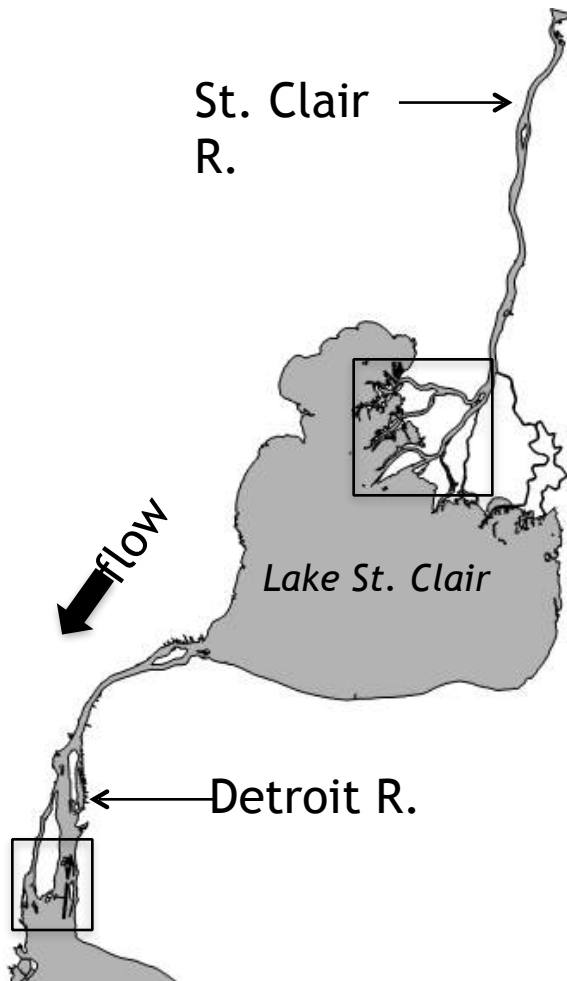
Detroit-St. Clair River System



Shipping routes in the lower Detroit and St. Clair Rivers



Shipping routes in the lower Detroit and St. Clair Rivers



St. Clair River Delta

Shipping Chan.

St. Clair cut-off



Study Objectives

- Determine the likelihood that lake sturgeon use shipping lanes vs. other main distributaries
 - Determine if shipping channel use is consistent between rivers
 - Determine how shipping channel use varies with season
- Determine the duration of shipping channel use (residency)

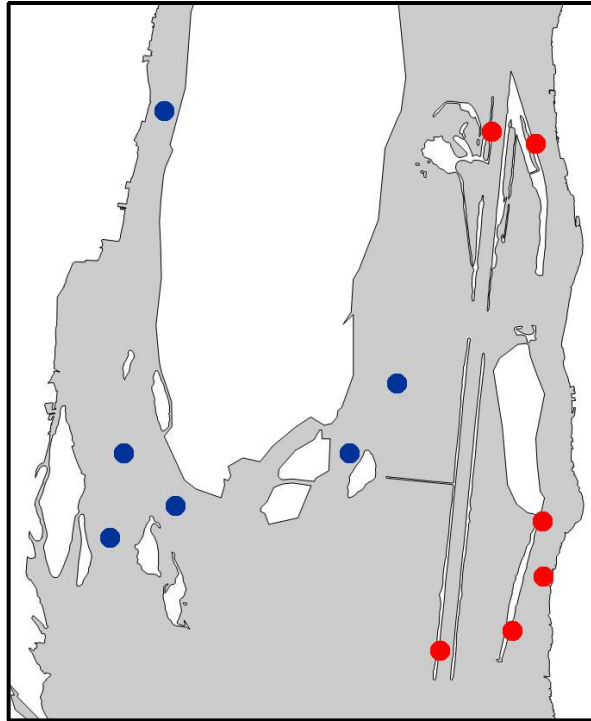


Acoustic Telemetry

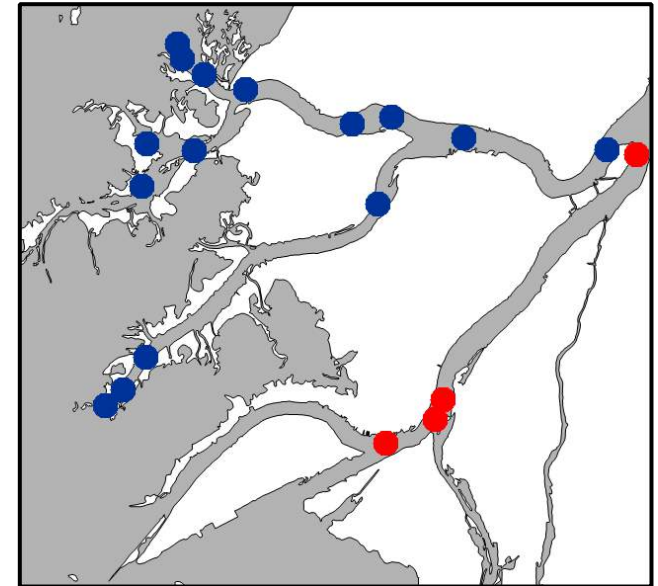
- Tagging: 2011-2014; $N=247$ (Detroit=75, St. Clair=172); VEMCO V16-6L; 2min. delay; battery life = 10 yrs
- Receiver (VR2W) Distributions (**red**=shipping route; **blue**=no freighters)



Lower Detroit R.



St. Clair R. Delta



Data Analyses

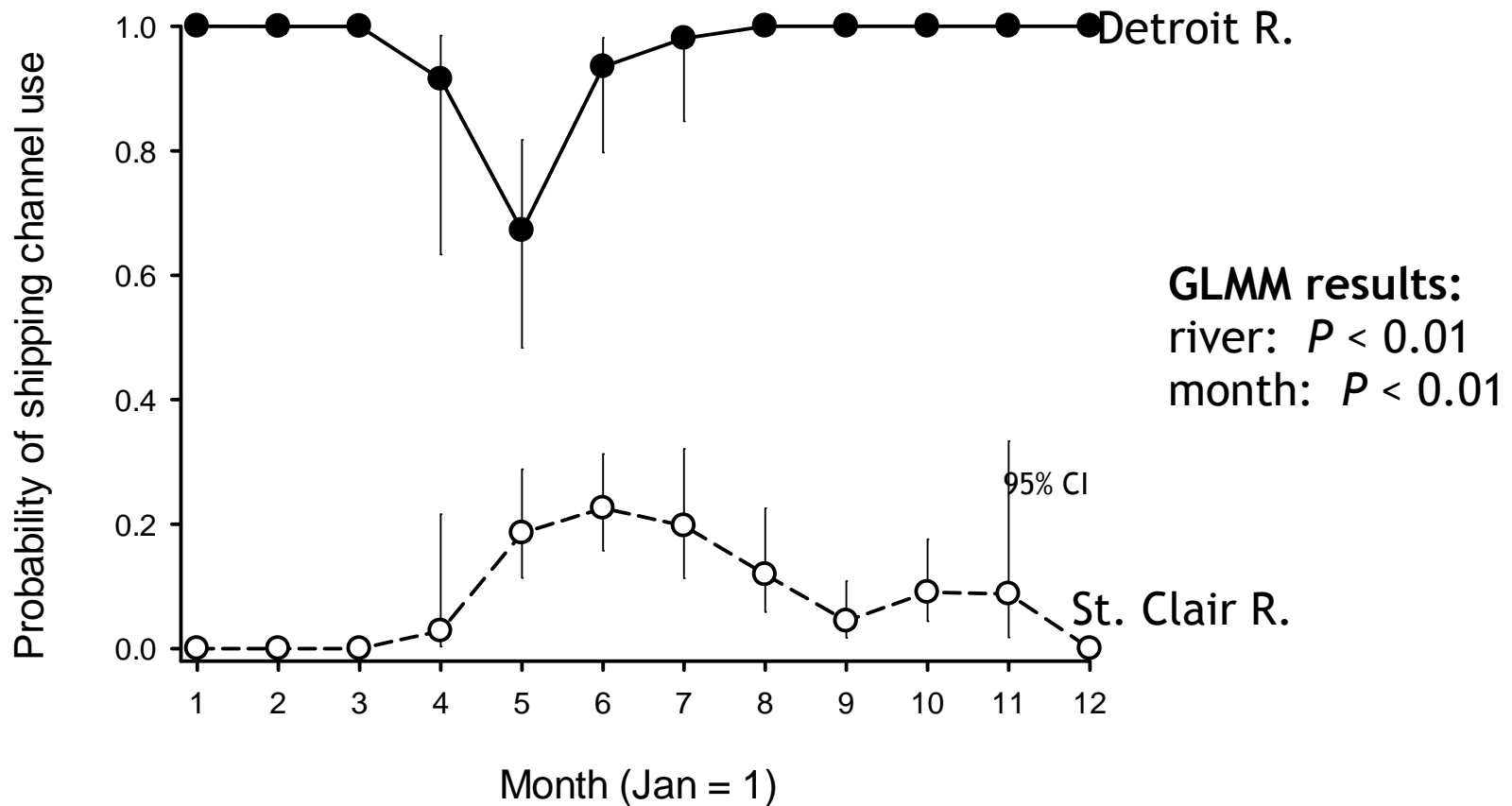
○ Channel use:

- Visits = events consisting of $10 \geq$ detections separated by at least 1 hr.
- Binary response variable (Y): 1=shipping channel; 0=other distributary
- GLMM: $P(Y=1) = \text{month} + \text{river} + \text{month} \times \text{river} + b_i$ (sturgeon $i=1, 2, 3\dots$)

○ Channel residency:

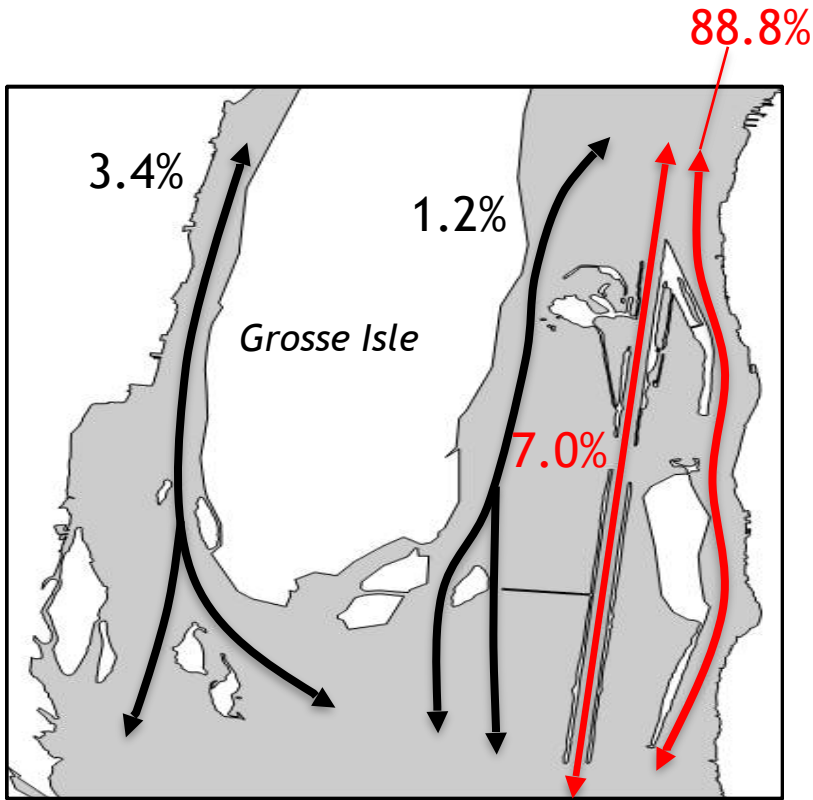
- Response variable = Σ days/month with ≥ 1 shipping channel visit (values: 1-31)
- FMM (zero-truncated negative binomial): $\text{days} = \text{month} + \text{river} + \text{month} \times \text{river}$

Lake sturgeon use of shipping lanes varies seasonally and by river

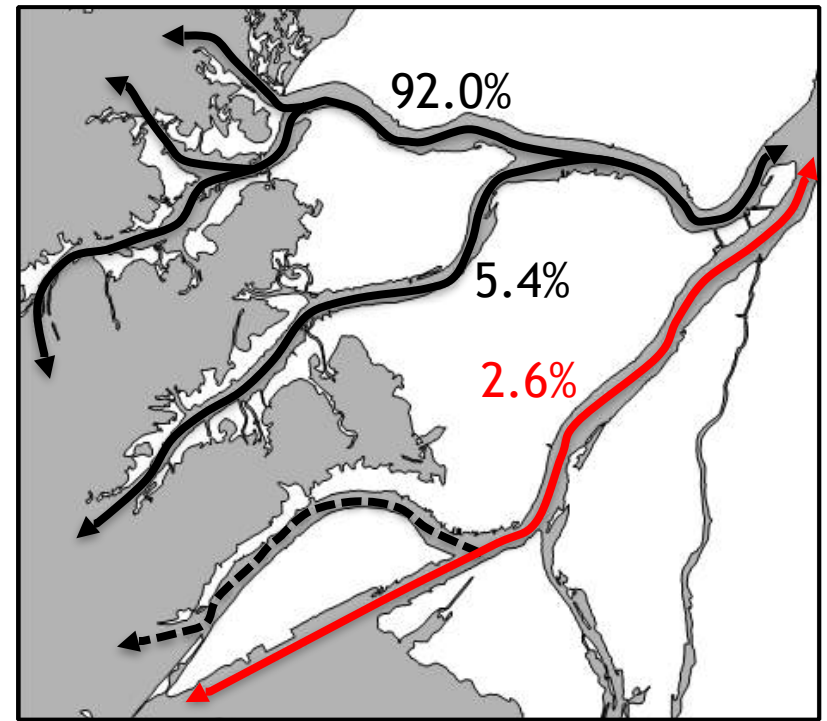


Lake sturgeon habitat use by channel

(% of total visits by channel)

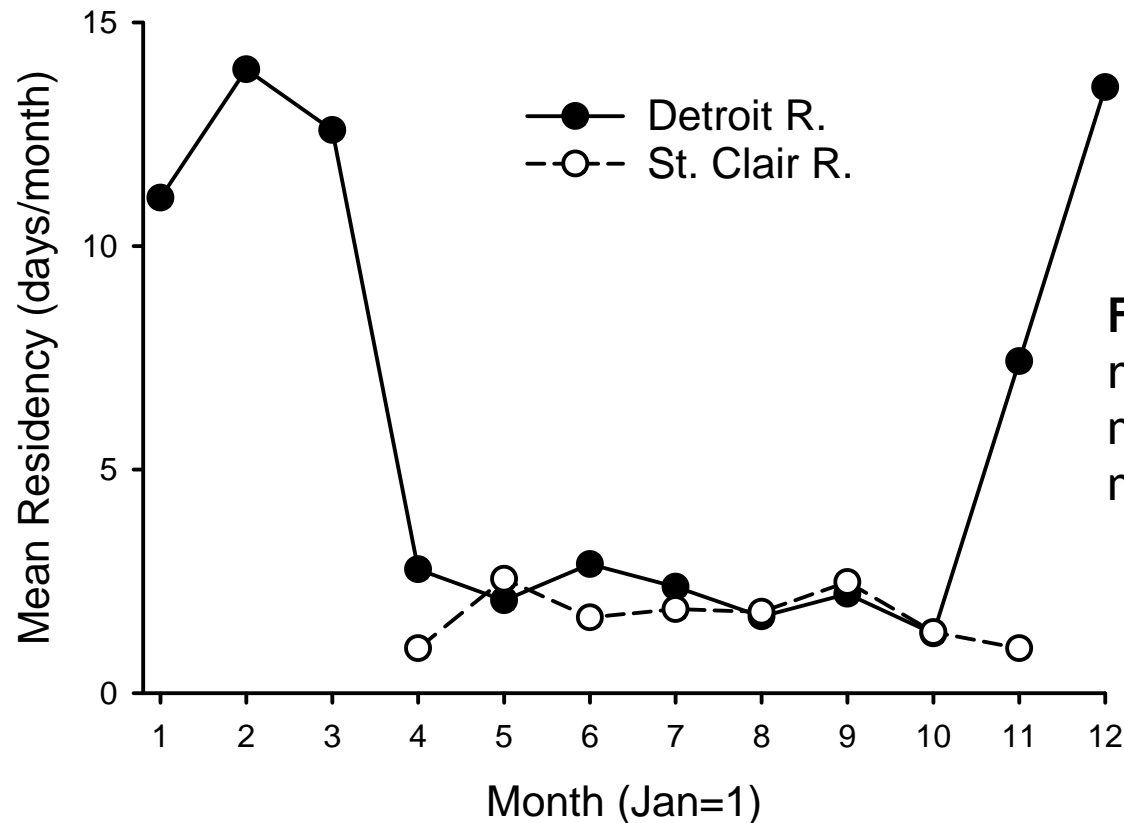


Lower Detroit R.



St. Clair River Delta

Residency in shipping channels was short and similar between rivers (...except during winter?)



FMM results:
river: $P = 0.93$
month: $P > 0.12$
month \times river: $P > 0.42$

Sturgeon-vessel interactions are probable

- Lake sturgeon do not avoid shipping lanes
 - *Detroit R.:* shipping lanes are important movement corridors
 - *St. Clair R.:* Shipping channel use peaked in the spring when spawning-ready lake sturgeon frequently jump/porpoise
- Injured/decapitated lake sturgeon likely the result of ship strikes



Questions



Conclusions & Implications

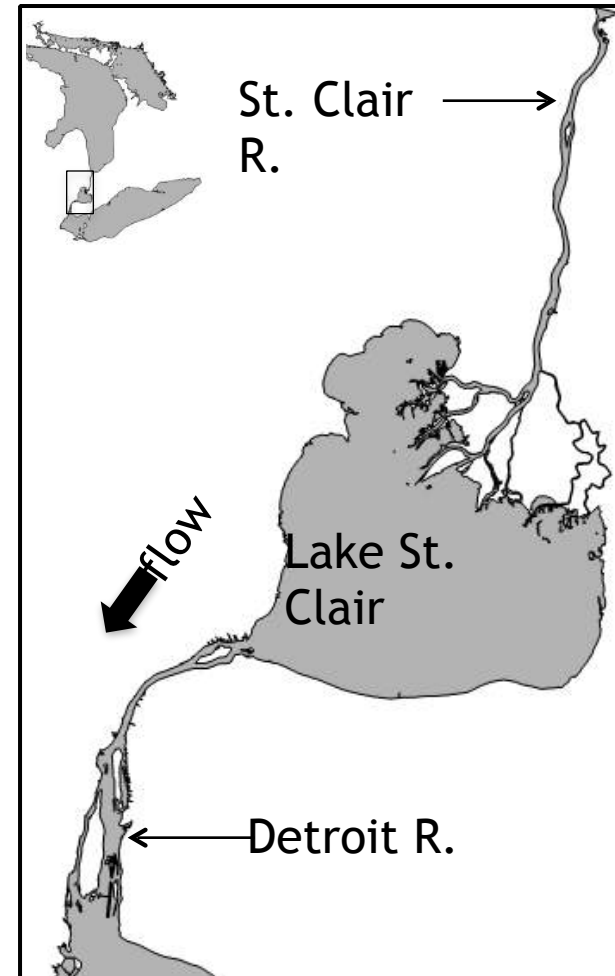
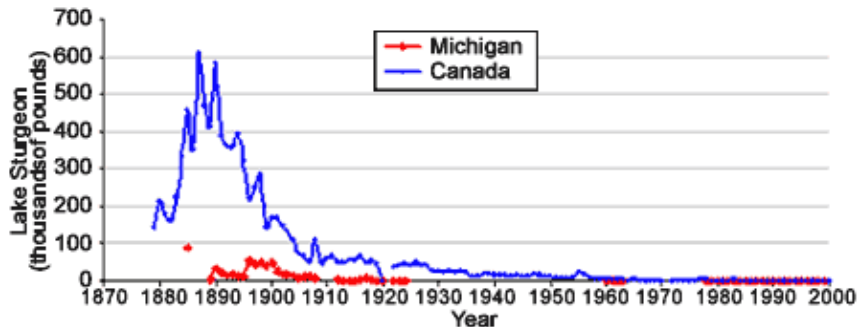
- Injured/decapitated lake sturgeon likely the result of ship strikes
- Mortality from ship strikes may limit population recovery
- Could climate change increase lake sturgeon vulnerability to ship strikes in the Detroit River?



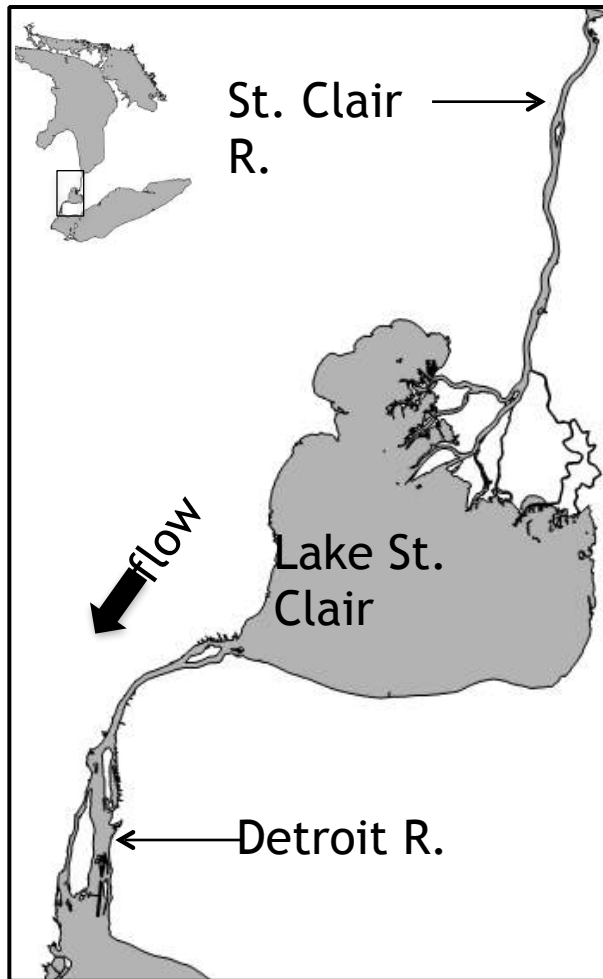
What is the potential for ship-lake sturgeon interactions in the Detroit-St. Clair River System?



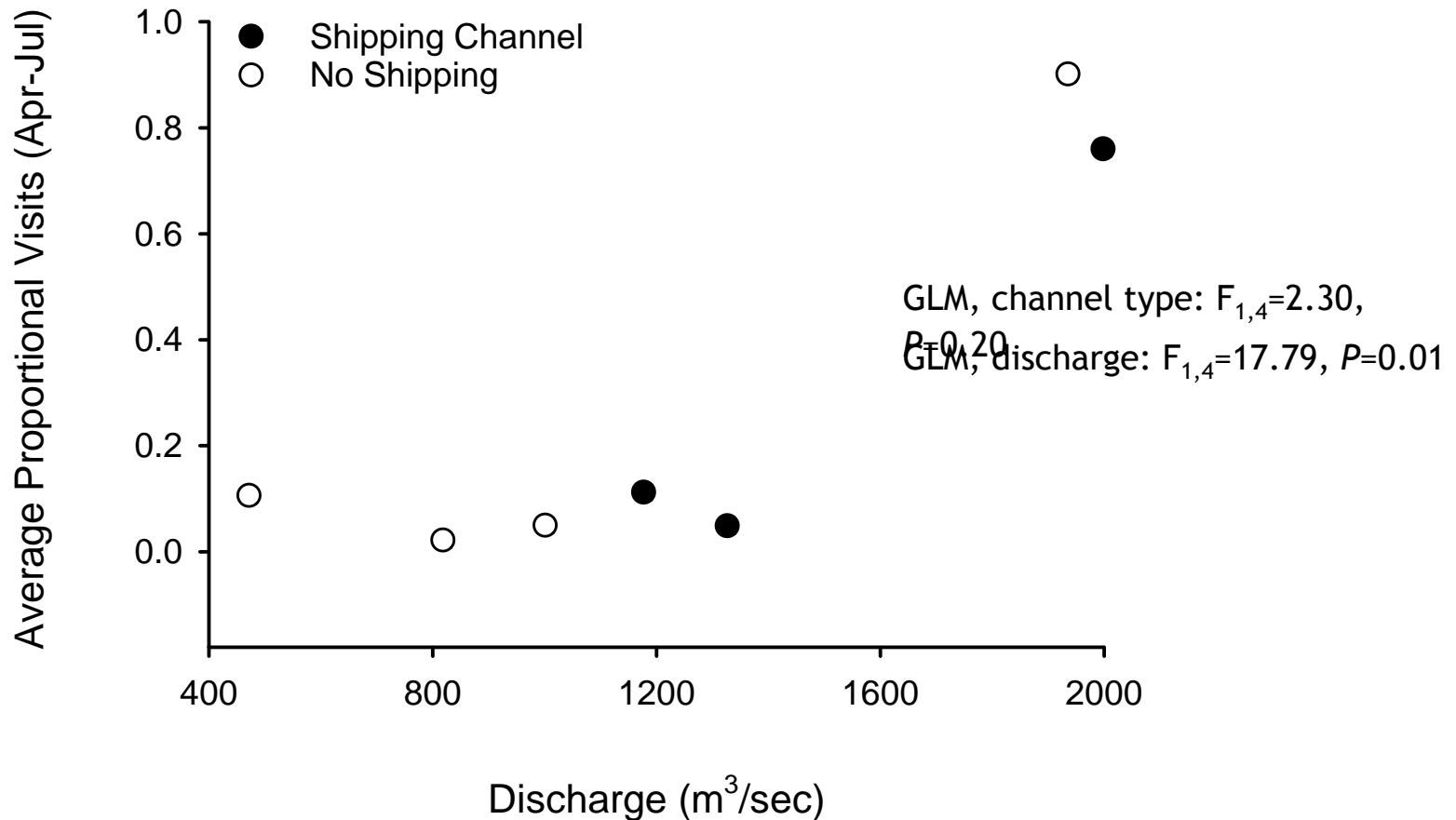
Lake Sturgeon *Acipenser Fulvescens*



Detroit-St. Clair River System



Lake sturgeon channel use associated with channel discharge





Detroit-St. Clair River System

