

Jun 9th, 4:10 PM - 4:30 PM

Increased Downriver Passage of Juvenile Blueback Herring after Reconfiguring an Ultrasonic Field

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International Conference on Engineering and Ecohydrology for Fish Passage. 70.
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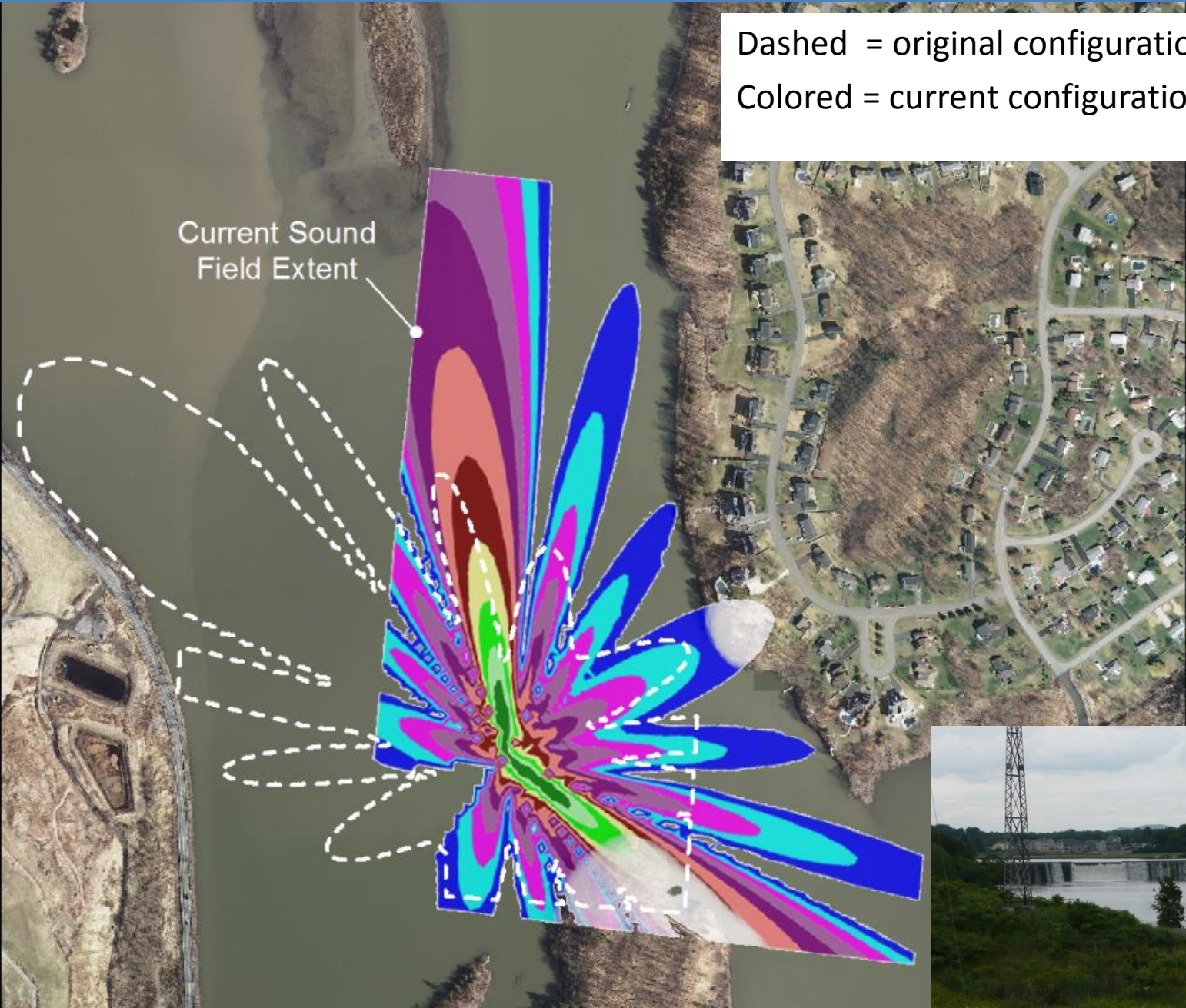
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Increased Downriver Passage of Juvenile Blueback Herring after Reconfiguring an Ultrasonic Field, Mohawk River, New York



Background

Dashed = original configuration
Colored = current configuration



Original Configuration (2008) Study Results

- Proportion of herring passing the main channel downriver site =0.31
- 3x greater than expected based on river flows
- Conclusion

Acoustic deterrent effective but needed improvement

Original and Reconfigured Study Hypotheses

1) $H_0: N_{d\text{downriver}}/N_{d\text{upriver}} = V_{d\text{downriver}}/V_{d\text{upriver}}$

V = volume of water moving downstream at each site

2) $H_0: N_{d\text{downriver}}/N_{d\text{upriver}} = 0.5$

$H_1: N_{d\text{downriver}}/N_{d\text{upriver}} > 0.5$ (majority)

$H_2: N_{d\text{downriver}}/N_{d\text{upriver}} < 0.5$

Methodology

Data

Ambient

- River Flow
 - 1) ADCP, fixed and mobile
 - 2) Crescent plant discharge
 - 3) USGS Cohoes gauge
- Temperature
HOBO loggers, 15 min.

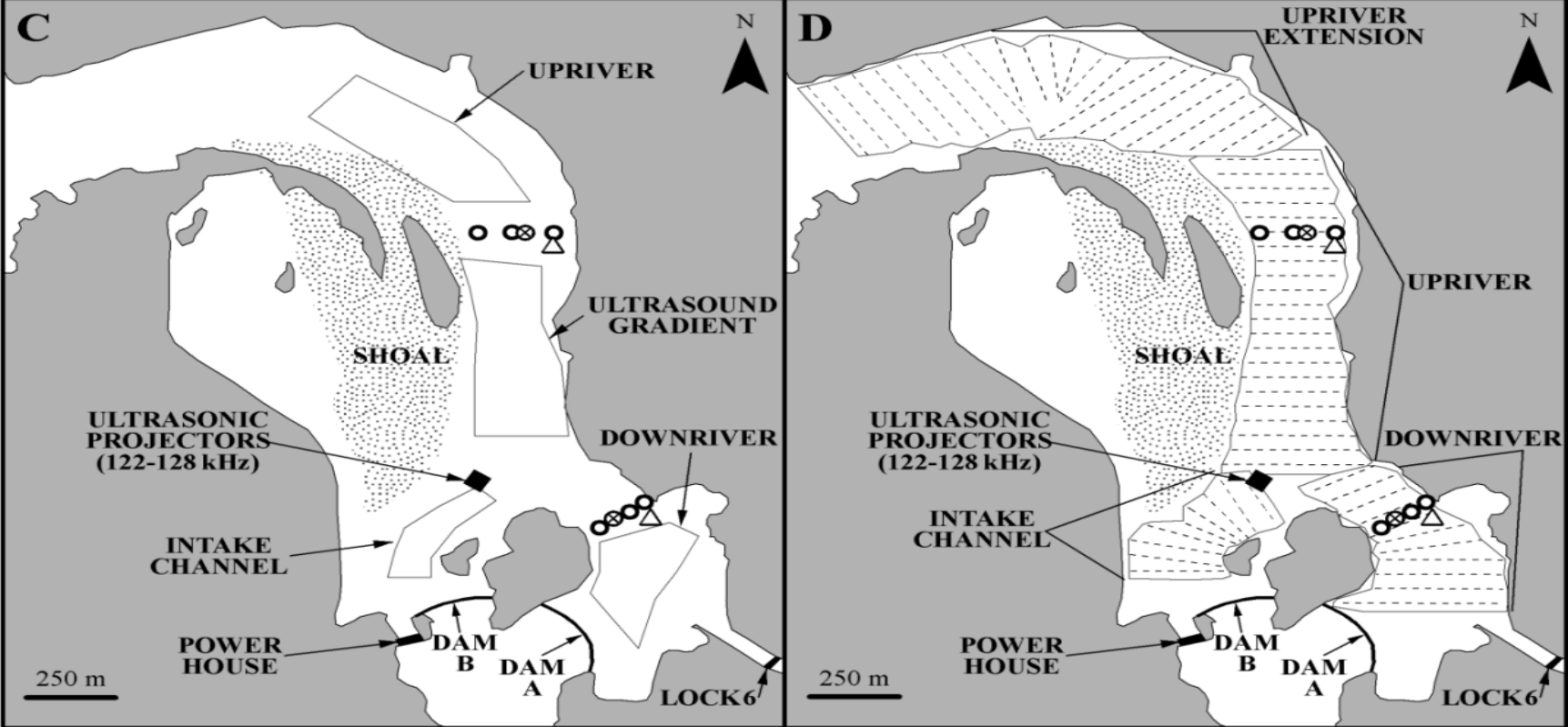
Fish Pop'n

- Hydroacoustic
 - 1) Mobile
420 kHz split-beam echo sounder
 - 2) Fixed
2 arrays, 3 horizontal, 1 vertical split-beams
- Trawl
3 m cone, 95 mm stretch mesh net, 1.8 m x 1.2 m frame

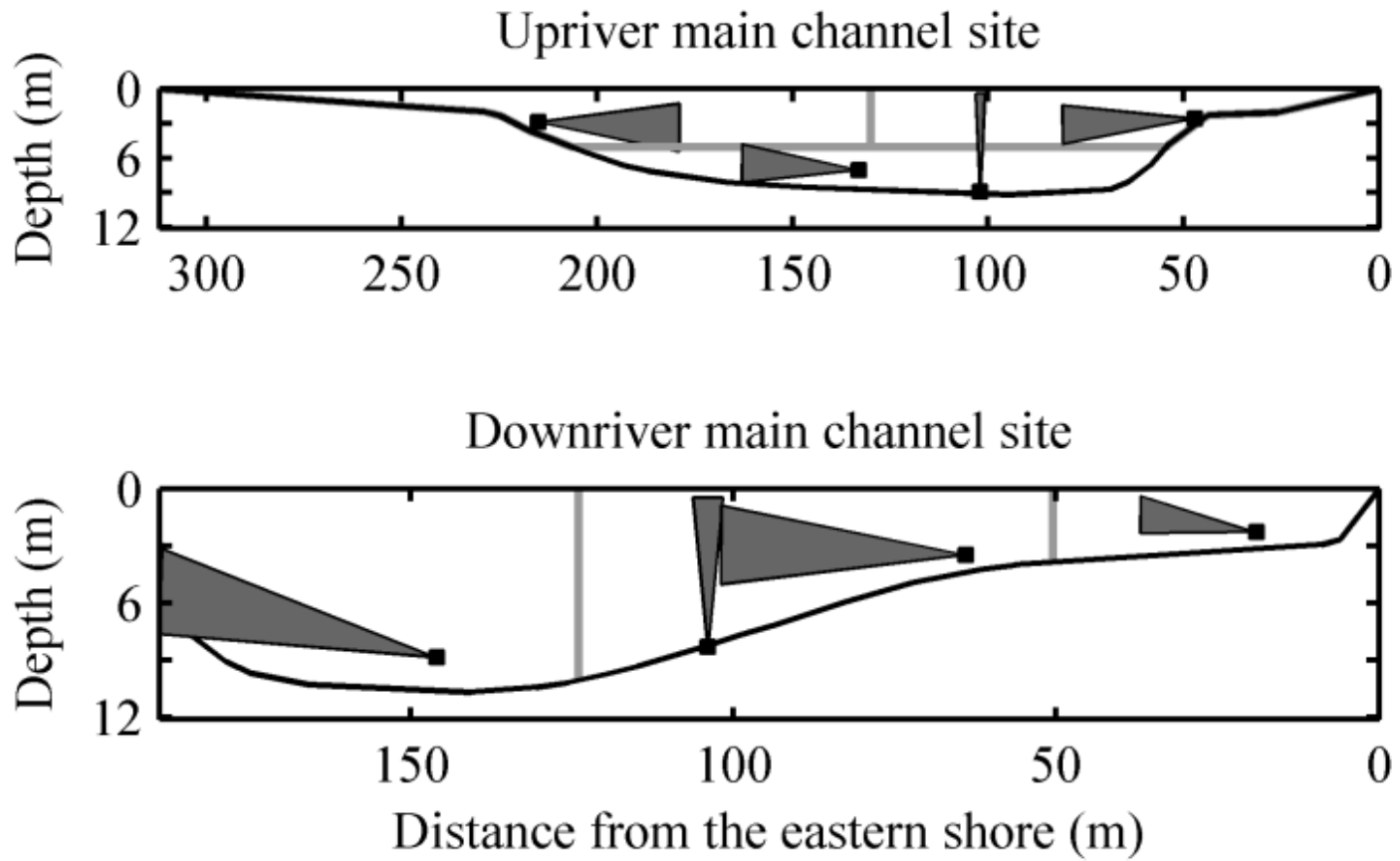
Supplemental

- Invertebrate
Plankton tow nets
- Precipitation
Albany airport

Field Study Maps



Fixed Hydroacoustic Sites Split-Beam Transducers Coverage



Sampling Schedule

River Flow

- ADCP
 - 1) Fixed = continuous
 - 2) Mobile = Daily
- Crescent plant discharge/USGS Cohoes gauge = continuous

Temperature Continuous, 15 min. intervals

Mobile 7 Day-Time Surveys
1 Night-Time*

Fixed Continuous

Trawl 11 Night-Time Surveys
2 Day-Time**

Data Analyses

Flow

- Difference in paired estimates of upstream/downstream fixed sites
- Compared with mobile ADCP

Temperature

- 15-minute plots

Data Analyses

Trawl Surveys

- Abundance Estimate (CPUE)
- Verified with mobile hydroacoustic
- 50 individual subsample per trawl, length

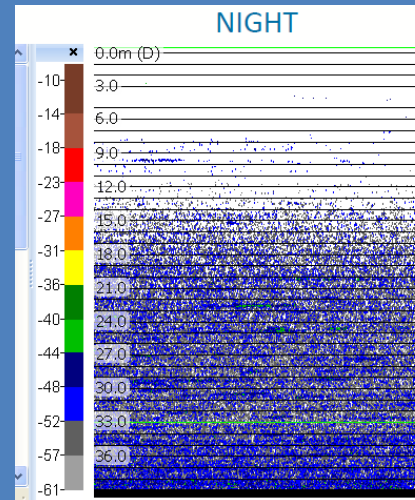
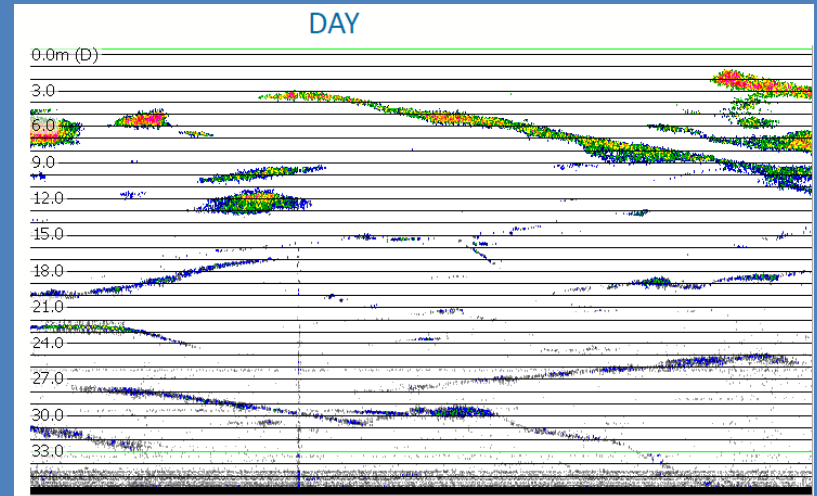
Mobile Hydroacoustic Surveys

- Quantify the backscattering coefficient volume
- Filter for juvenile herring target strength
- Calculate herring target strength density
- Survey maps w/kriging interpolation
- (Dunning and Gurshin 2012)

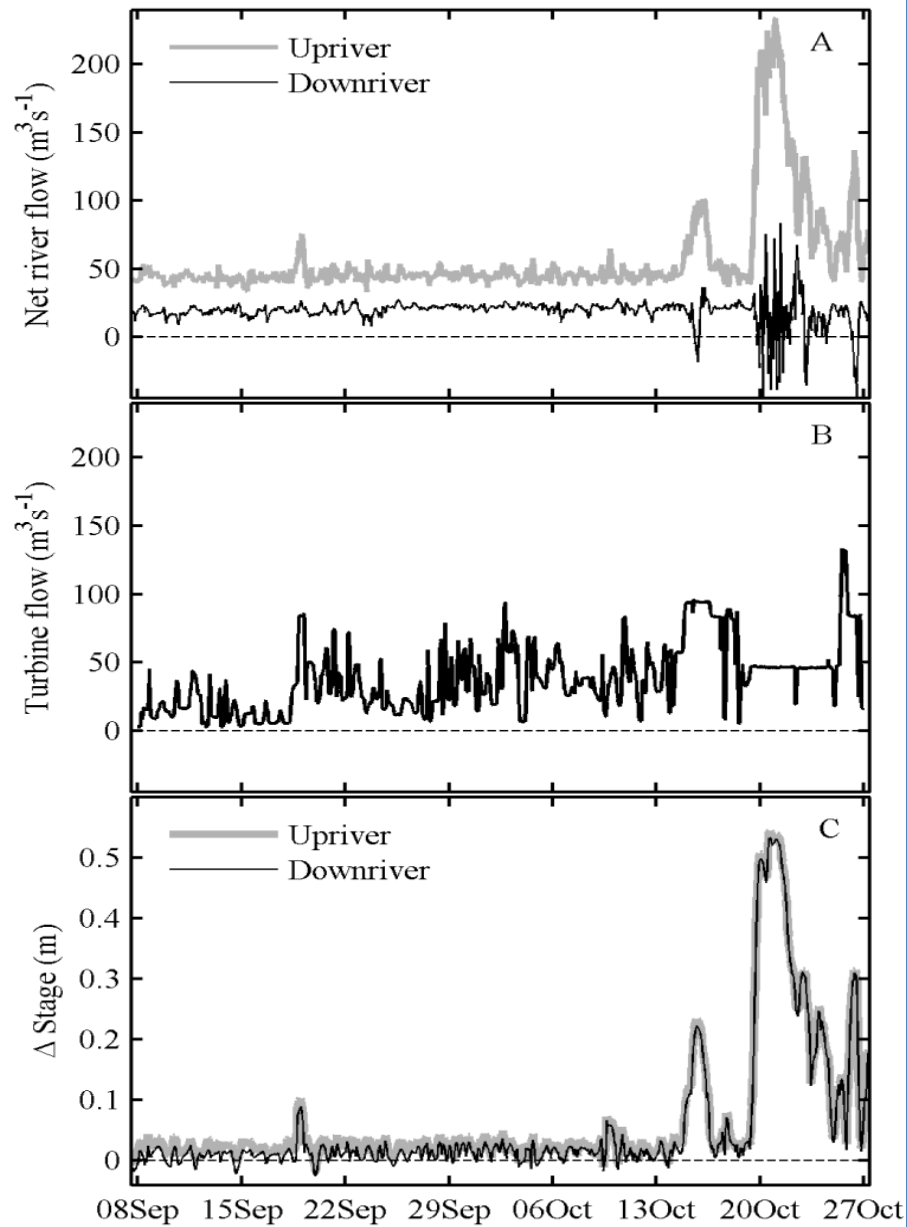
Data Analyses

Fixed Hydroacoustic Surveys

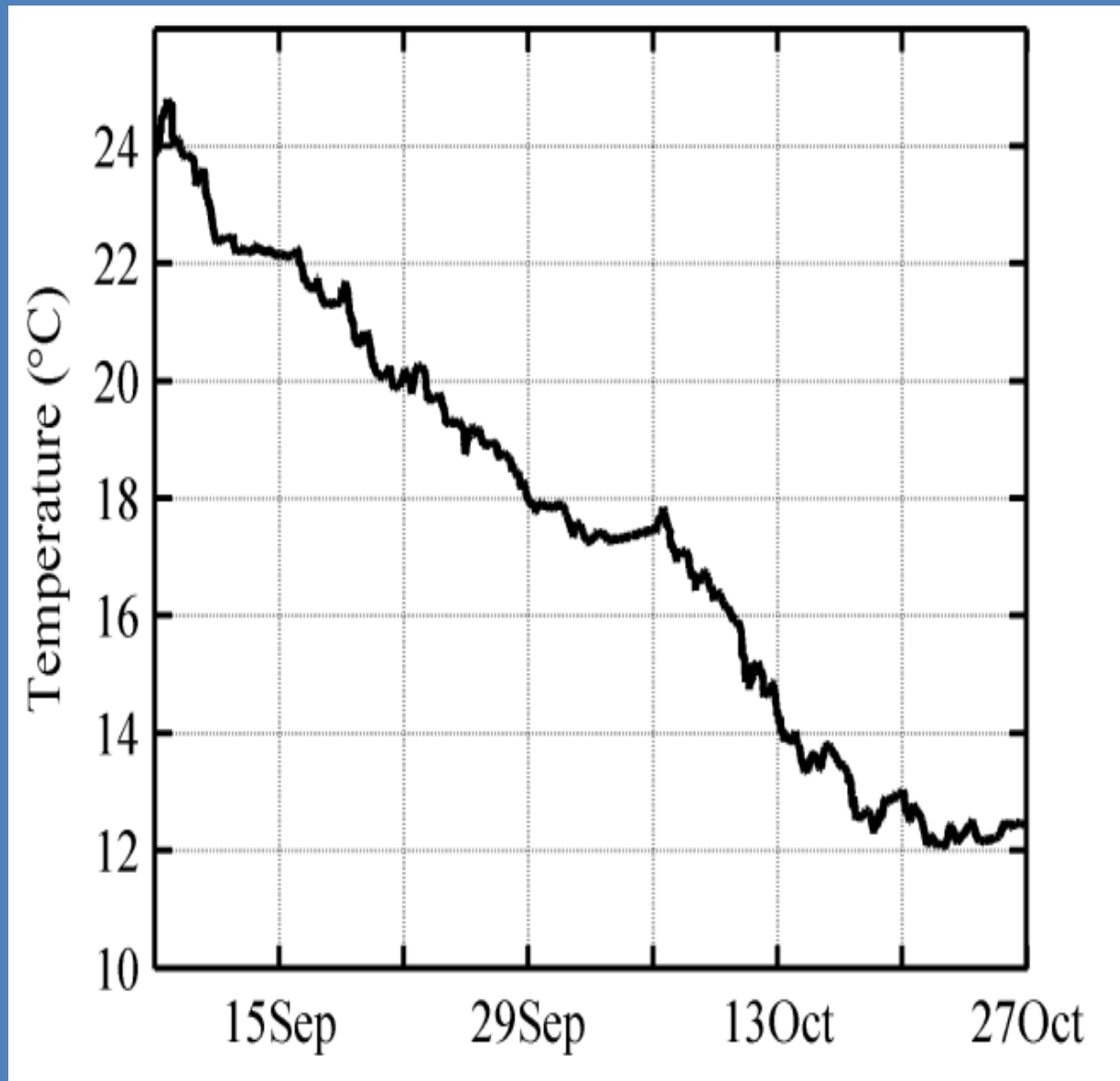
- Quantify the backscattering coefficient volume
- Filter for juvenile herring target strength
- Filter *Chaoborus* and bubbles
- Calculate herring target strength density
- Spatial and temporal trends
- (Dunning and Gurshin 2012)



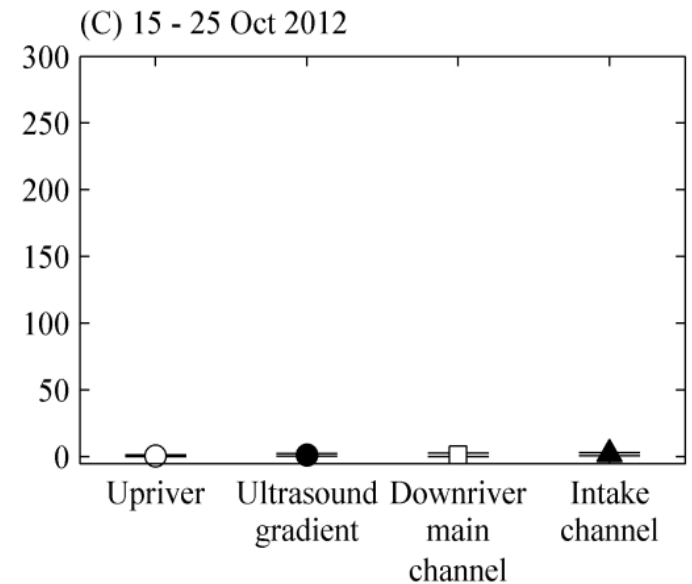
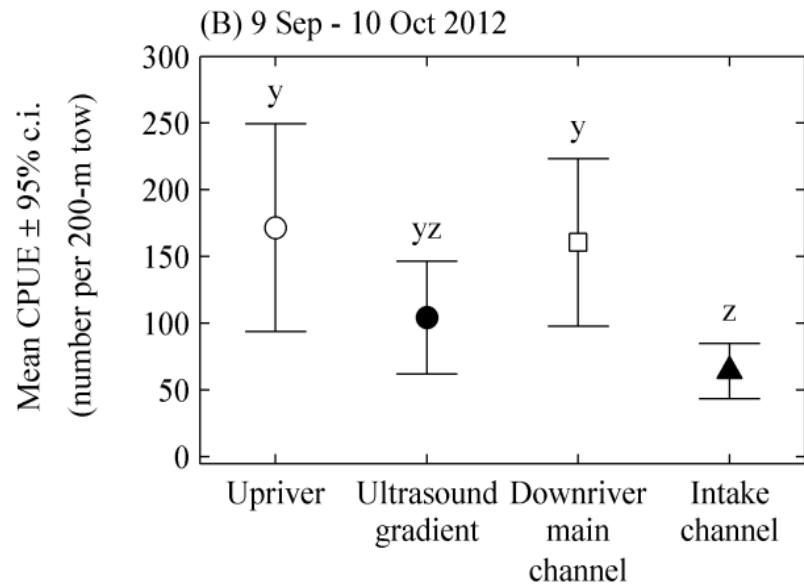
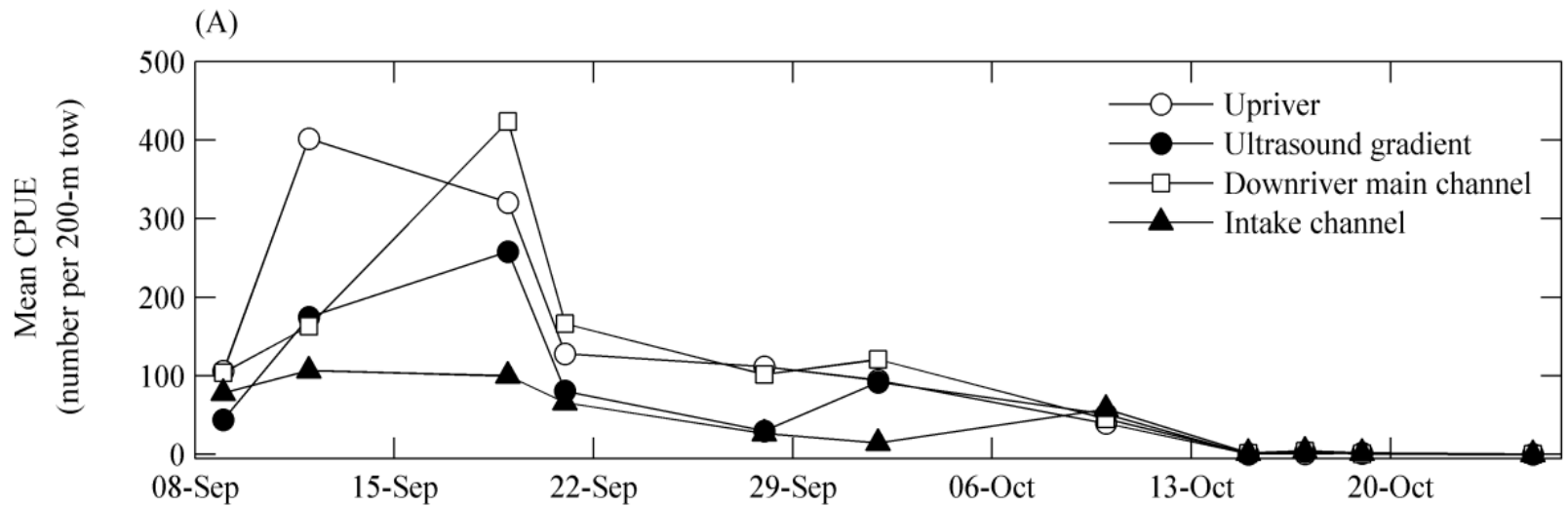
Flow



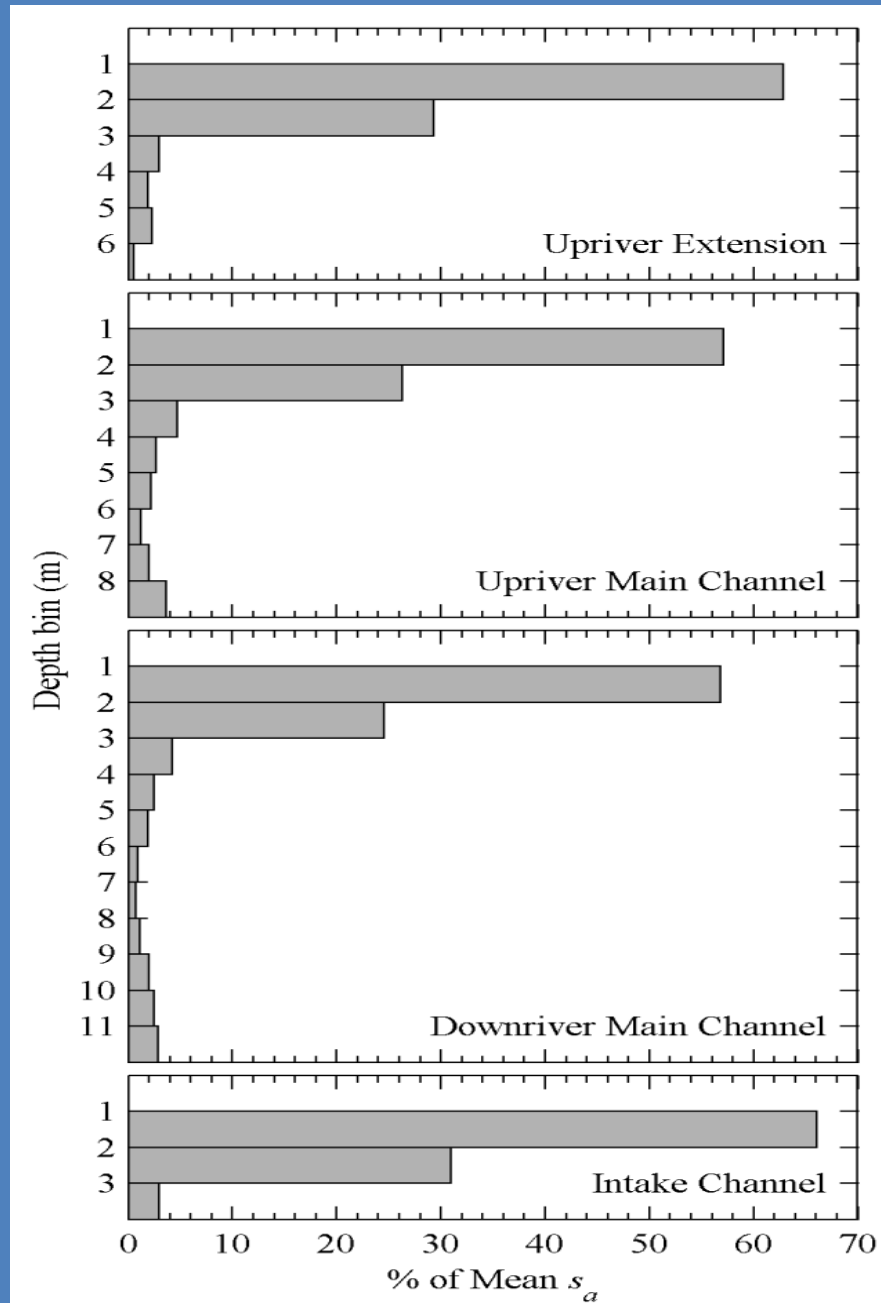
Temperature



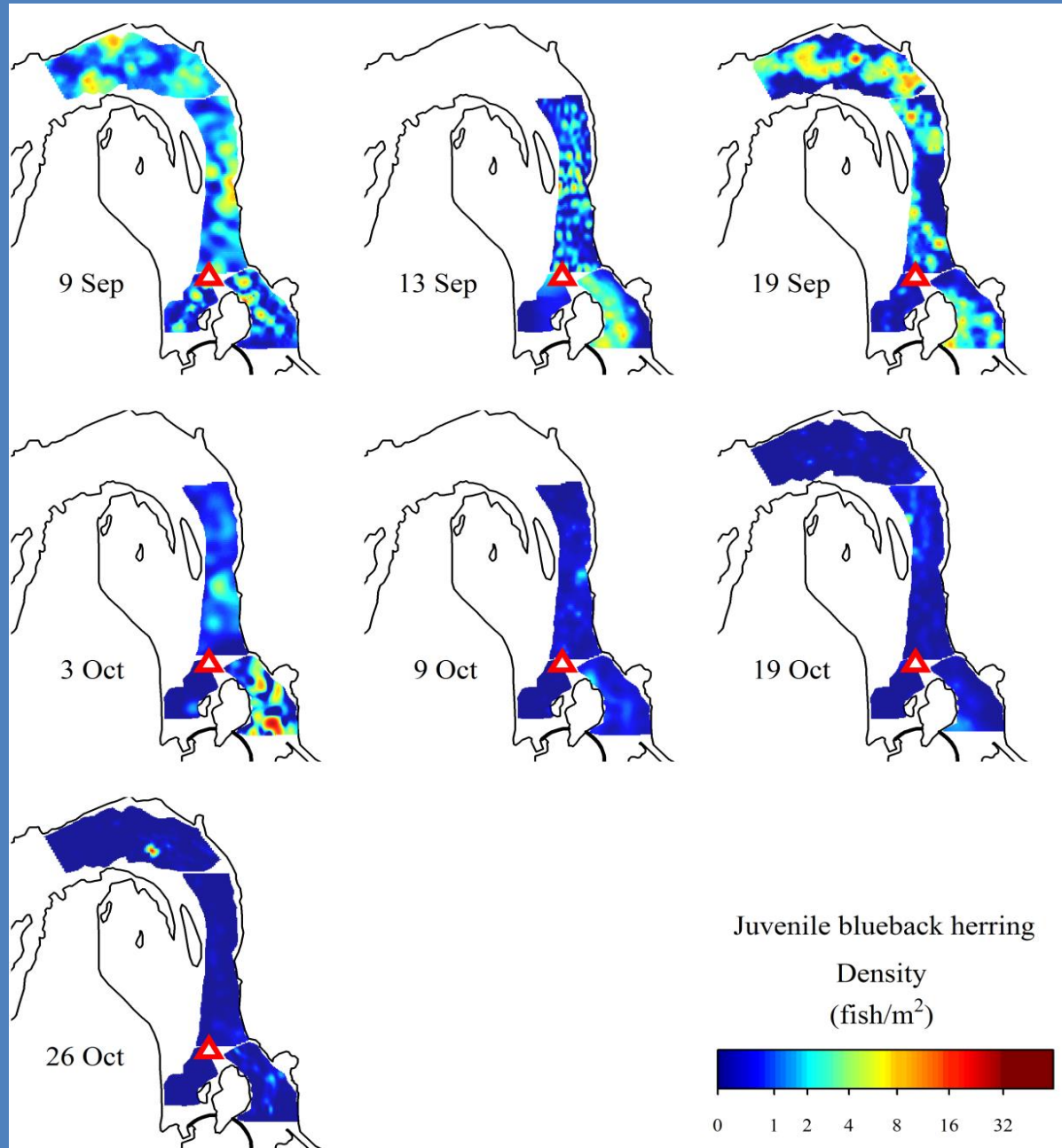
Trawl Surveys



Mobile Hydroacoustic Survey



Mobile Hydroacoustic Survey

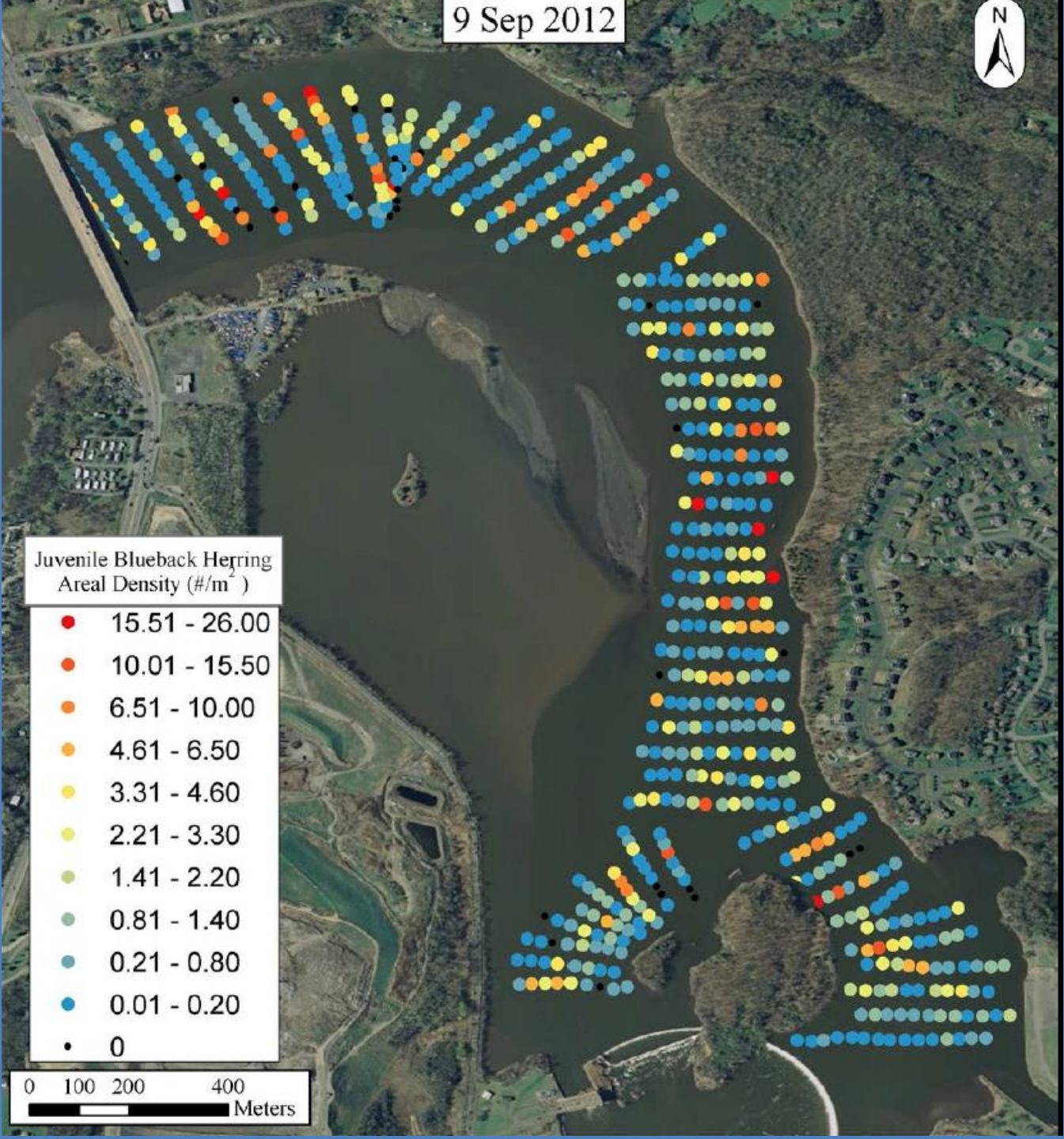


9 Sep 2012



Results

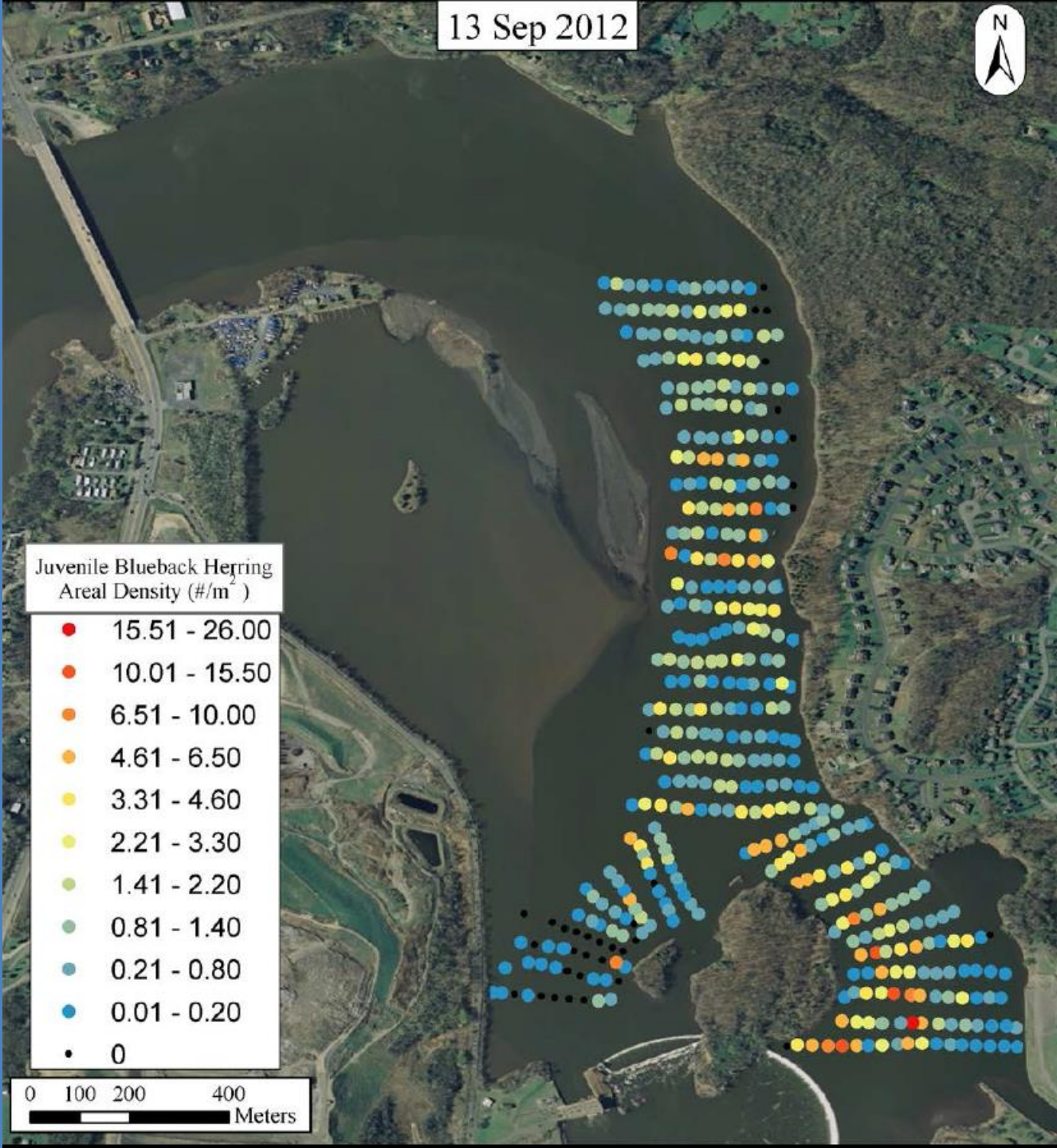
Mobile Surveys



Results

Mobile Surveys

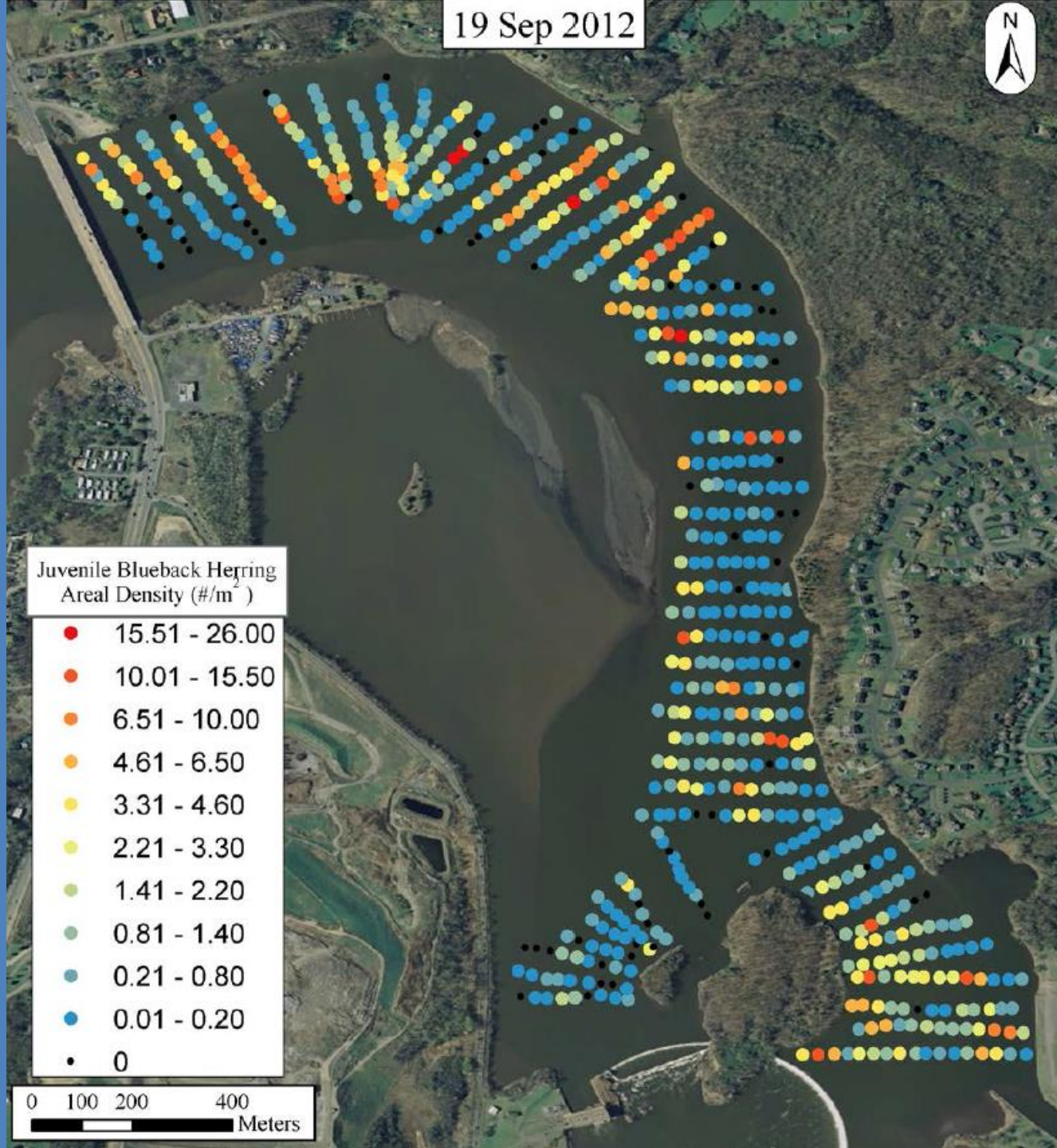
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Results

Mobile Surveys

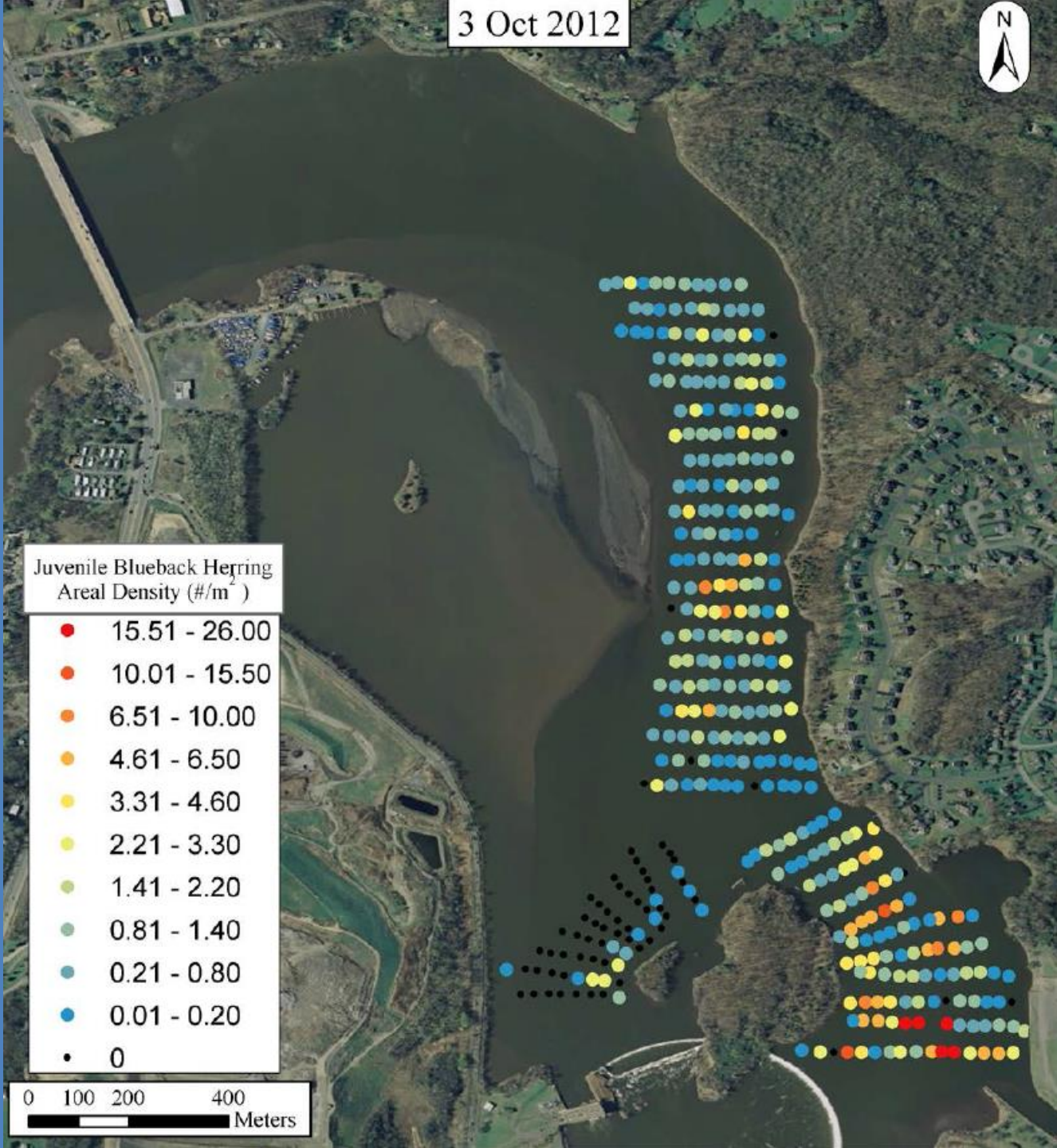
19 Sep 2012



Results

Mobile Surveys

3 Oct 2012

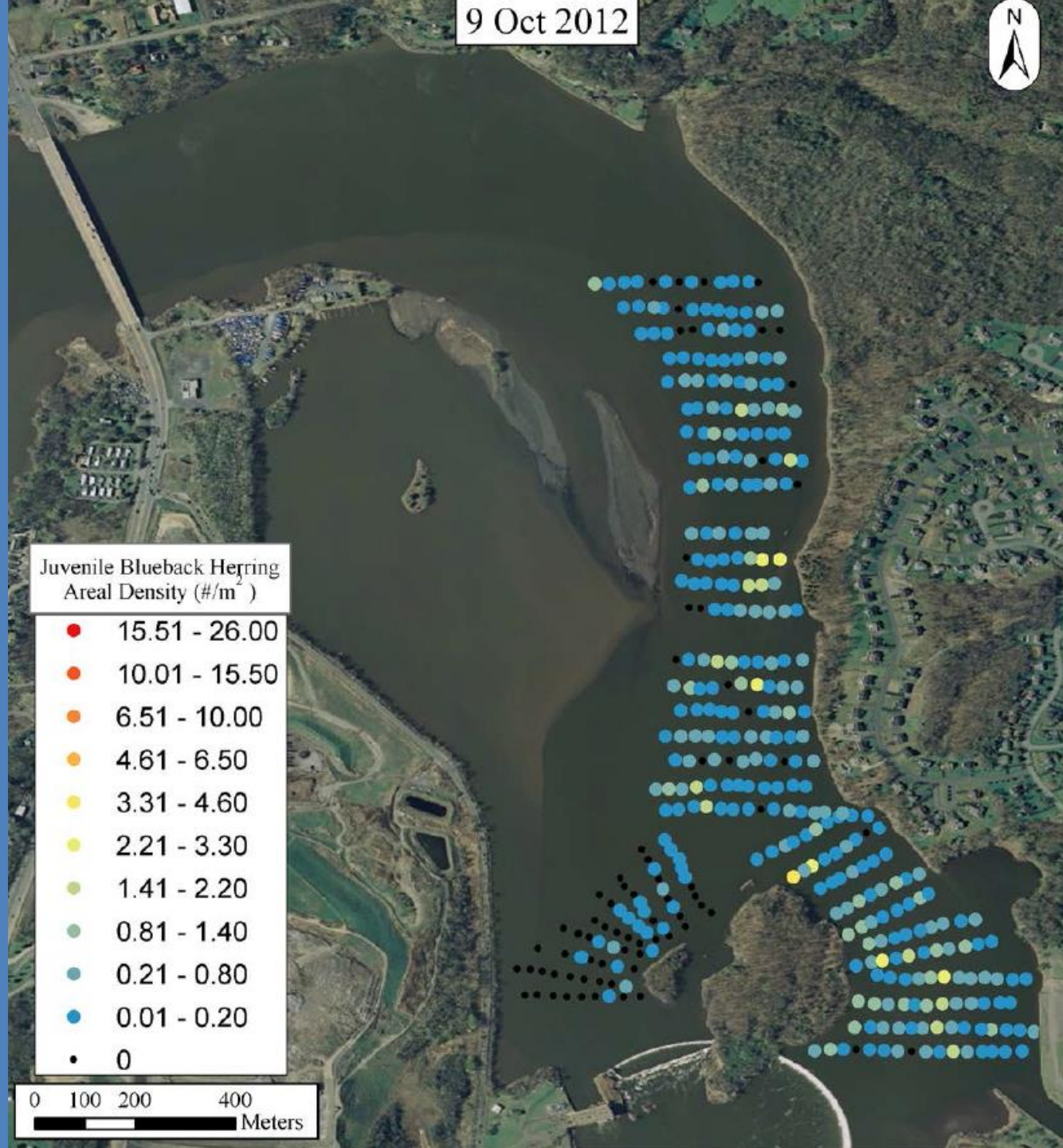


9 Oct 2012



Results

Mobile Surveys

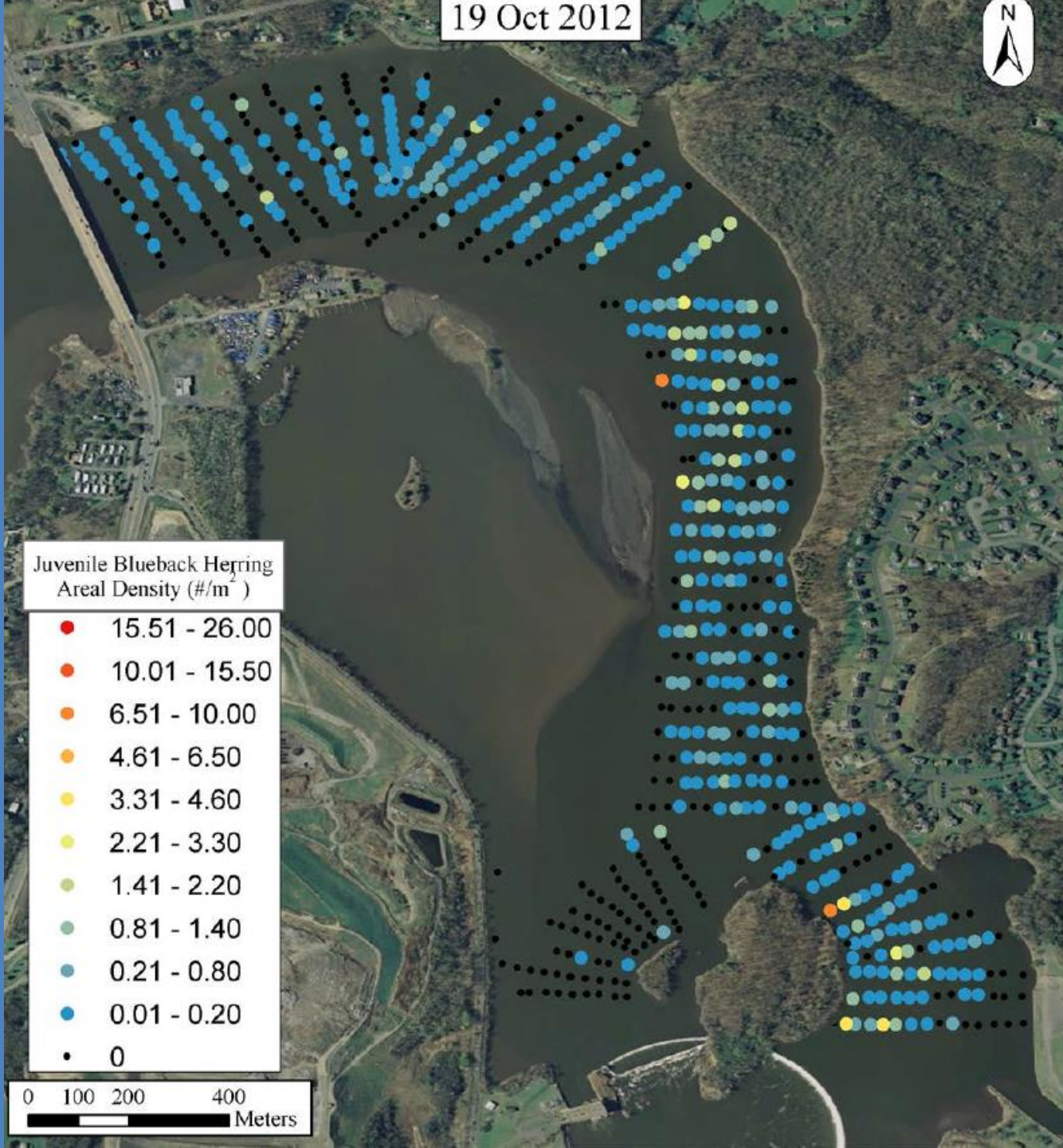


19 Oct 2012



Results

Mobile Surveys

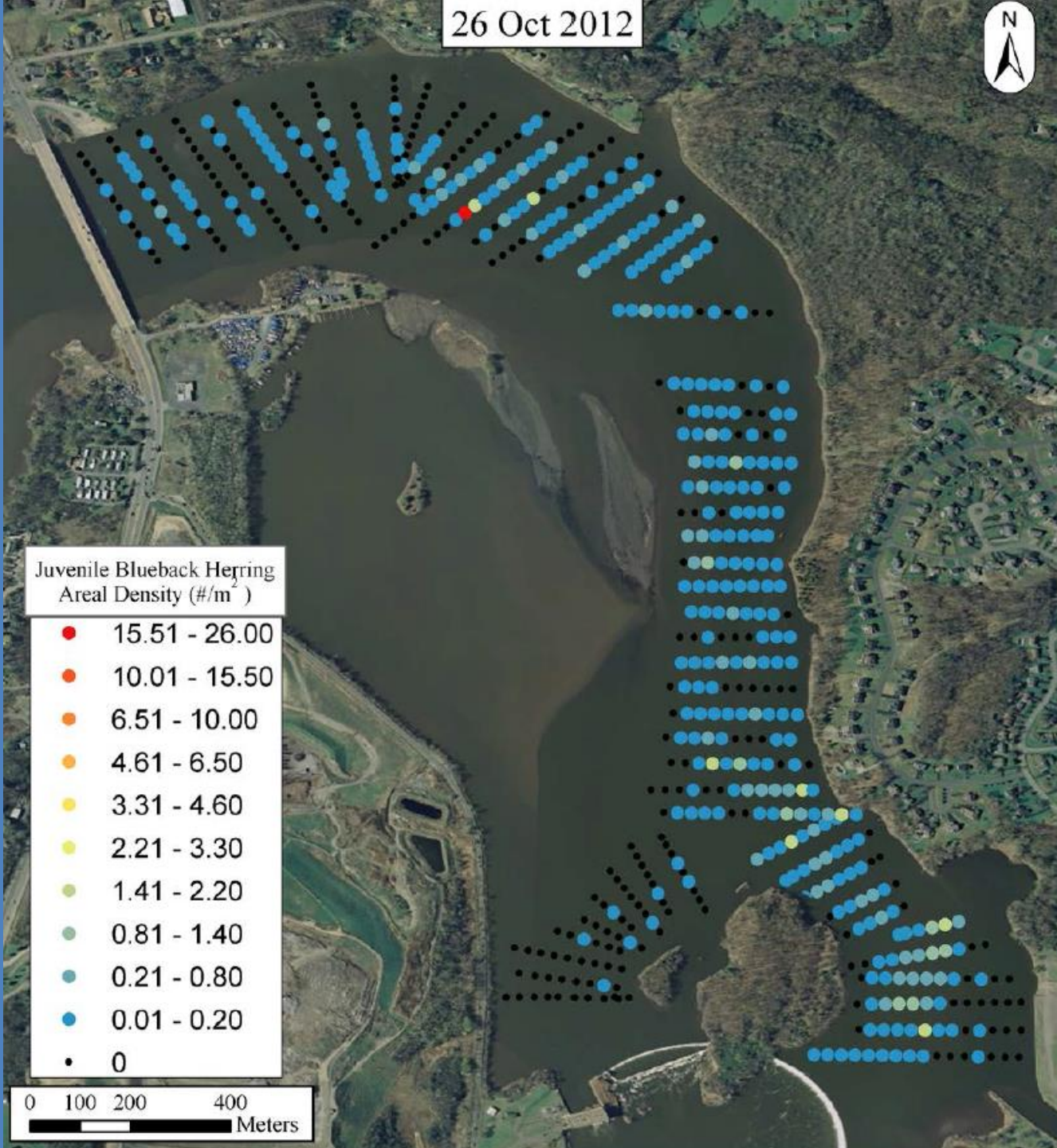


26 Oct 2012

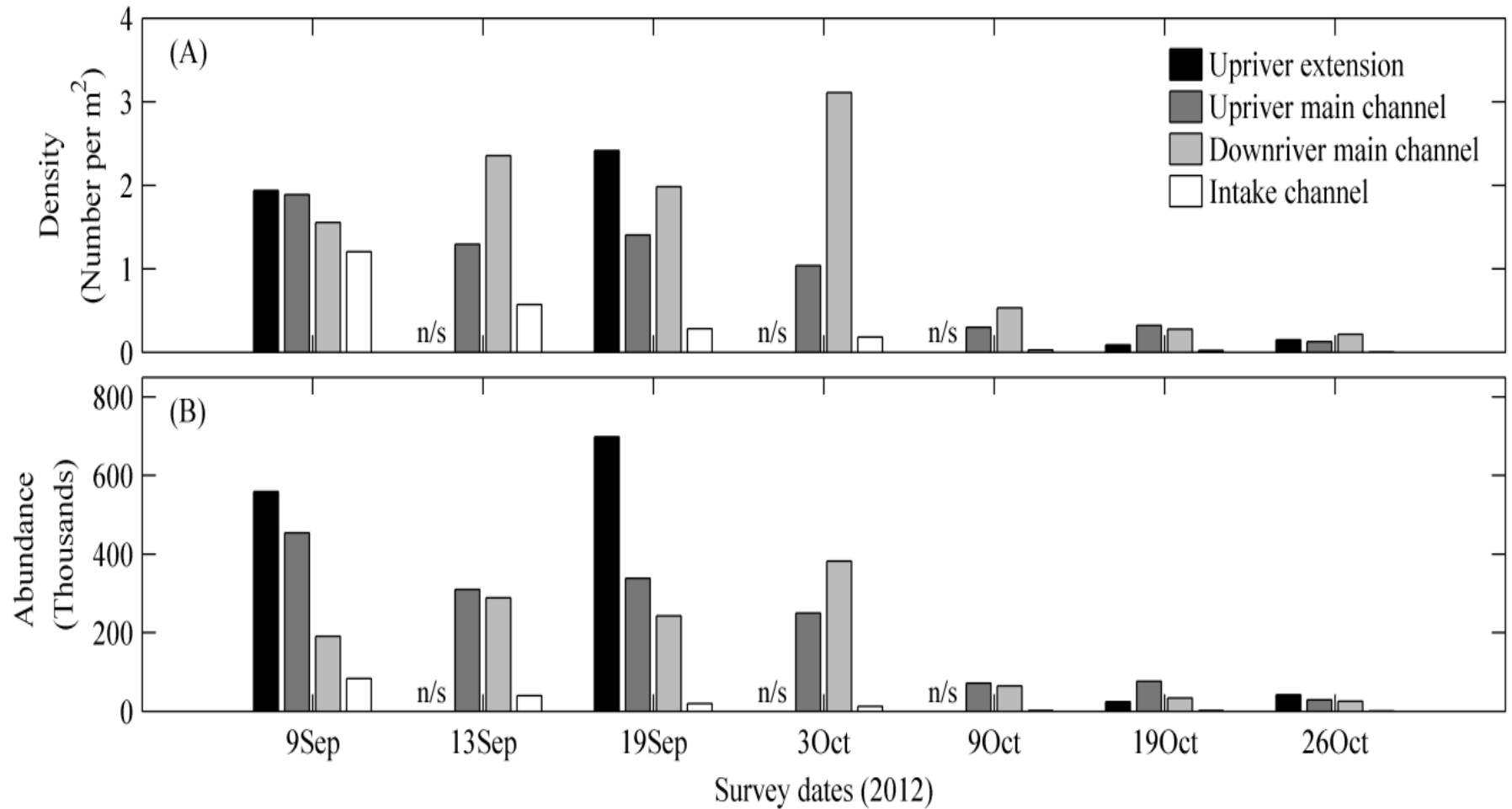


Results

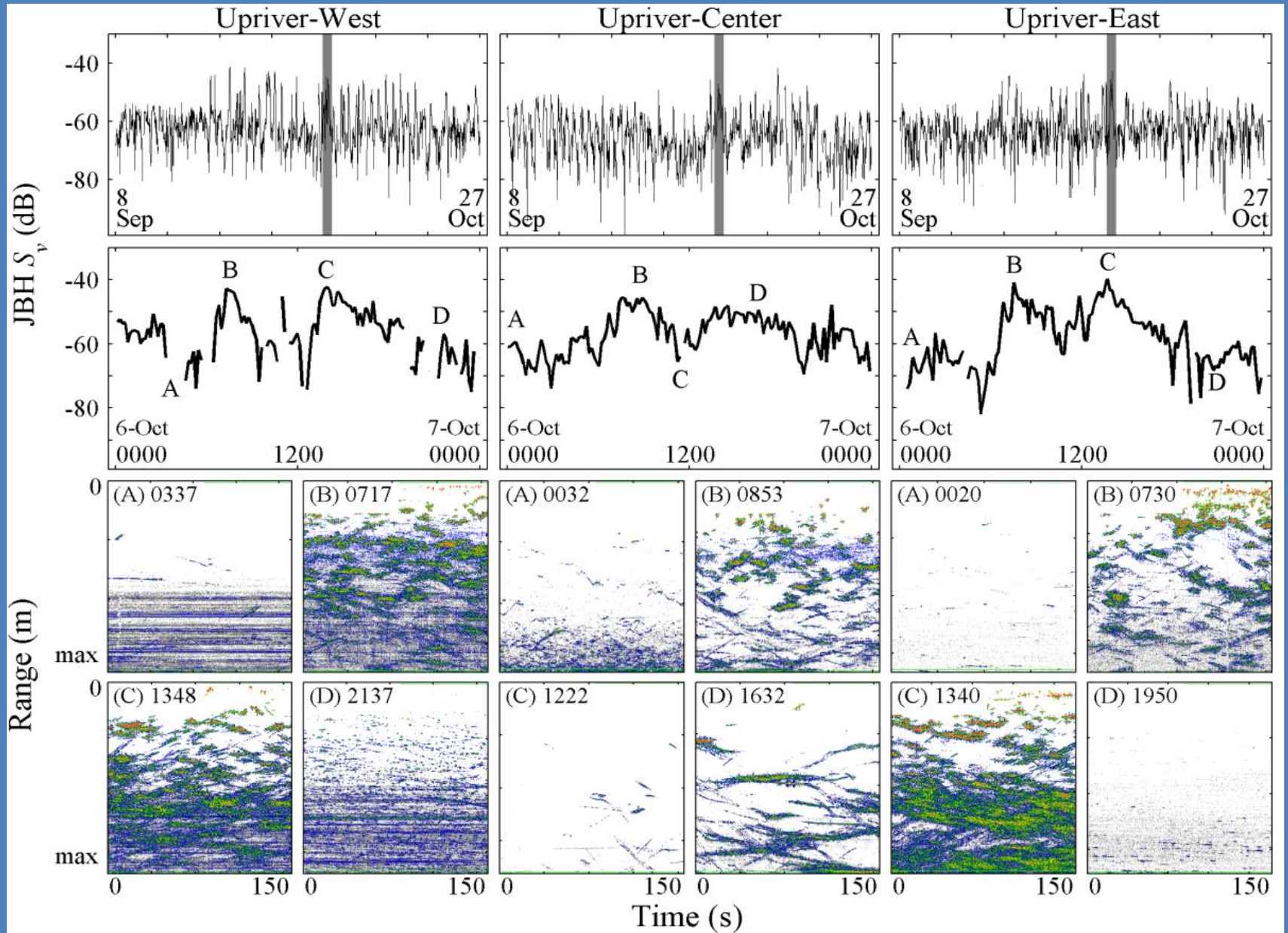
Mobile Surveys



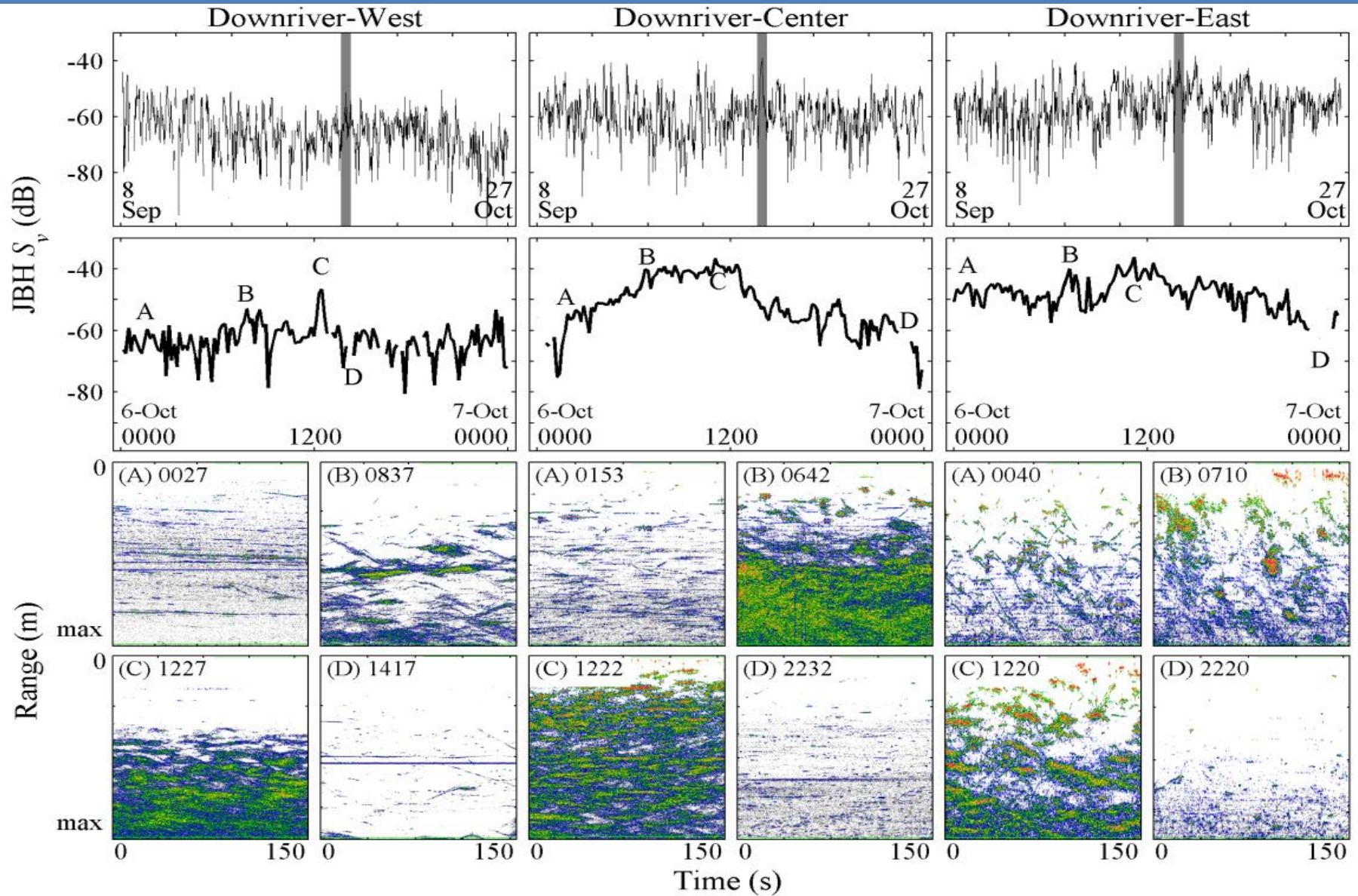
Mobile Hydroacoustic Survey



Fixed Hydroacoustic Survey



Fixed Hydroacoustic Survey



Fixed Hydroacoustic Survey

1) $H_0: V_{d, \text{downriver}} / V_{d, \text{upriver}} = 0.49$

V = volume of water moving downstream at each site

2) $H_0: N_{d, \text{downriver}} / N_{d, \text{upriver}} = 0.76$

$H_1: N_{d, \text{downriver}} / N_{d, \text{upriver}} > 0.5$ (majority)

$H_2: N_{d, \text{downriver}} / N_{d, \text{upriver}} < 0.5$

Conclusions

1. **Deterrence Rate =76%,
45% improvement after reconfiguration**
2. **18° C is limiting temperature at which JBBH complete
downstream migration out of Crescent Pool**
3. **Strong diurnal activity patterns, dawn – early
afternoon**