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Tracking American Shad (*Alosa sapidissima*) in the Hudson River: a five-year study.

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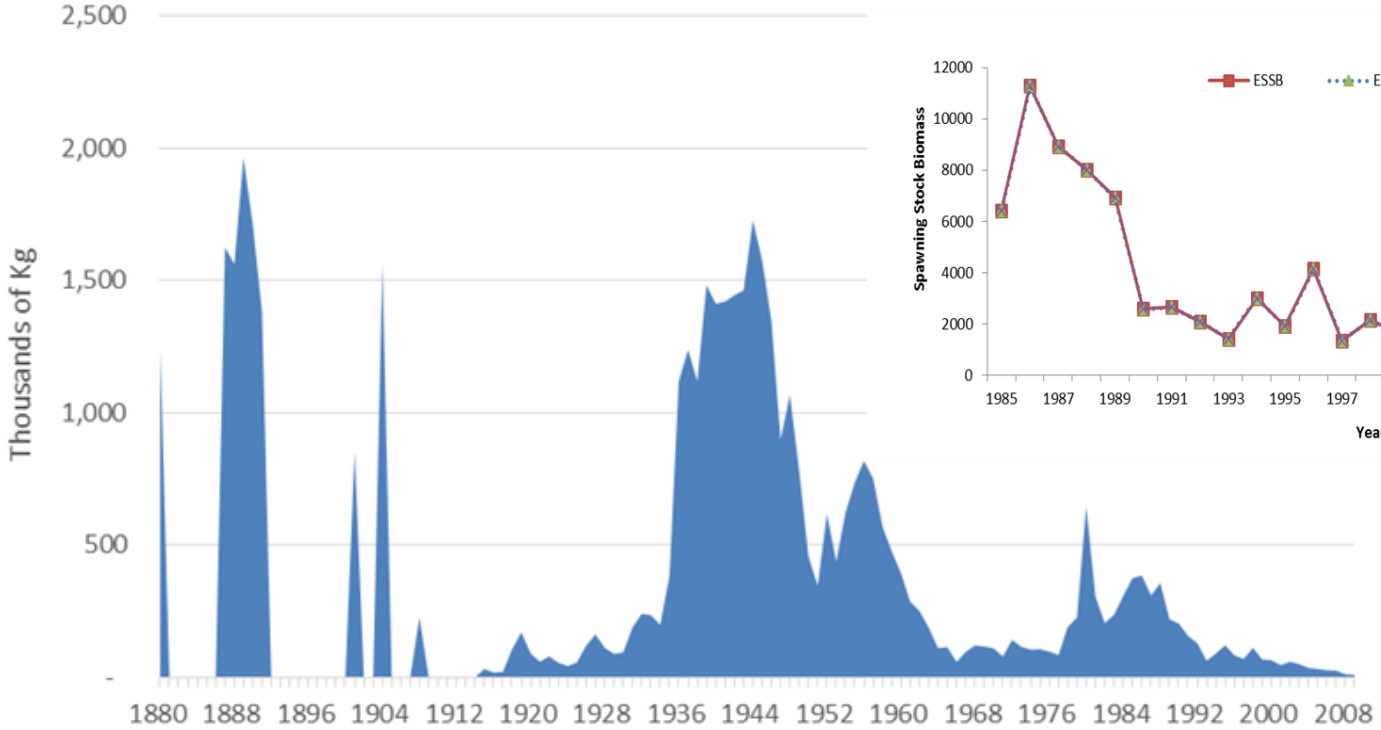
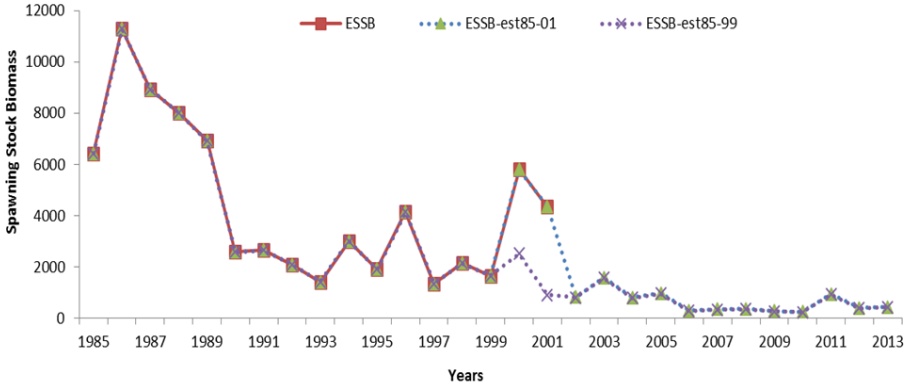
Historic population indices





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Hattala & Kahnle 2015

Study Site: Hudson River

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Methods: Fish capture

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≤ 30 minutes

Methods: Tagging

n = 174 A. shad ≥450 mm (TL)

	2009	2010	2011	2012
Males	14	13	12	7
Females	26	31	38	33
Total	**40**	**44**	**50**	**40**

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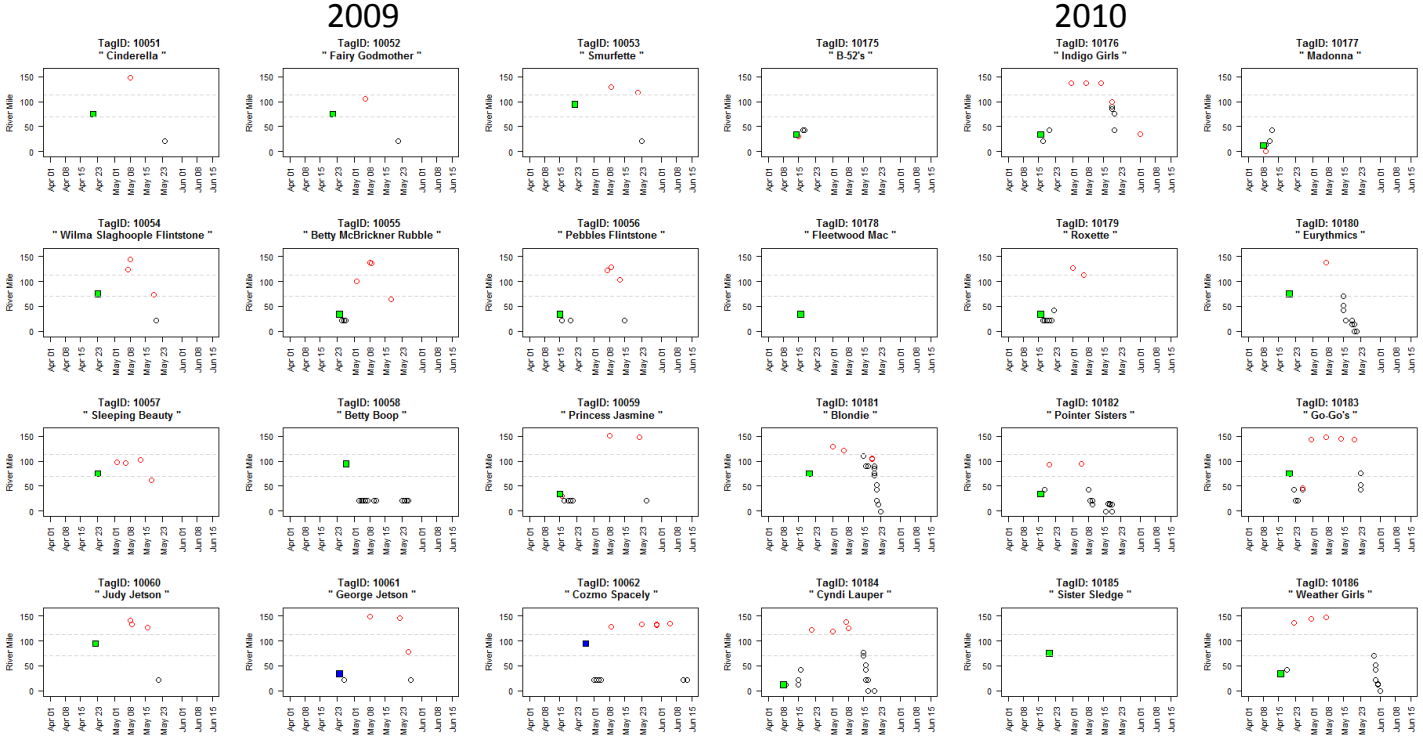
Methods: Tracking

Sonic tags
(2009-2012)

Hybrid tags
(2009-2010)

Results: Fish migrations

- Initial Tag, Male
- Initial Tag, Female
- Stationary Receiver
- Mobile Tracking
- "Dipping" behavior
- RM 70 to 113



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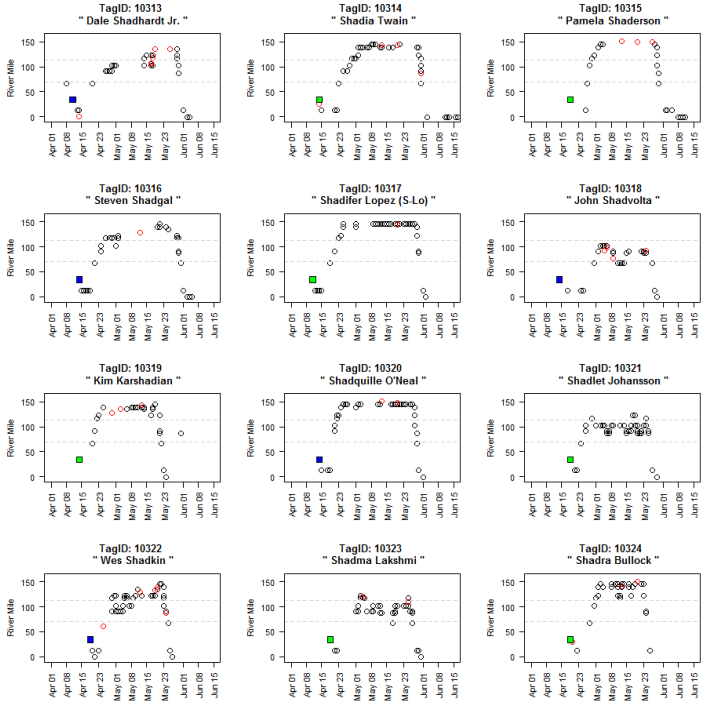
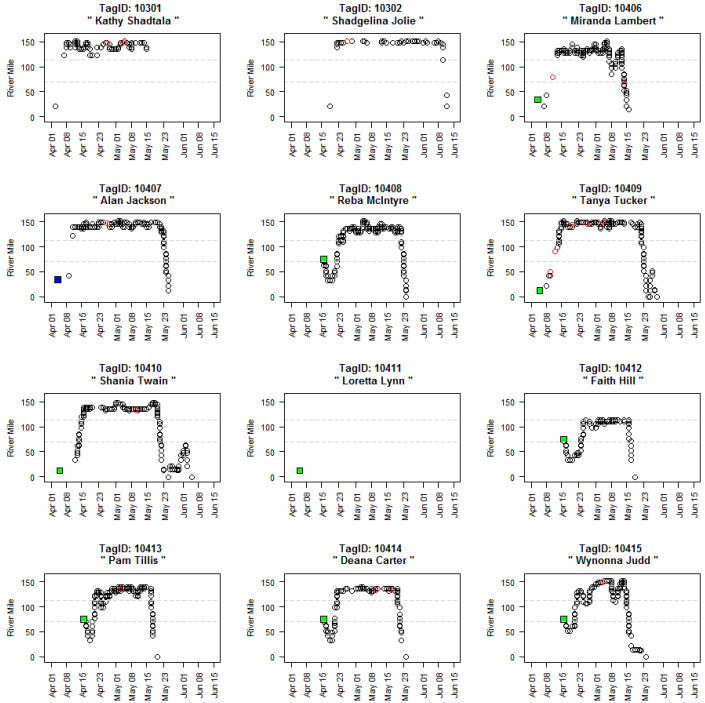
Results: Fish migrations

- Initial Tag, Male
- Initial Tag, Female
- Stationary Receiver
- Mobile Tracking
- "Dipping" behavior
- RM 70 to 113

2011



2012



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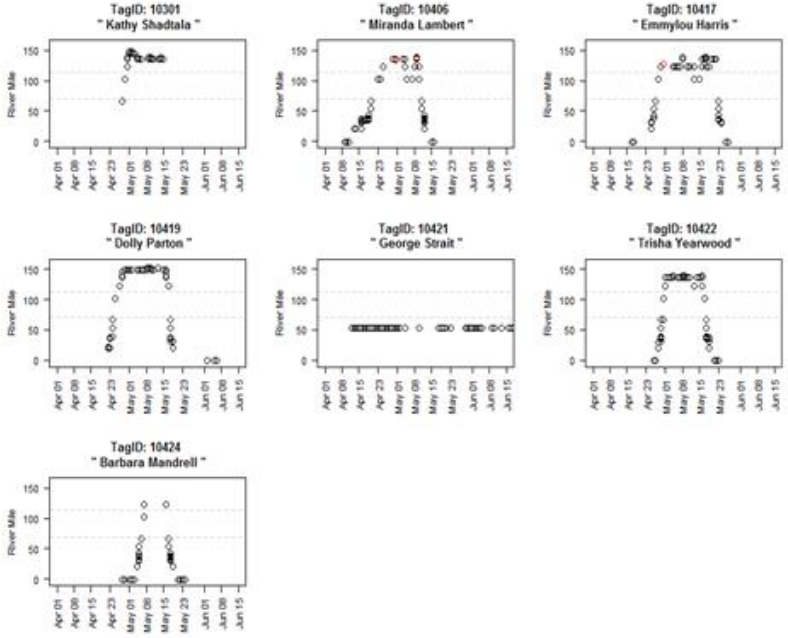
Results: Fish migrations

2013



Initial Tag, Male	Initial Tag, Female
Stationary Receiver	Mobile Tracking
"Dipping" behavior	RM 70 to 113

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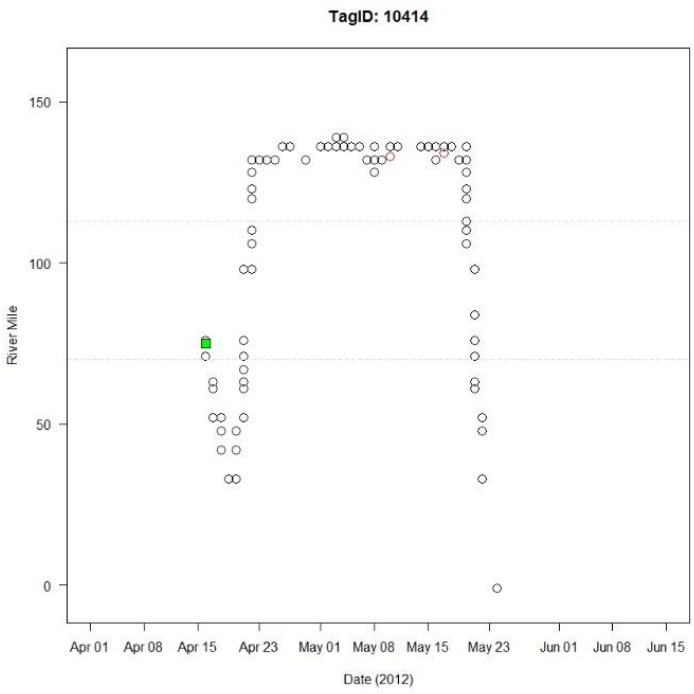
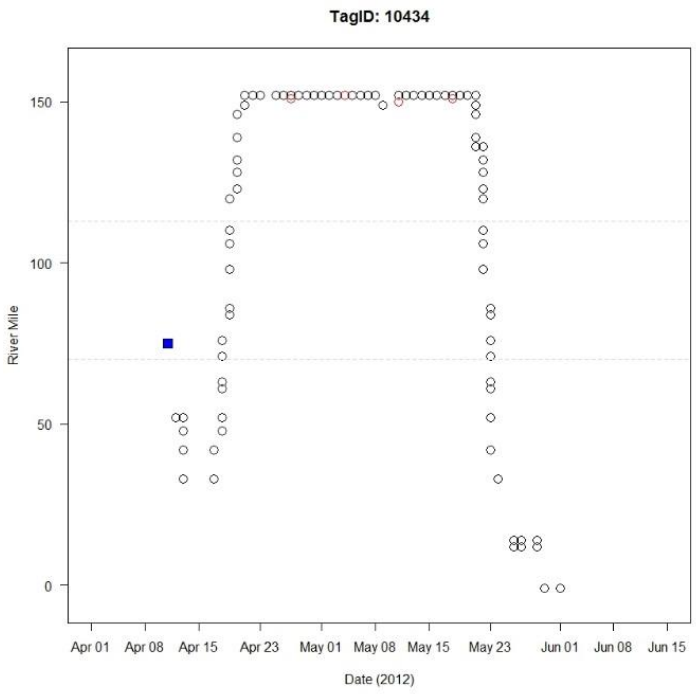
Results: Fallback

Initial Tag, Male
Initial Tag, Female
Stationary Receiver
Mobile Tracking
"Dipping" behavior
RM 70 to 113





$\bar{x} = 5.1 \pm 2.3$ days
n = 111

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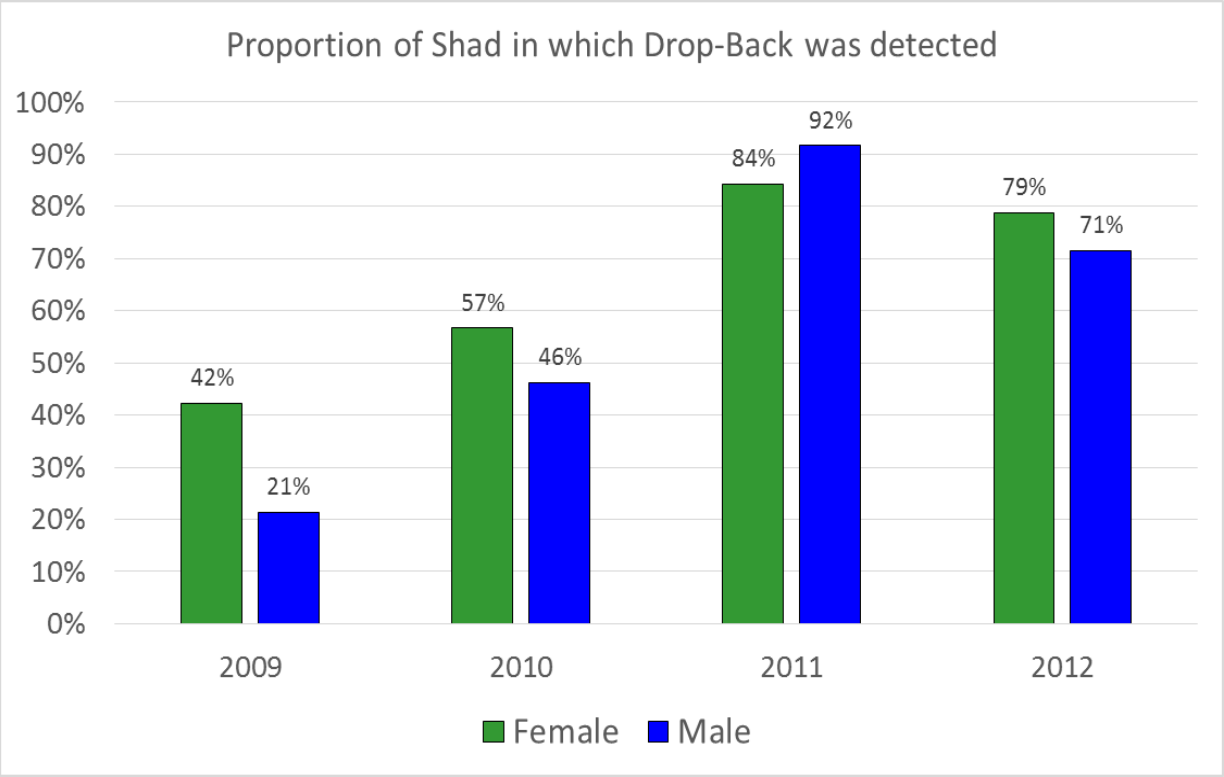
Results: Fallback



Year	Mean duration (days)
2009	4.7 ±2.8
2010	4.4 ±1.9
2011	5.0 ±2.1
2012	6.0 ±2.3

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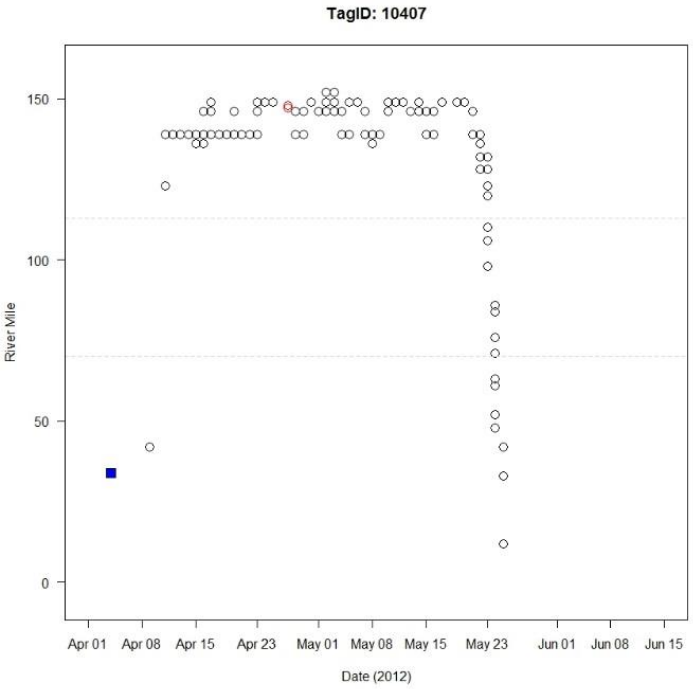
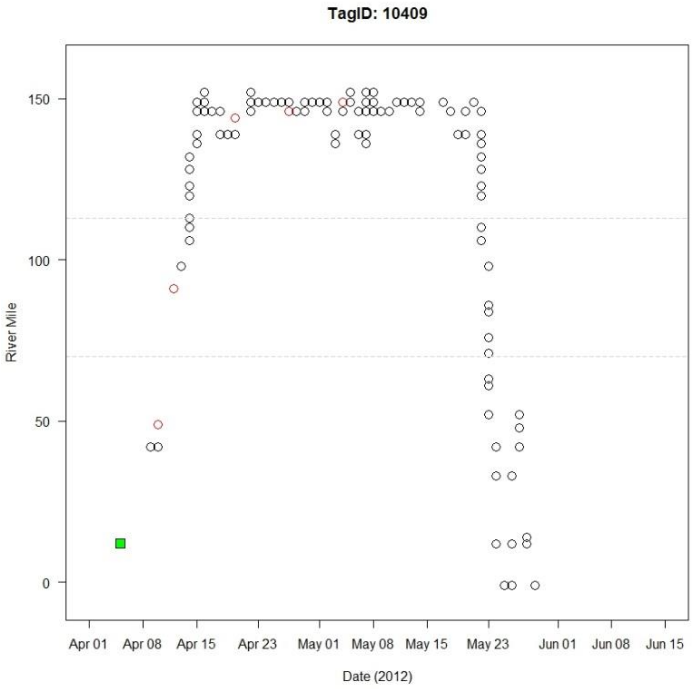
Results: Down-river forays

Initial Tag, Male
Initial Tag, Female
Stationary Receiver
Mobile Tracking
"Dipping" behavior
RM 70 to 113





n = 61

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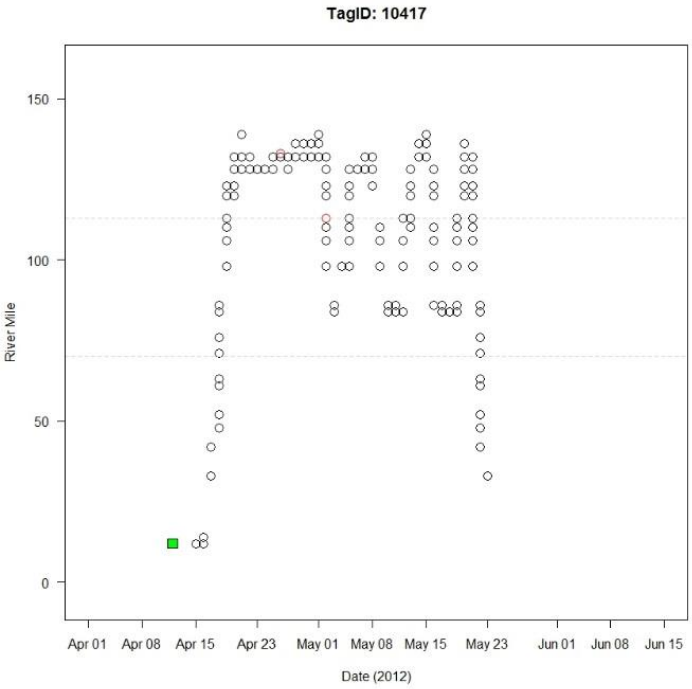
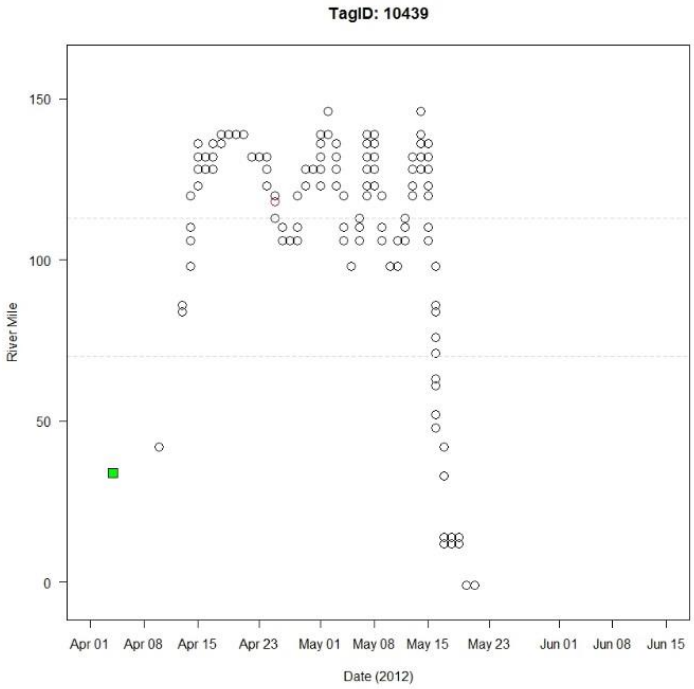
Results: Down-river forays

Initial Tag, Male
Initial Tag, Female
Stationary Receiver
Mobile Tracking
"Dipping" behavior
RM 70 to 113





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Results: Down-river forays

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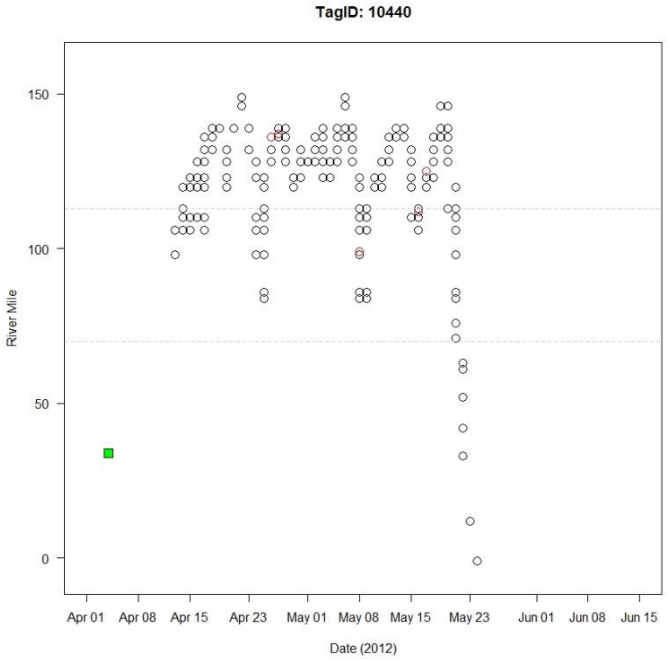

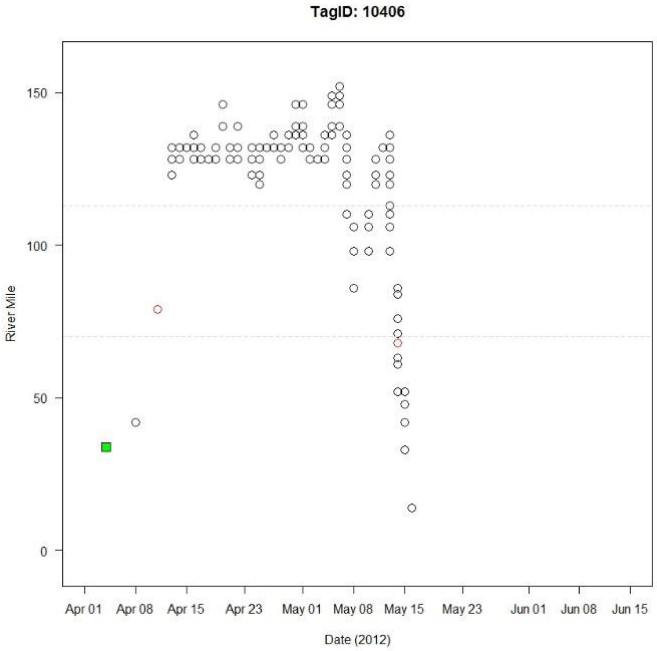

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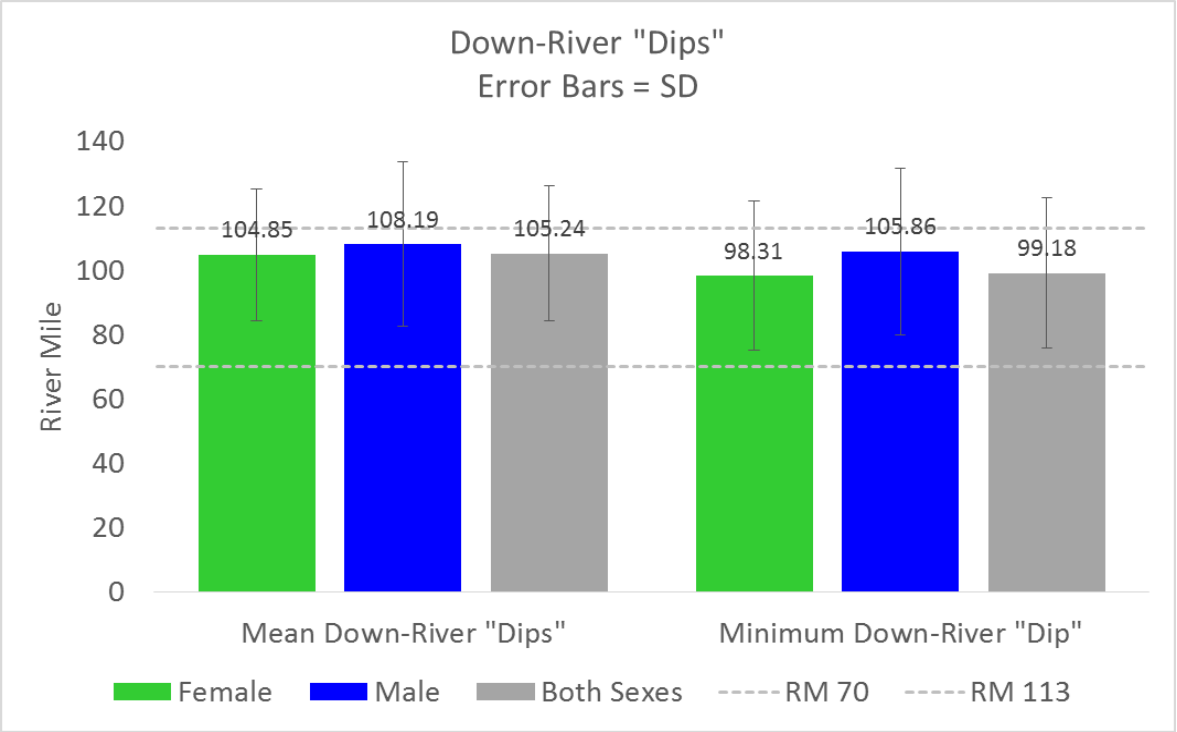
Results: Down-river foray distances



n = 61

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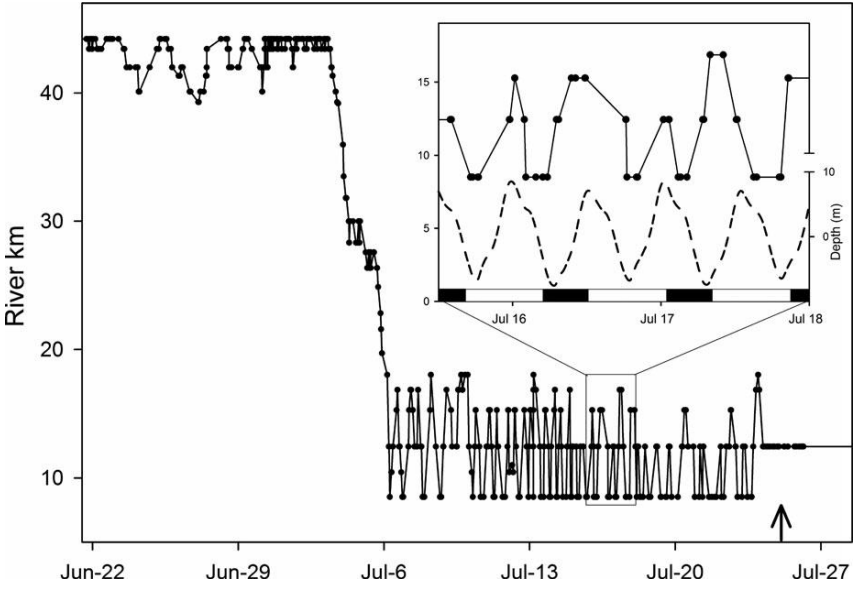
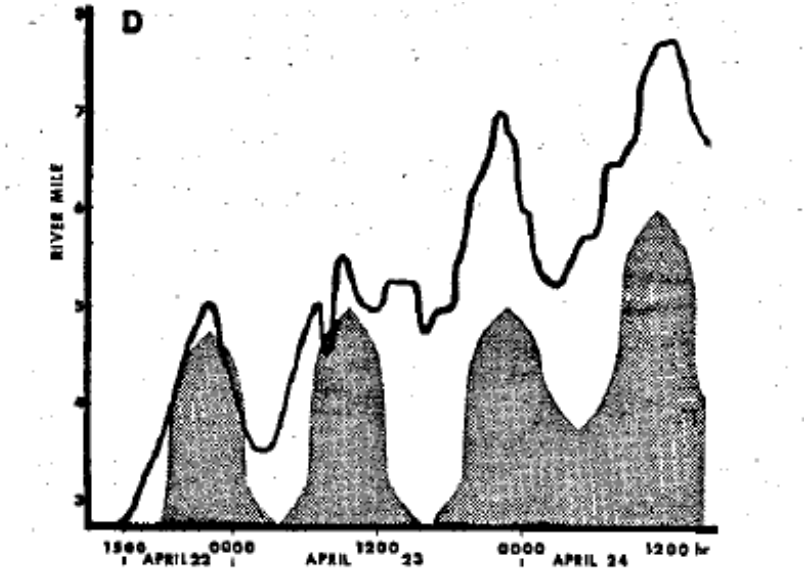
Potential explanatory variables





Grote et al. 2014, Dodson et al. 1972

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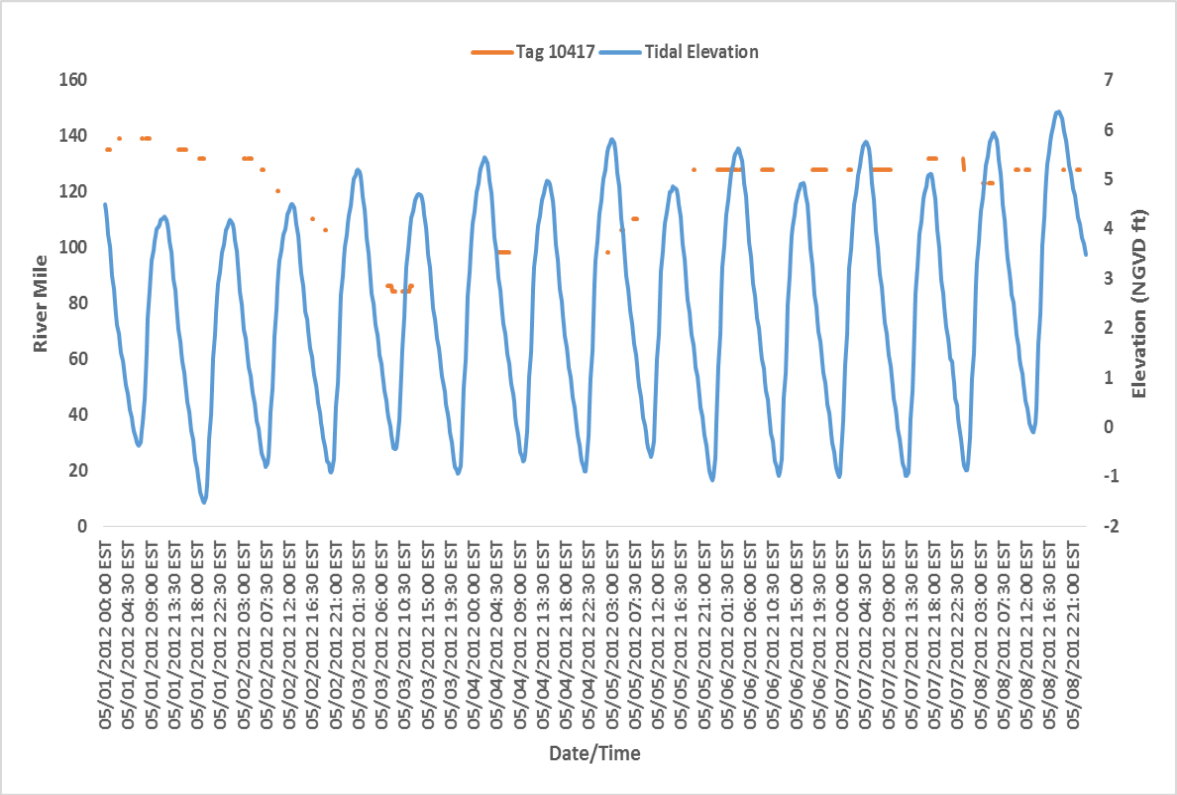
Tide: Down-river forays



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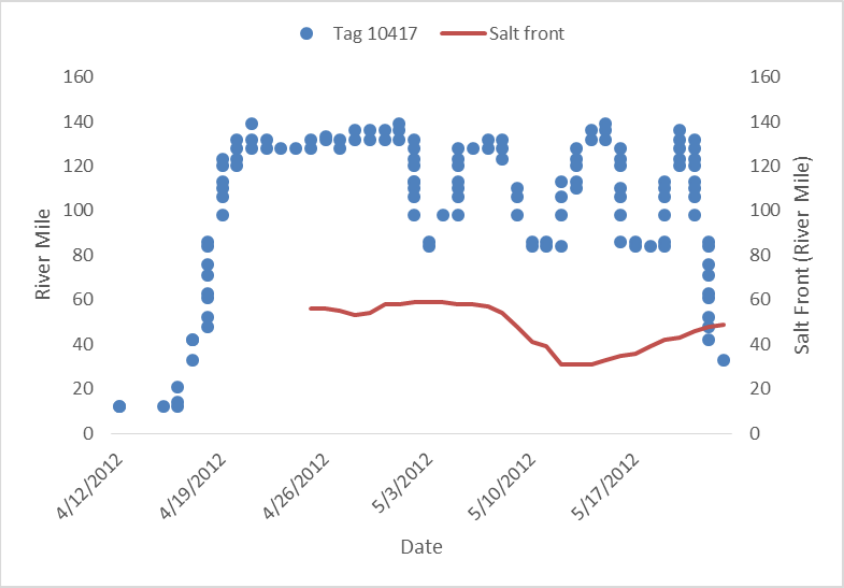
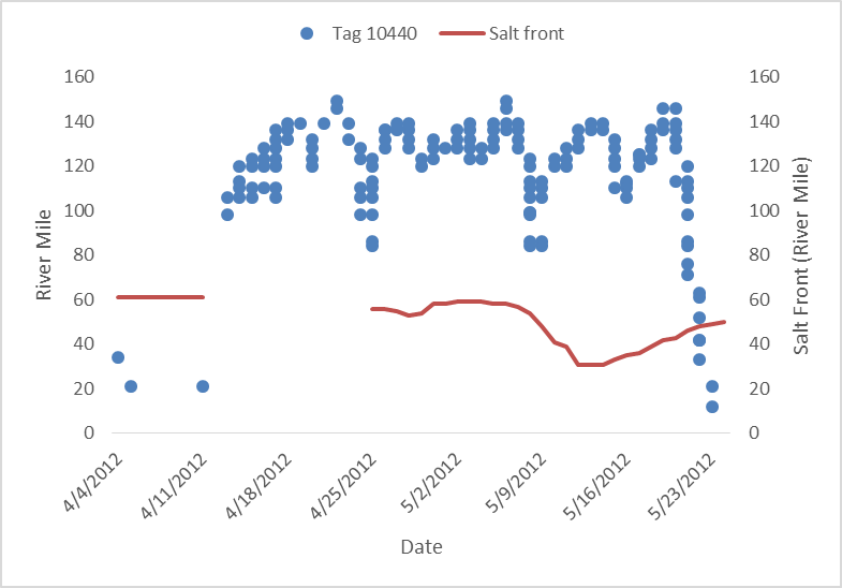
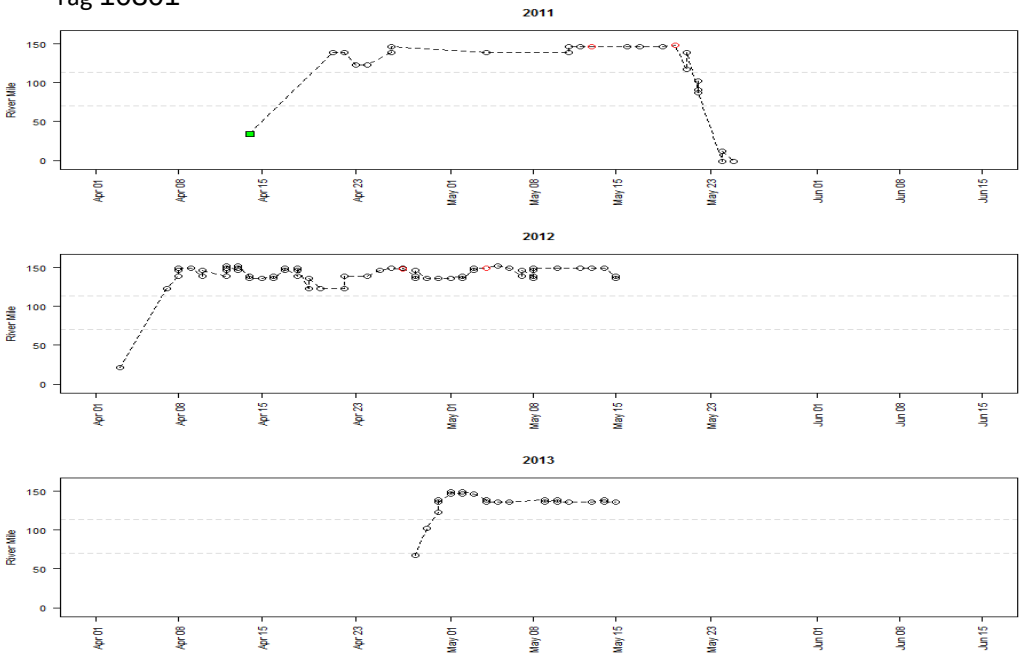
Salt Front: Down-river forays



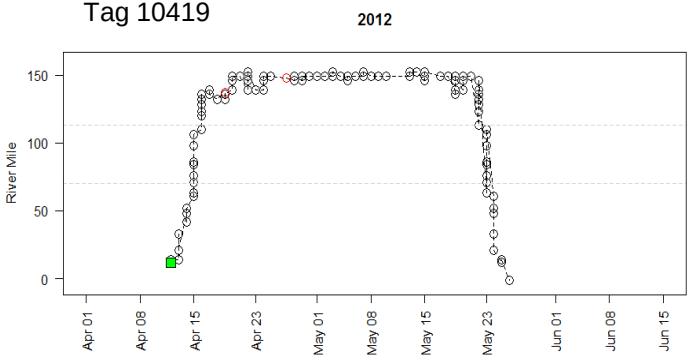


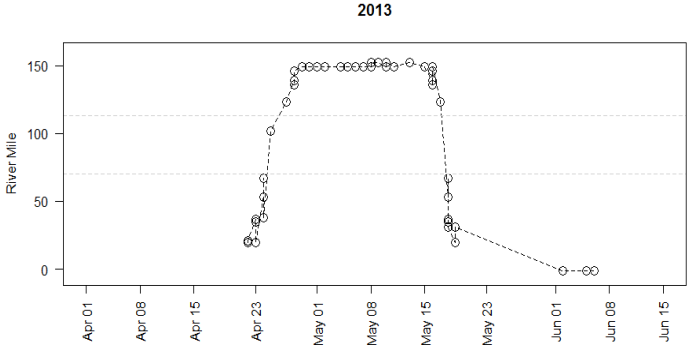
Multi-year tags (n = 8)

Tag 10301



Tag 10419





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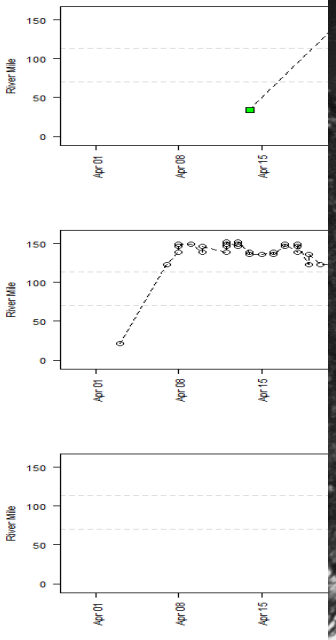
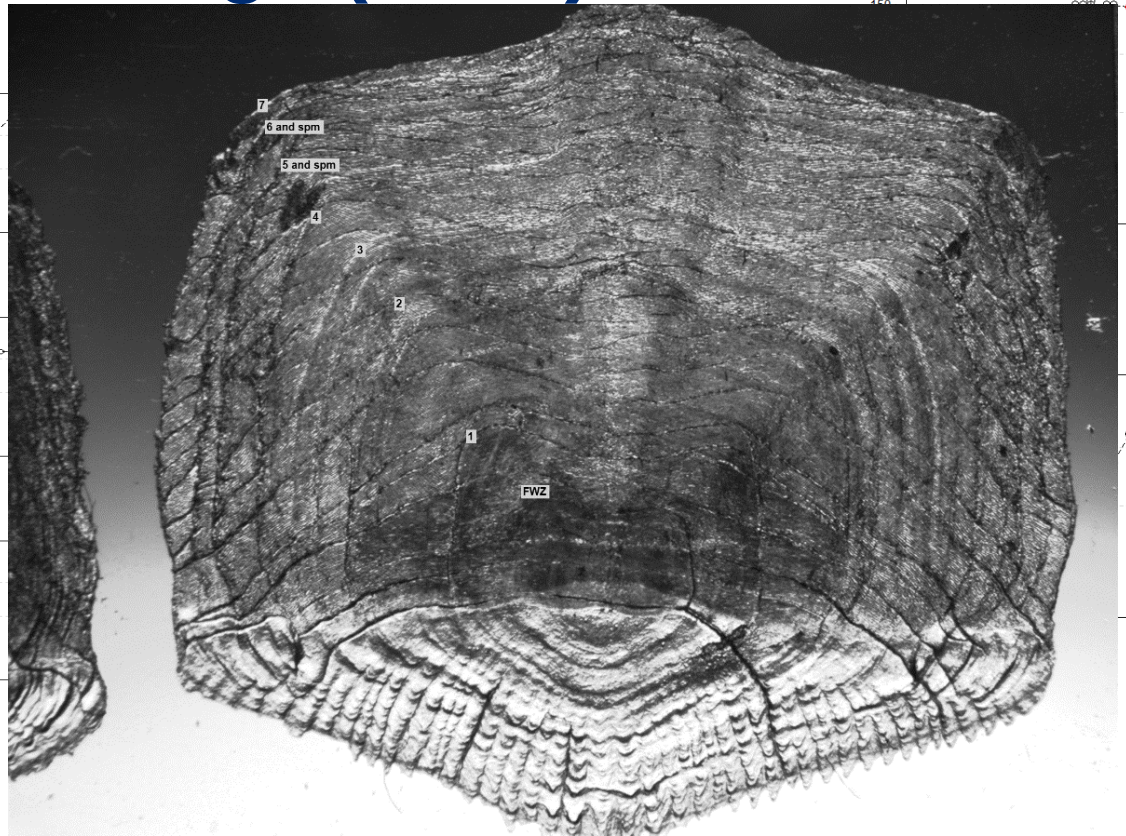
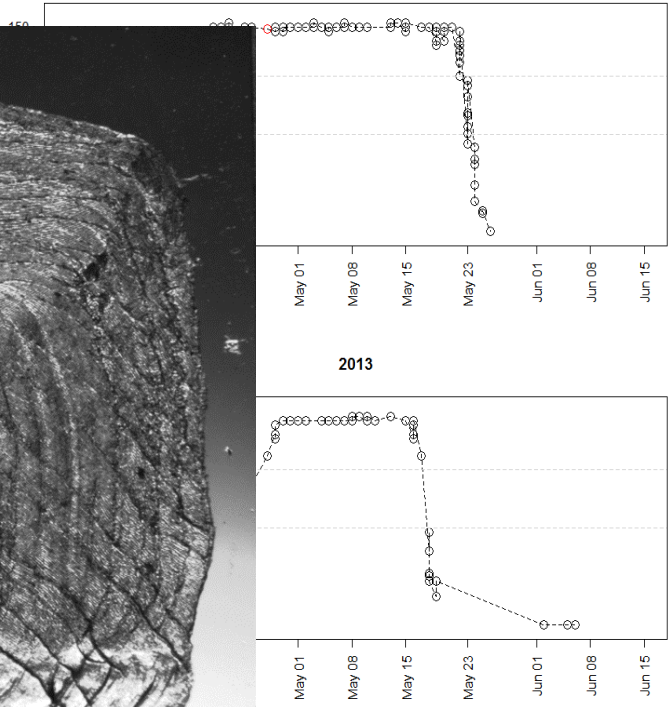
Multi-year tags (n = 8)

Tag 10301





Tag 10419



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Conclusions

- Migratory behaviors likely influenced by handling procedures – observed fallback
- Down-river forays (“dipping”) elicit questions on spawning ground selection and migratory behavior.
  - Searching behavior, batch spawning (Olney 2001, 2003)
  - Important management implications if fishery is ever re-opened (commercial fishing zone)
- Multi-year detections demonstrate post-spawning survival and iteroparous reproductive strategies of American shad populations in the Hudson River.

Acknowledgements

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Tim DeGroat

Riverkeeper

Captain John Lipscomb

Dr. Pat Sullivan

Cornell University Cooperative Extension

Additional Data

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Citations

Hattala, K., Kahnle, A. (2015). *Draft recovery plan for Hudson River American shad*. Report prepared for the New York State Department of Environmental Protection, New Paltz, New York.

Grote, A. B., Bailey, M. M., & Zydlewski, J. D. (2014). Movements and demography of spawning American shad in the Penobscot River, Maine, prior to dam removal. *Transactions of the American Fisheries Society*,*143*(2), 552-563.

Dodson, J. J., Leggett, W. C., & Jones, R. A. (1972). The behavior of adult American shad (Alosa sapidissima) during migration from salt to fresh water as observed by ultrasonic tracking techniques. *Journal of the Fisheries Board of Canada*, *29*(10), 1445-1449.

Olney, J. E., Denny, S. C., & Hoenig, J. M. (2001). Criteria for determining maturity stage in female American shad, Alosa sapidissima, and a proposed reproductive cycle. *Bulletin Français de la Pêche et de la Pisciculture*, (362-363), 881-901.

Olney, J. E., & McBride, R. S. (2003). Intraspecific variation in batch fecundity of American shad: revisiting the paradigm of reciprocal latitudinal trends in reproductive traits. In K. E. Limburg, & J. R. Waldman (Eds.),*American Fisheries Society Symposium* (Vol. 35, pp. 185-192).

Appendix – Age structure of tagged fish

Female

Age	2009	2010	2011	2012
4		1		
5	4	8	2	10
6	9	10	19	4
7	9	6	10	15
8	1	4	6	2
9				1
10				
11	1			

Male

Age	2009	2010	2011	2012
4				1
5	3	5	1	
6	1	2	6	2
7	4	4	3	2
8	3	1		1
9			1	
10				1
11	1			

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Cating (1953)