Climate-related effects on river herring counts

Adrian Jordaan[1] and Jacob P. Kritzer [2]

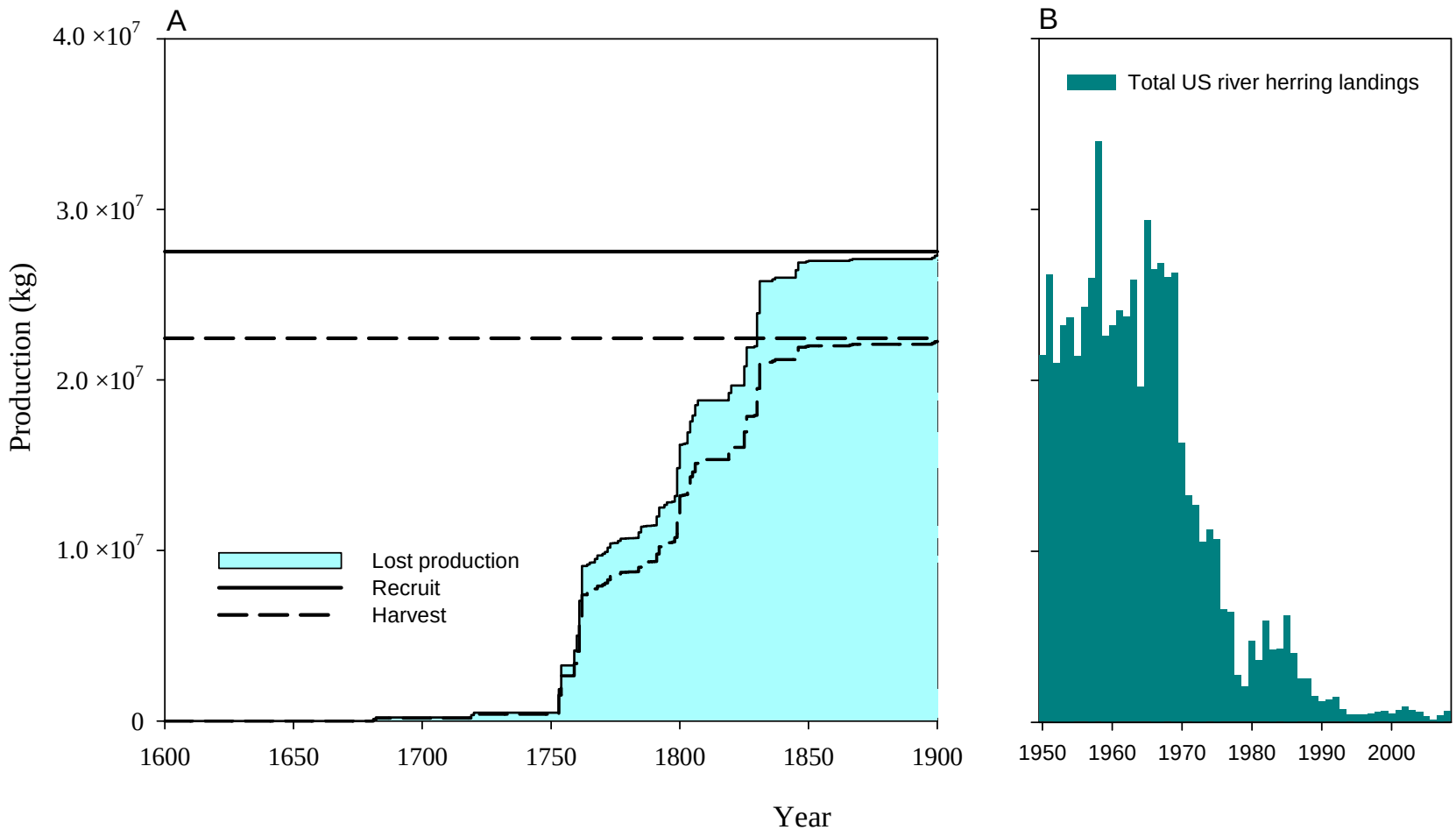
[1]School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY, 11794

[2]Environmental Defense Fund, 18 Tremont Street, Suite 850, Boston, MA 02108

Low population sizes

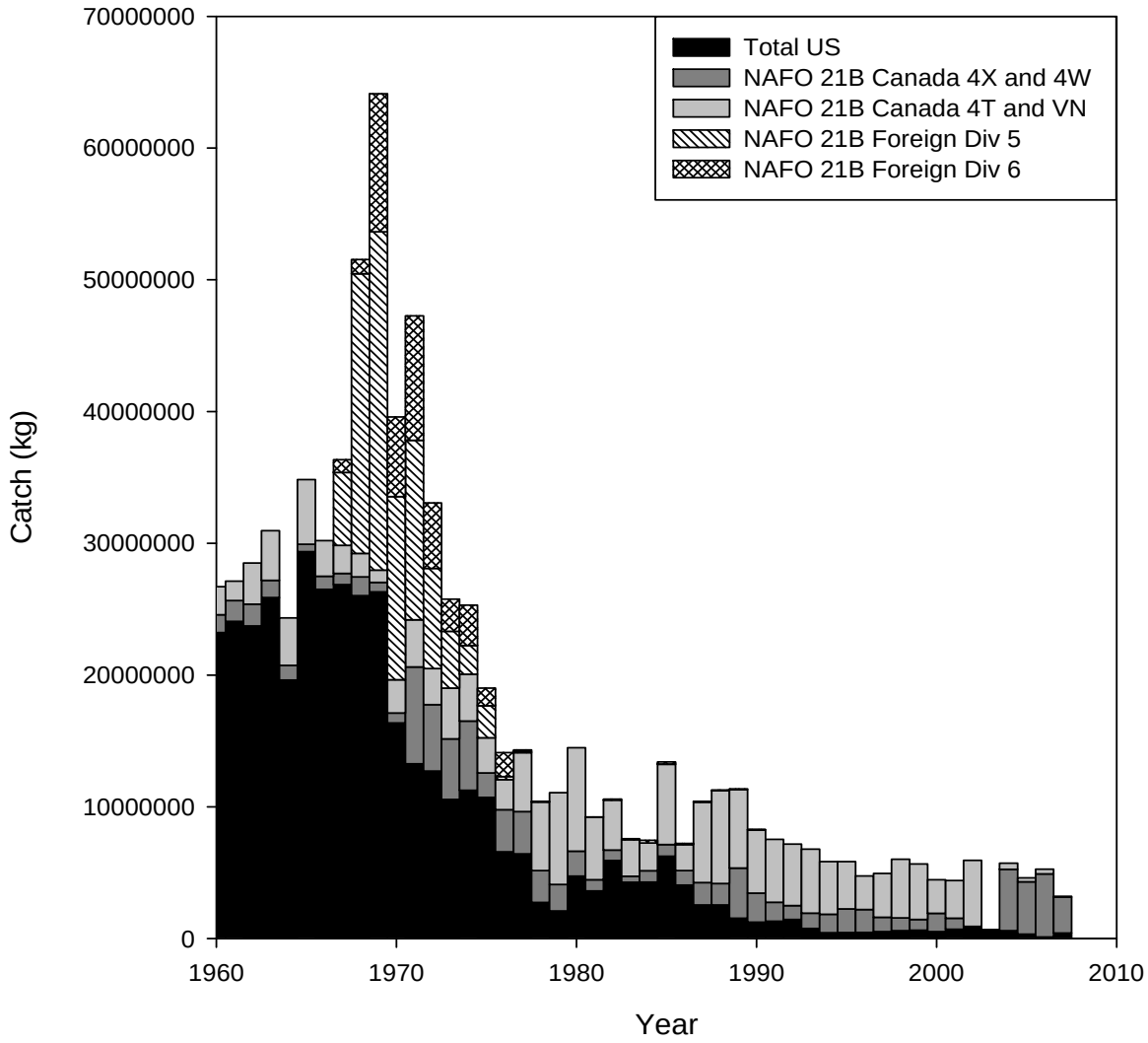
- 3 step process
  - Historical habitat loss (95% by 1850)
  - Heavy overfishing in 1960-1970s
  - Current and ongoing declines, particularly for blueback herring

Historical habitat loss (95% by 1850)



Hall et al. In Press

Heavy overfishing in 1960-1970s



Low population sizes are more susceptible to environmental change

- No data that allows fisheries independent analysis of impact of 1960-1970s overfishing
- Even since then data is limited and concentrated in the northeastern States
- Summary of ongoing analyses

Summary of broad results

	GBAHZ	GoMAHZ	SNEAHZ	CANAHZ	USMENZ	USCANMA	NAFO_21E	NAFO_21E	NAFO_21E	NAFO_21E	TotalUSZ	TOTAL_CA	TOTAL_US	StipedBas	SBassChae	NOAHurle	NOAHurle	TempNE-4	PHDINE-4	TempSE-4	PrecSE-4	PHDISE-4	PHDISE	PHDINE
Androscoggin	(+) 0.05					(+) 0.01																		
Buckeye																								
Chowan Ale					(+) 0.05						(+) 0.01											(+) 0.05		
Chowan BB											(+) 0.01													
Cocheco														(+) 0.01			(+) 0.01							
Connecticut		(-) 0.05				(+) 0.05								(-) 0.01										
Damariscotta		(-) 0.05										(-) 0.05		(+) 0.01										
Exeter			(+) 0.01																(+) 0.01				(-) 0.05	
Gilbert			(+) 0.01		(-) 0.05												(-) 0.01							
Lamprey																							(-) 0.01	
Mattapoisett																								
Merimack																								
Monument Ale			(+) 0.05																					
Monument BB												(+) 0.01												
Nemasket																								
Nonquit																								
Oyster																								
Parker																								
Saco																								
Saint Croix				(+) 0.01							(+) 0.01					(-) 0.01								
Shetucket																								
Taylor				(+) 0.01							(+) 0.01								(-) 0.05					
Union											(-) 0.05		(+) 0.05											
Winnicut	(+) 0.01																							(-) 0.05

Fisheries/predators

Climate

Summary of results using flow

	Sum of spring flow					Sum of summer flow -4					Sum of fall flow -4				
	Androscog	Connectic	LampreyS	OysterSpr	StCroixSpi	Androscog	Connectic	LampreyS	OysterSur	StCroixSu	Androscog	Connectic	LampreyF	OysterFal	StCroixFal
Androscoggin															
Connecticut							(+) 0.1								
LampreyAL															
LampreyBB															
OysterAL														(-) 0.05	
OysterBB														(-) 0.1	
Saint Croix															
CochecoAL															
CochecoBB			(+) 0.05	(-) 0.05											
ExeterAL								(+) 0.001	(-) 0.05				(-) 0.001	(+) 0.001	
ExeterBB									(-) 0.1						
TaylorAL								(+) 0.1	(-) 0.05						
TaylorBB															
MattapoisettAL															
MonumentAL															
MonumentBB															

Z-scored flow data shown, results change with non standardized data (Androscoggin)

Fishway-based hypotheses

- Low flow summer 3-4 years prior: Low summer flow results in low water quality behind the dam (upstream) that impacts juvenile growth/survival.

- Low flow fall 3-4 years prior: Impacts out-migration of juveniles after summer growth

- High spring flow in year of data collection: Reduces passage of fish due to velocity barrier (note that some populations still spawn below dam

Conclusions

- Fishing-related variables better correlate with river counts than climate variables at broad scales

- Once fine-scale (flow) data are used, results indicate that summer and fall condition more important

- Need more work to identify thresholds…

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