Valuing Ecological Changes in the Lake Michigan Recreational Fishery

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Research Questions

For recreational anglers in Lake Michigan…

1. How does target species affect the value of a fishing trip?

2. What is the change in economic value associated with the decline in the Chinook salmon population?

Background

Current Sportfish (Introduced / Invasive)

Chinook salmon

Alewife

Current fishery econ. impact:
$400 million/year in WI

Substitute Sportfish (Native)

Walleye

Yellow perch

Lake trout

Data Collection

- Wisconsin Angler Survey 2016
- Choice Experiment:
  - 6 questions presented to each respondent

11. Which of the following options would you prefer? Please choose only one.

	Option A	Option B	Option C
• Target species	Chinook Salmon	Lake Trout	
• Number of target species caught	2	1	
• Average size of target species	10 pounds / 30 inches	15 pounds / 35 inches	Do something other than fish Lake Michigan or Green Bay
• Secondary target species	Coho Salmon	Rainbow Trout	
• Likelihood of catching secondary species	High	Low	
• Trip cost per person	$150	$50	
Preferred option	☐	☐	☐

Attributes and Attribute Levels

Attribute	Levels
Target species **(2nd target species)**	Chinook salmon (Coho salmon) ~~Lake trout (Chinook salmon)~~ Lake trout (rainbow trout) Walleye (yellow perch)
Number of fish caught	Chinook salmon/lake trout: 1, 2, 3 fish Walleye: 2, 4, 6 fish
Size of fish caught	Chinook salmon/lake trout: 5, 10, 15 lbs. Walleye: 2, 3, 4.5 lbs.
Prob. of catching 2nd target	Low, high
Trip cost per person	$50, $100, $150, $200

Estimation Methods: Random Utility Maximization (RUM) Model

Predict how anglers react to changing trip attributes

$$U_{ijt} = \alpha p_{jt} + \boldsymbol{\beta' target_{ijt}} + \delta catch_{ijt} + \eta size_{ijt} + \gamma high_{ijt} + \boldsymbol{\phi' target_{ijt}} \times (catch_{ijt} + size_{ijt} + high_{ijt}) + \varepsilon_{ijt}$$

Estimate parameters using multinomial logit framework

WTP for fishing trips scenarios

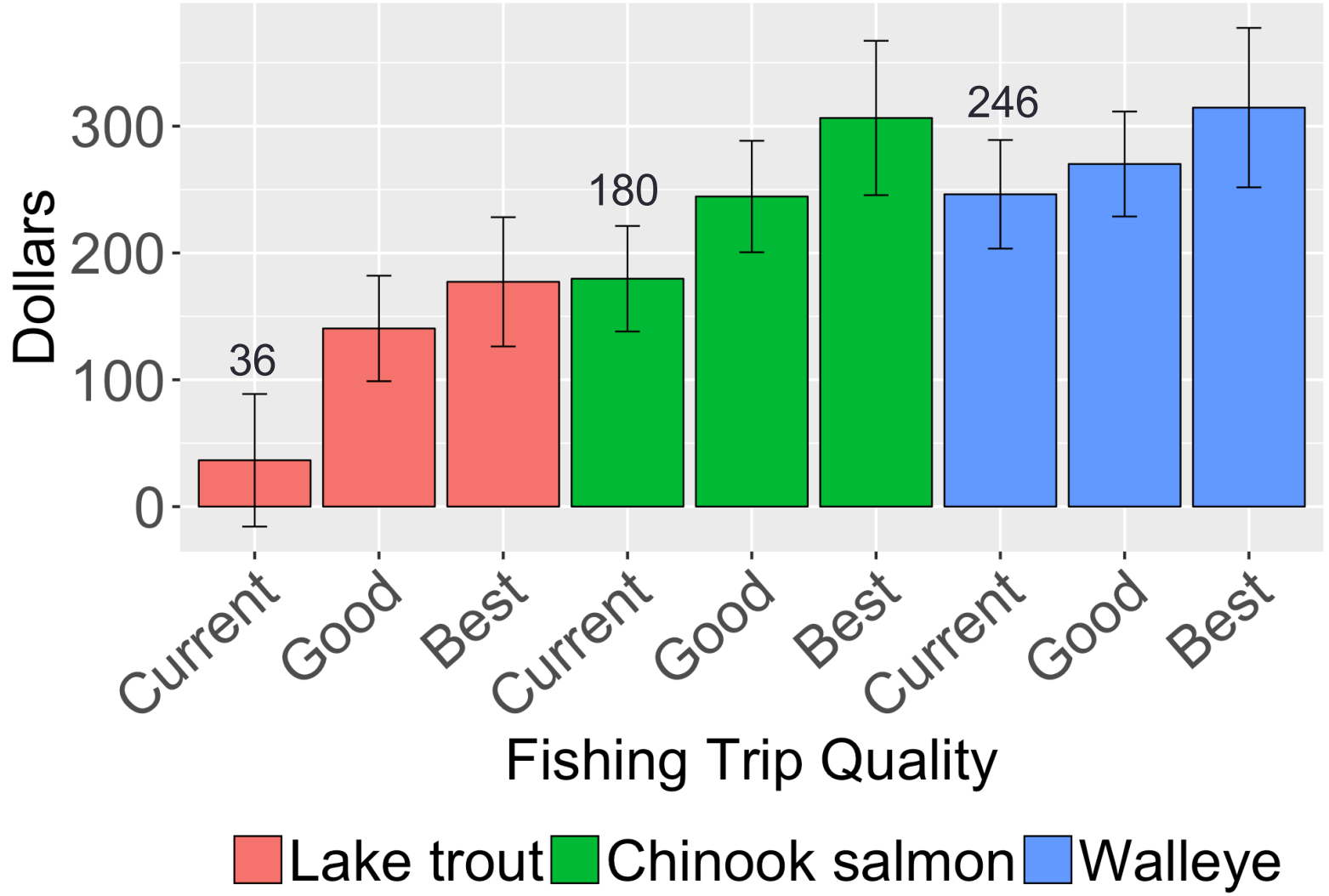
Attribute Levels of Trip Configurations

For Chinook salmon, lake trout, and walleye:

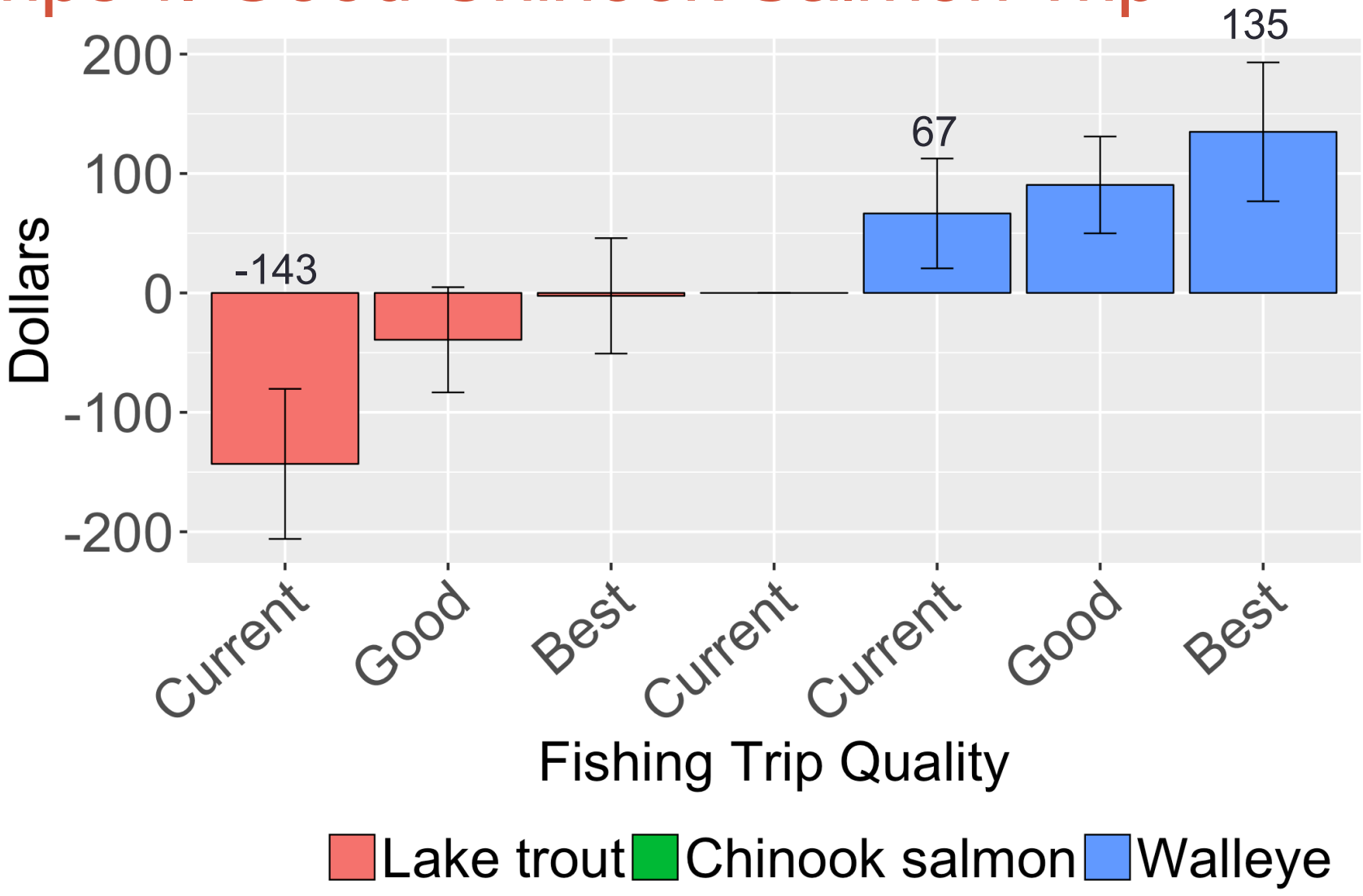
Attribute	Current	Good	Best
Catch	Low	Medium	High
Size	Low (Med. for Chinook)	Medium	High
Prob. 2nd target	Low (High for Walleye)	High	High

Low, medium, and high numeric values vary by species

Salmon Anglers' Marginal WTP for Fishing Trips v. Not Fishing



Salmon Anglers' Marginal WTP for Fishing Trips v. Good Chinook Salmon Trip



Economic Value

- Chinook salmon under current conditions: $23 million/year
  - 127,798 Chinook salmon trips in 2015
- If all Chinook salmon trips targeted another species:

Target species	Quality	Change in Economic Value [90 % C.I.]
Lake trout	Current	- $18 million* [-26 m, -10 m]
	Good	- $5 million [-11 m, 1 m]
	Best	- $0.3 million [-6 m, 6 m]
Walleye	Current	+ $9 million* [3 m, 14 m]
	Good	+ $12 million* [6 m, 17 m]
	Best	+ $17 million* [10 m, 25 m]

Conclusions

- If Chinook salmon go extinct…
- Lake trout and walleye may offer viable substitute
- Short-term losses possible while species continue recover