



# Decision making in a mixed commercial-recreational fishery for Atlantic bluefin tuna

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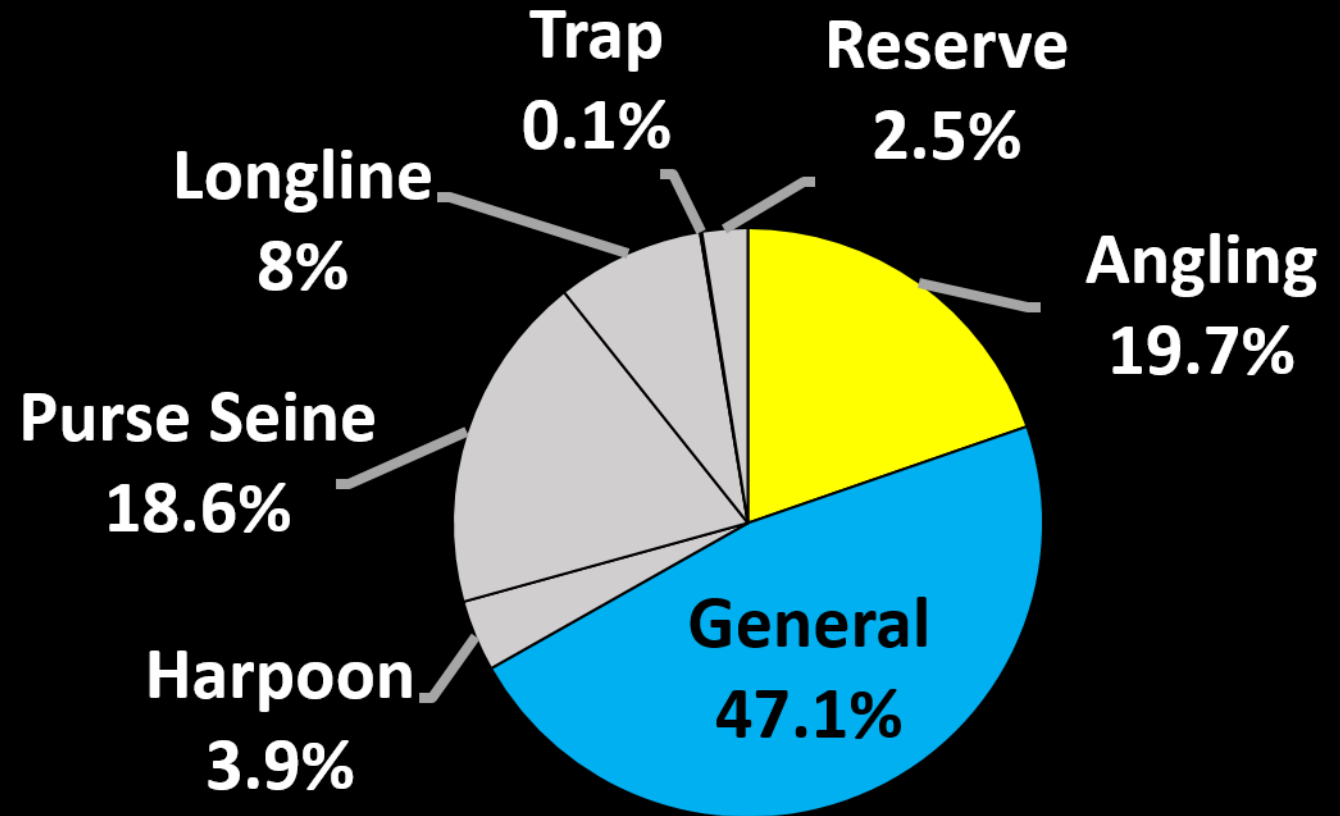
# The Atlantic bluefin tuna fishery

Internationally managed by ICCAT

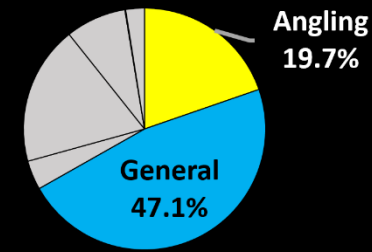


2018 U.S. quota: 1,059 mt

- Maine to North Carolina



# Permit structure: a closer look



## General category—Commercial

- Can only harvest fish  $\geq 73$ "
- ~2,500 from ME-NC



## Angling category—Recreational

- Primarily harvest fish 27-73" (1 annual trophy  $\geq 73$ " )
- ~13,000 from ME-NC



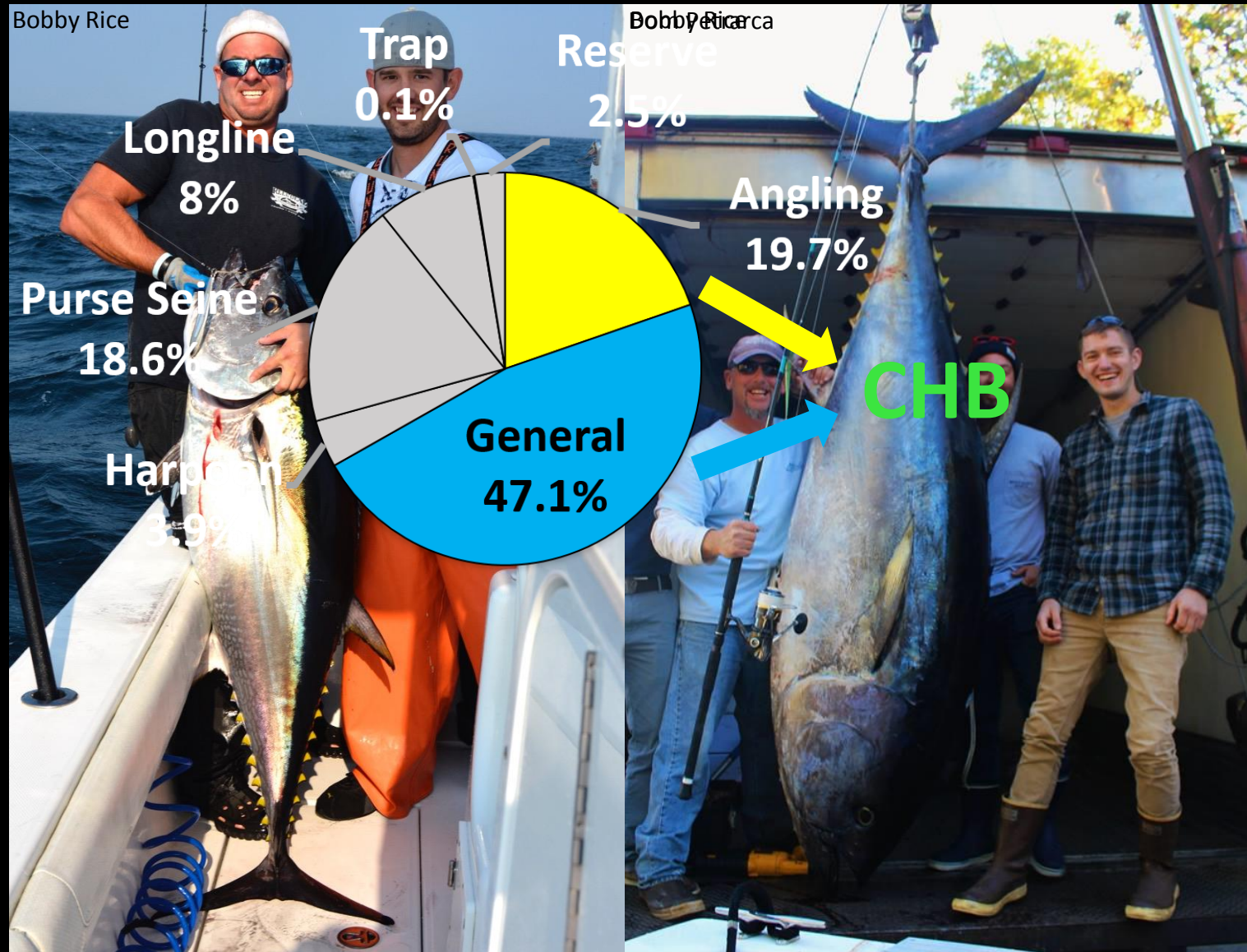
# The Charter/Headboat (CHB) permit

- Can fish under either General or Angling *on a trip-by-trip basis*
- ~2,500 from ME-NC

2002-2015:

~24-43% of Angling quota

~19-46% of General quota



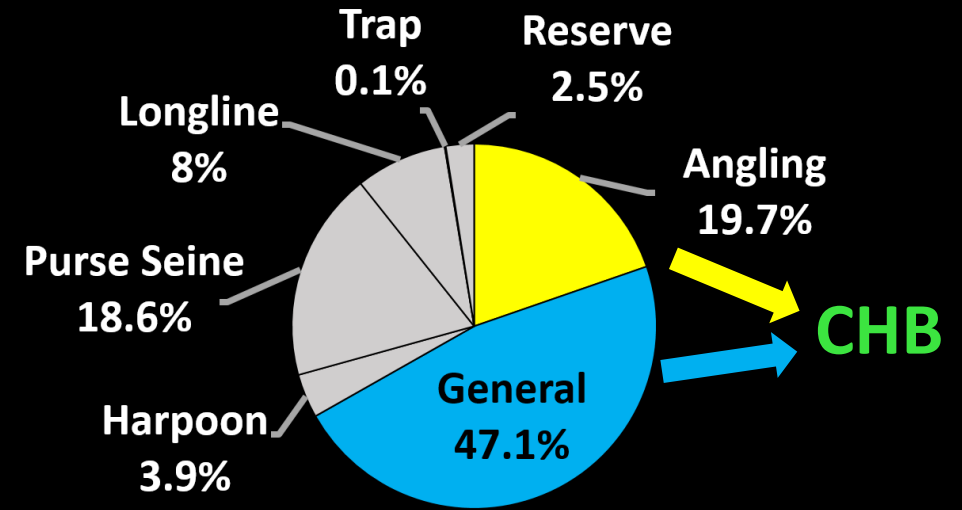
# Objectives

## 1) Characterize CHB permit holders:

- Private anglers vs. charter captains
- Commercial (General) vs. recreational (Angling)

## 2) Apply novel survey methodology:

- Which factors influence bluefin tuna trip type?
- *Inertia versus opportunism*
- Improve forecasting



# The sequential stated-choice survey

- Web survey (2016): All CHB permit holders from ME-NC
- Simulated fishing trips (2 per survey):
  - Would you fish? Take clients?
  - How would you dispose of any bluefin tuna caught?
- Factors:
  - Regulations (Angling, General)
  - Anticipated and actual fish size
- Model probability of harvesting a fish under Angling or General category



Bobby Rice

# Example scenario

## Recreational Regulations

2 fish 27"-<47" CFL daily  
1 fish 47"-<73" CFL daily  
1 annual trophy (73"+ CFL)

## Commercial Regulations

4 fish over 73" CFL daily

Size range of bluefin tuna  
that you expect to encounter

45" - 75" CFL

Annual trophy already retained?

No

Clients on board?

No

Catch Disposition

1<sup>st</sup> bluefin tuna

Current question,  
see below

# Example scenario

## Reminder of trip characteristics:

Recreational Regulations	2 fish 27"-<47" CFL daily 1 fish 47"-<73" CFL daily 1 annual trophy (73"+ CFL)
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Commercial Regulations	4 fish over 73" CFL daily
------------------------	---------------------------

Size range of bluefin tuna that you expect to encounter	45" - 75" CFL
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Annual trophy already retained?	No
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Clients on board?	No
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Catch Disposition	
-------------------	--

1 <sup>st</sup> bluefin tuna	
------------------------------	--

Current question,  
see below



First fish: **70"**



☒ Retain under Angling category

☒ Release

Second fish: **75"**

☐ Retain as annual Angling trophy

☐ ~~Retain under General category~~

☐ Release

# Modeling decision making

- Random parameters logit: Examine preference heterogeneity

$$P_{ni} = \int \left( \frac{e^{\beta' x_{ni}}}{\sum_j e^{\beta' x_{nj}}} \right) f(\beta) d\beta$$

←

## Trip attributes ( $\beta \sim N(\mu, \sigma^2)$ )

- Regulations
- Anticipated fish size
- Actual fish size
- First fish of trip

→

## Individual attributes

- Location
- Stated primary trip type
- Full-time charter captain



# Results

- Response rate: 36% (n = 861)
- Primary bluefin tuna trip type:
  - Private recreational (40%)
  - Charter recreational (33%)
  - Private commercial (24%)
  - Charter commercial (3%)



Bobby Rice

?



# Key drivers of harvest behavior: Marginal effects

Trip-level variables

Clients are on board

First fish of trip\*

Angling

30%

55%

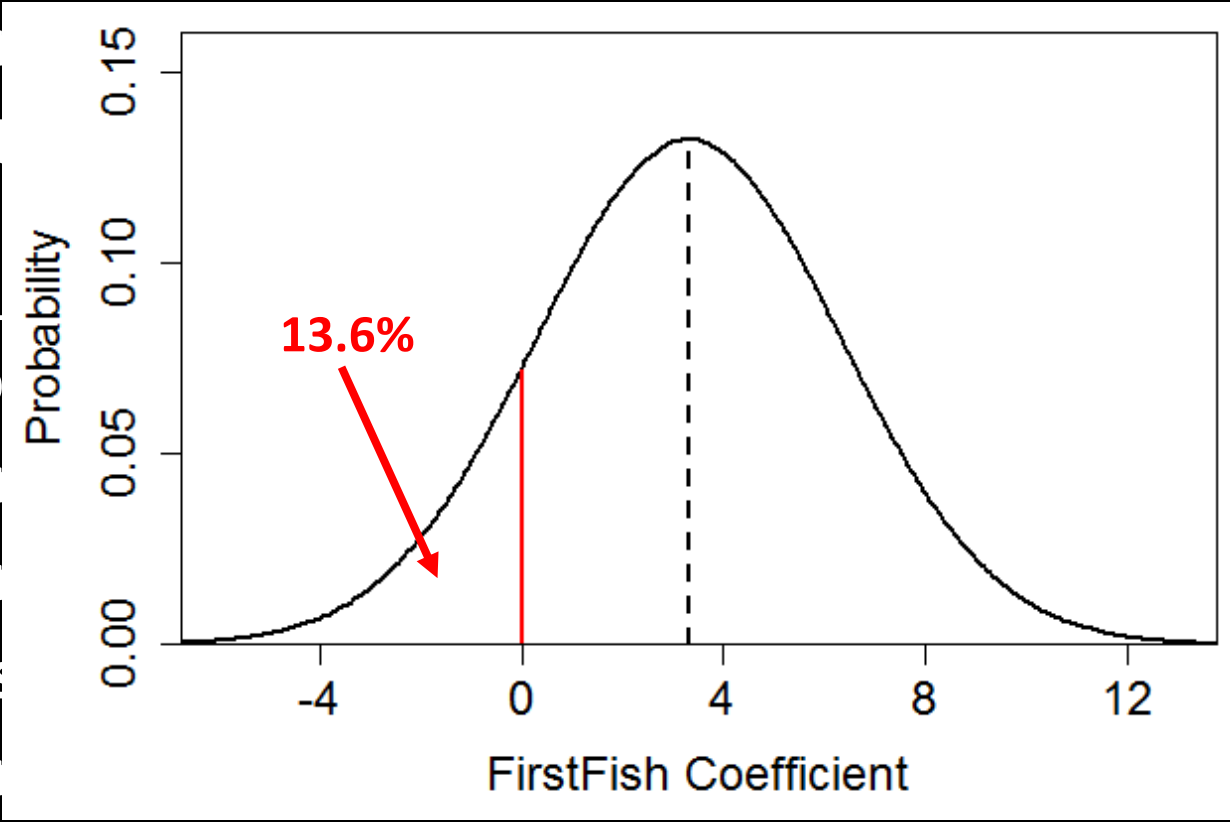
General

-6%

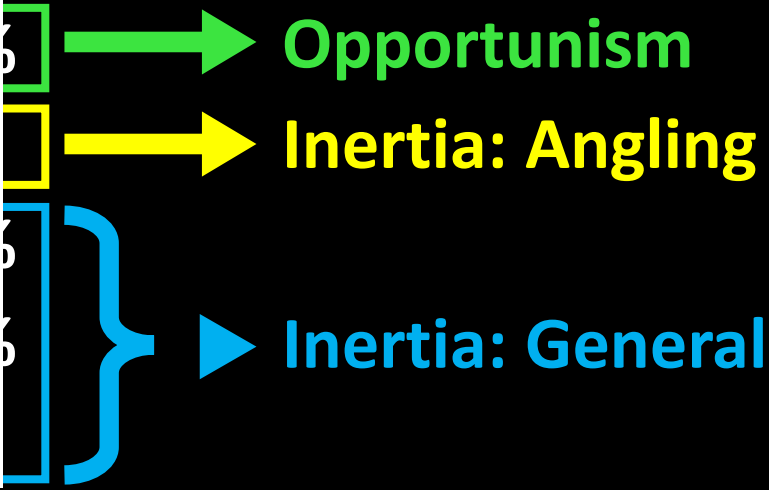
43%



Dom Petrarca



General



binds to Angling

\*Random parameter

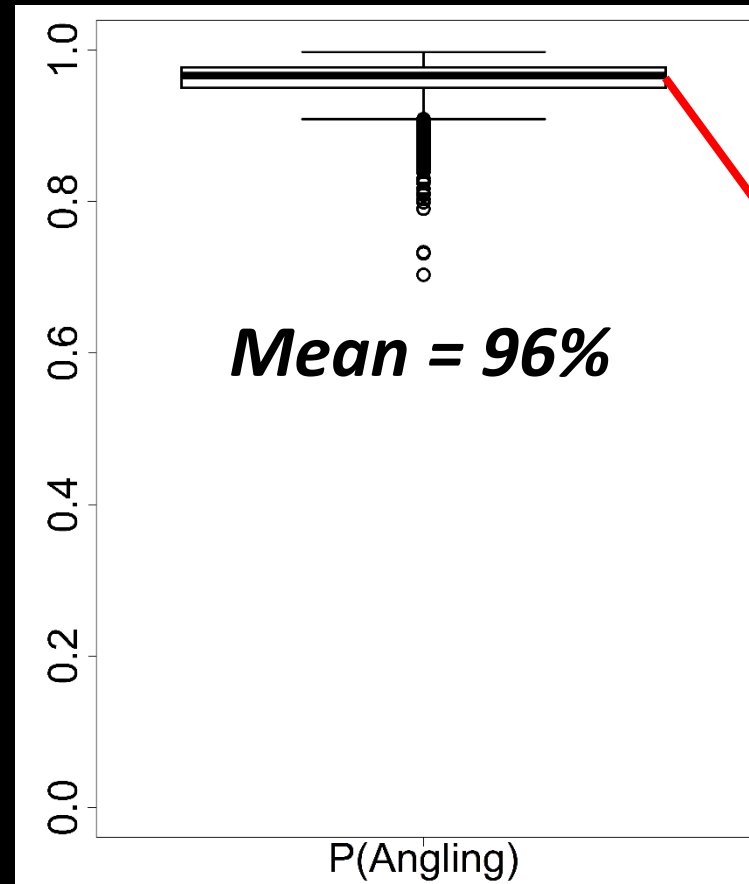
# Harvest behavior simulations



- 60" bluefin tuna
  - First fish of the trip
- Probability of harvest under Angling?**

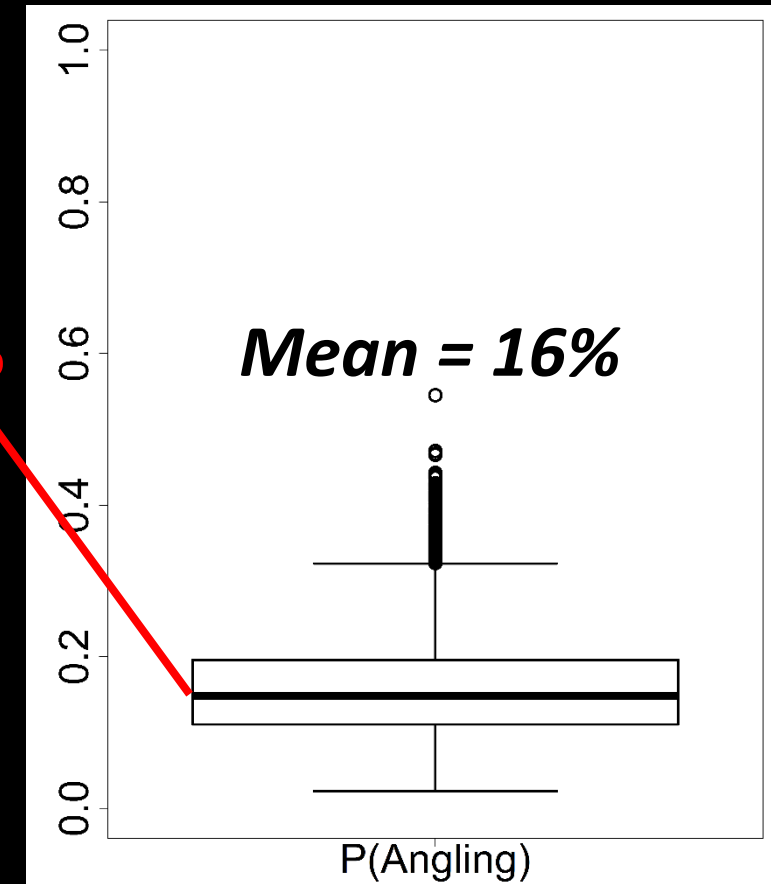
## Scenario A

- NY/NJ permit holder
- Clients on board
- Angling bag limit is 4
- Ant. size 45-75"



## Scenario B

- New England permit holder
- No clients on board
- Angling bag limit is 1
- Ant. size *not* 45-75"



80%

# Conclusions

- **Diverse uses of the CHB permit—not just for charter captains!**
- **Evidence for both opportunism and inertia**
- **Primarily General category fishermen exhibited greater preference stability (inertia)**
- **NY/NJ permit holders (opportunists) may be most sensitive to changing conditions**
- **Harvest patterns can fluctuate dramatically based on fish size, regulations, and availability**



# Acknowledgments

## Collaborators:

- Andrew Scheld (VIMS)
- John Graves (VIMS)
- Rob Hicks (VIMS)
- Ron Salz (NOAA)
- Kristy Wallmo (NOAA)
- Clifford Hutt (NOAA)
- NMFS HMS Management Division
- QuanTech, Inc.



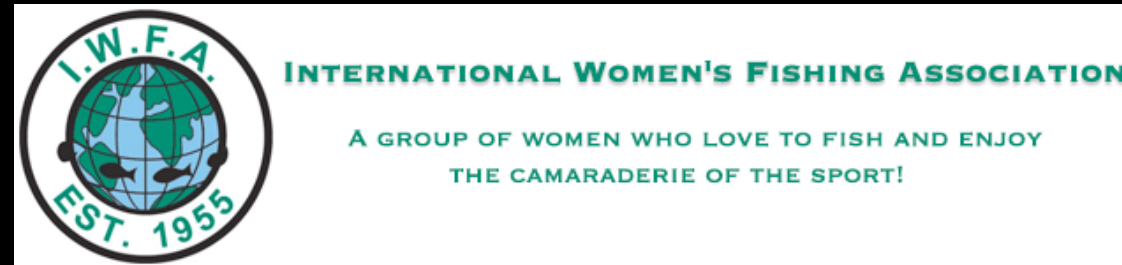
## Funding:

- NOAA Saltonstall-Kennedy Grant Program
- NMFS-Sea Grant Graduate Fellowship in Marine Resource Economics



## Outreach

- Focus group participants
- *On The Water* magazine
- VIMS Publications Center



**Thank you!**




# Backup

# The recreational Atlantic bluefin tuna fishery

- High economic output



NOAA 85-155A (9-93)			UNITED STATES DEPARTMENT OF COMMERCE
CUSTOMER SERVICE 888-872-6862 or <a href="http://www.nmfspermits.com">http://www.nmfspermits.com</a>			National Oceanic and Atmospheric Administration NATIONAL MARINE FISHERIES SERVICE
2003 FISHING YEAR PERMIT			
FEDERAL FISHERIES PERMIT			
PERMIT NUMBER 10076376	DATE ISSUED 09/12/2003	ISSUED PURSUANT TO: 16 U.S.C. 971-971H AND 1801 et seq.	
REGIONAL PERMIT NUMBER			
FISHERIES PERMITTED ATLANTIC HMS CHARTER/HEADBOAT - EXPIRES		VESSEL NAME FL2080FR	REGISTRATION NUMBER
		LENGTH	TONS HOLD CAP

noaa.gov



## Permitting

- Angling
- CHB

## Harvest limits

- Size classes
- Bag limits

## A friendly reminder:

Report your recreational landings of  
Atlantic swordfish, billfish, and bluefin  
tuna (including bluefin tuna dead discards)



Anglers must report all recreational landings of swordfish,  
billfish, and bluefin tuna (including bluefin tuna dead discards).  
The permitted owner of the boat, including those from  
Charter/Headboats, or a designee, is responsible for reporting  
within 24 hours.

## Non-Tournament Landings

- Report online: <http://go.usa.gov/33mqF> or call to report
- Swordfish or billfish: (800) 894-5528
- Bluefin tuna: (888) 872-8862

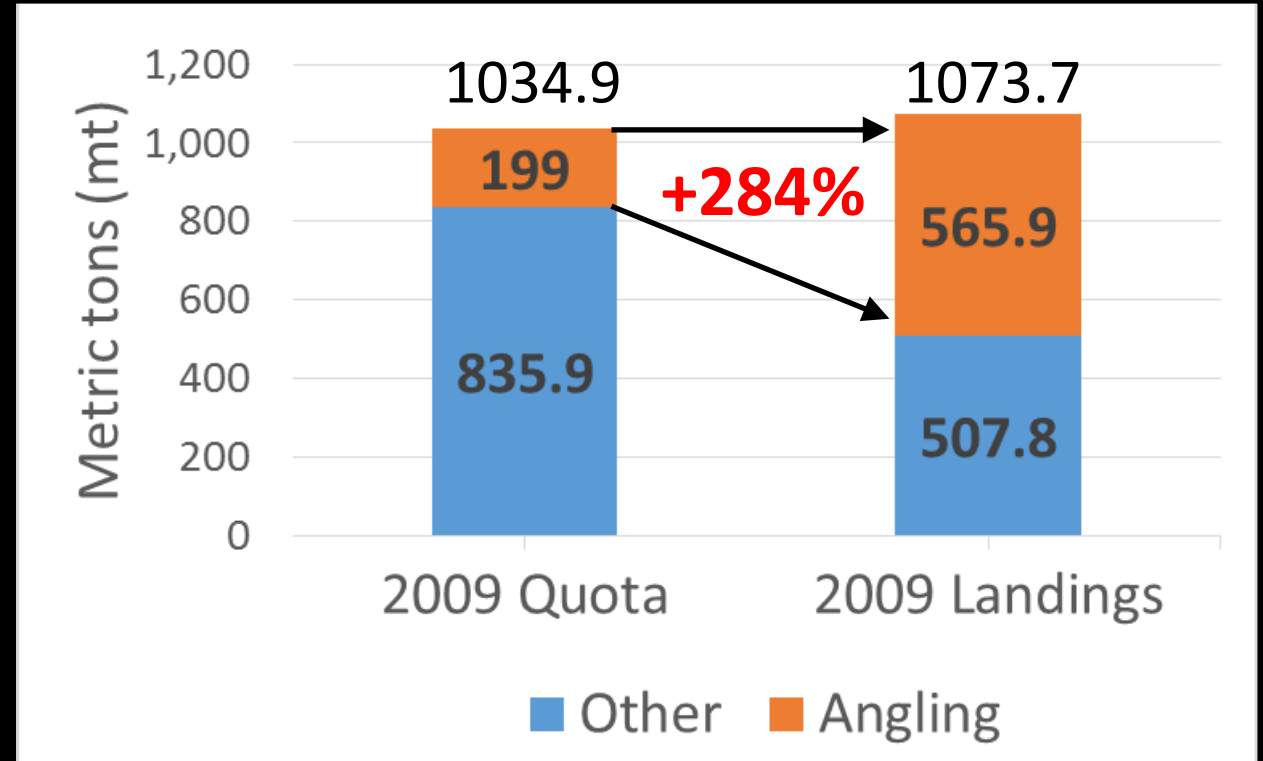
nmfs.noaa.gov

# Challenges to management: Predicting harvest

- Unpredictability in fish availability, fishing effort



- Reporting compliance: 10-20%

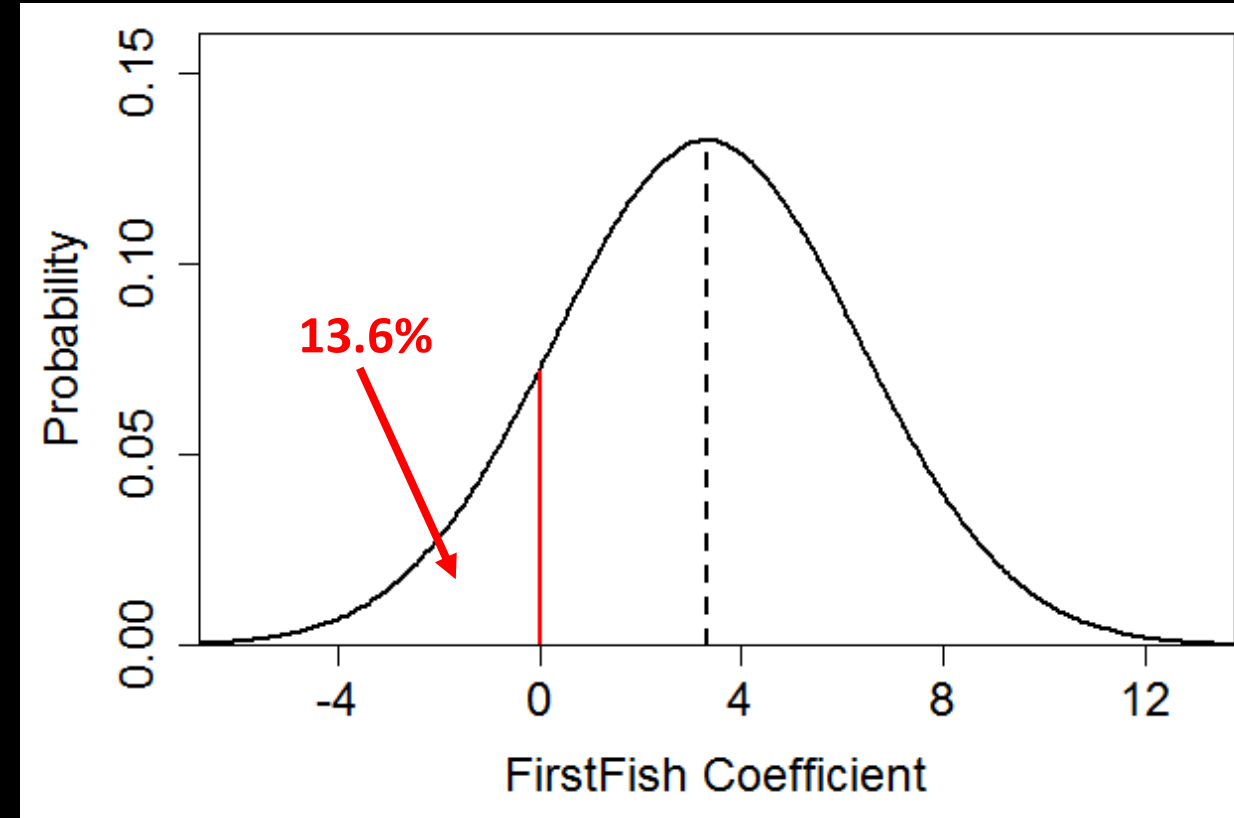


*“It is dangerous to extrapolate past fishing behavior under changed management or stock status conditions.”* (Fulton et al. 2010)

# Modeling: Trip-specific variables

\*p < 0.05  
\*\* p < 0.01

Trip-specific Variable	$\beta$	SD
Angling (intercept)	-1.83	--
General (intercept)	-0.45	--
BagLimit_General	1.30**	2.17**
BagLimit_Angling	0.45**	0.98**
AntSize_Sm_Angling	1.01**	3.04**
FirstFish	3.31**	3.02**
FishSize	-0.038*	0.026
Clients_Angling	1.75**	--
FirstTripAng_Ang	0.424	--
FirstTripGen_Gen	-0.310	--



***High heterogeneity in importance of trip variables on harvest decisions***

# Modeling: Individual variables

\*p < 0.05  
\*\* p < 0.01

## Individual Variable

$\beta$

NewEng\_Release

1.014\*\*

MidAtl\_Release

0.82\*\*

FirstTripAng\_Ang

0.42

FirstTripGen\_Gen

-0.31

PrimaryAng\_Ang

0.66\*

PrimaryGen\_Gen

1.91\*\*

SellBFT\_Gen

2.23\*\*

BindGen\_PrimGen

0.10

BindGen\_PrimAng

-0.41

BindAng\_PrimGen

-2.11\*\*

BindAng\_PrimAng

0.30

High opportunism/harvest orientation among NY/NJ permit holders

Some evidence for inertia among primarily recreational anglers

Strong evidence for inertia among commercial fishermen



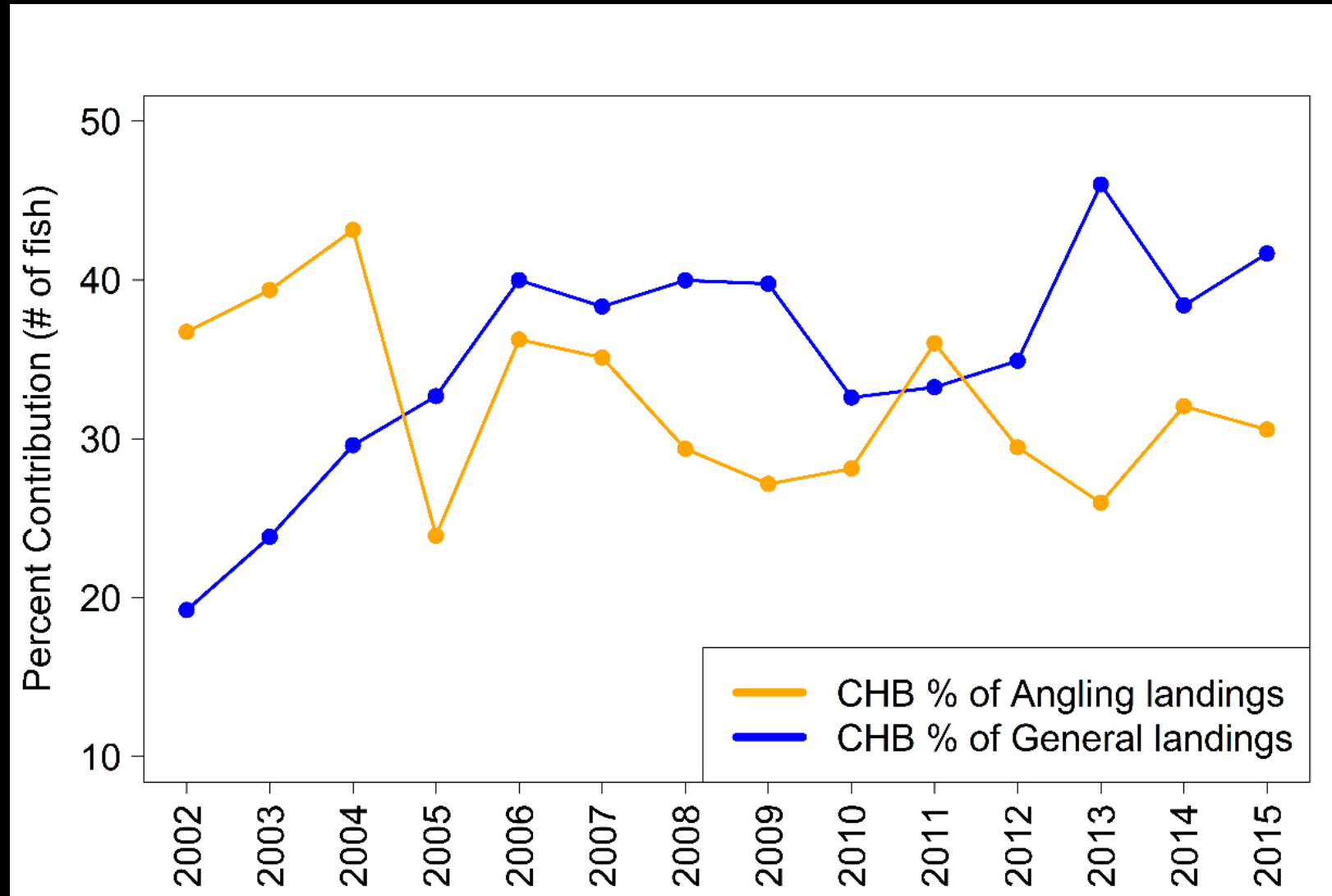
Mark DeBlasio

# Correlated random parameters

\*p < 0.05  
\*\* p < 0.01

	BagLim_Gen	BagLim_Ang	AntSize_Sm_Ang	FirstFish	FishSize
BagLimit_Gen	1	--	--	--	--
BagLimit_Ang	0.665**	1	--	--	--
AntSize_Sm_Ang	-0.0685	-0.319	1	--	--
FirstFish	-0.176	-0.135	0.0783	1	--
FishSize	-0.686*	-0.770	0.201	-.452**	1

# CHB contributions to Angling and General categories



# Introduction: Commercial-recreational conflicts

- Focus: Allocation disputes

## The Gulf War

On the coast, commercial and recreational fishermen are squaring off in a battle over the coveted snapper.

by BARRY YEOMAN | JUNE 2016 | 0 COMMENTS



William "Bubba" Cochrane unloads snapper in Galveston on April 25, 2016.  
PHOTOGRAPH BY JODY HORTON



texasmonthly.com

## Council allows sport guides to buy halibut quota

By: DJ Summers

MORRIS NEWS SERVICE - ALASKA

Posted: Wed, 12/21/2016 - 2:57pm

Culture shifts, as does policy.

The North Pacific Fishery Management Council, master of the nation's most valuable fishing region, decided on Dec. 10 to implement a new plan that in some ways reflects changing attitudes and economies in the North Pacific and in Alaska.

The plan involves allowing guided recreational halibut fishermen to buy up commercial quota through a system called an RQE — a recreational quota entity. This differs from an existing program that allows sport guides to lease, but not buy, commercial quota.

Commercial fishermen don't welcome the change, and in fact see it as one more nail in the coffin of a historical Alaskan enterprise that is more expensive and more difficult to enter than it ever has been.



myalaskanfishingtrip.com

# The “typical” case: Discrete stakeholder groups



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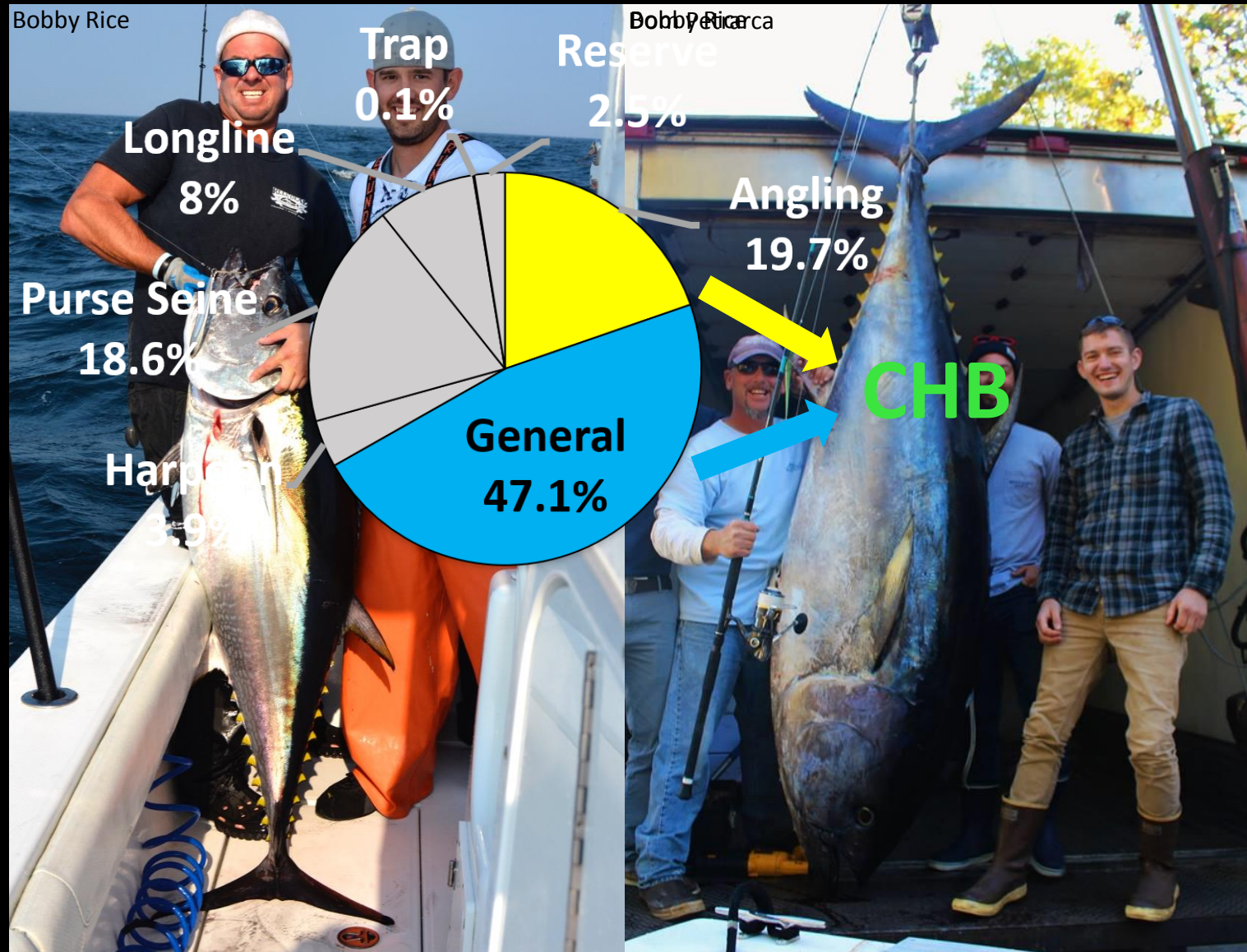
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- Can fish under either General or Angling *on a trip-by-trip basis*
- Uninspected Passenger Vessel ("6-pack") License required
- ~2,500 from ME-NC

2002-2015:

~24-43% of Angling quota

~19-46% of General quota



# Results

- Response rate: 36% (n = 861)
  - 788 completed both scenarios
- Primary bluefin tuna trip type:
  - Private recreational (40%)
  - Charter recreational (33%)
  - Private commercial (24%)
  - Charter commercial (3%)



Bobby Rice

## Two completed trips (n = 577):

- 2 Angling: 81 (14%)
- 2 General: 135 (23%)
- 1 Angling, 1 General: 165 (29%)
- 1+ release-only trip: 196 (34%)

