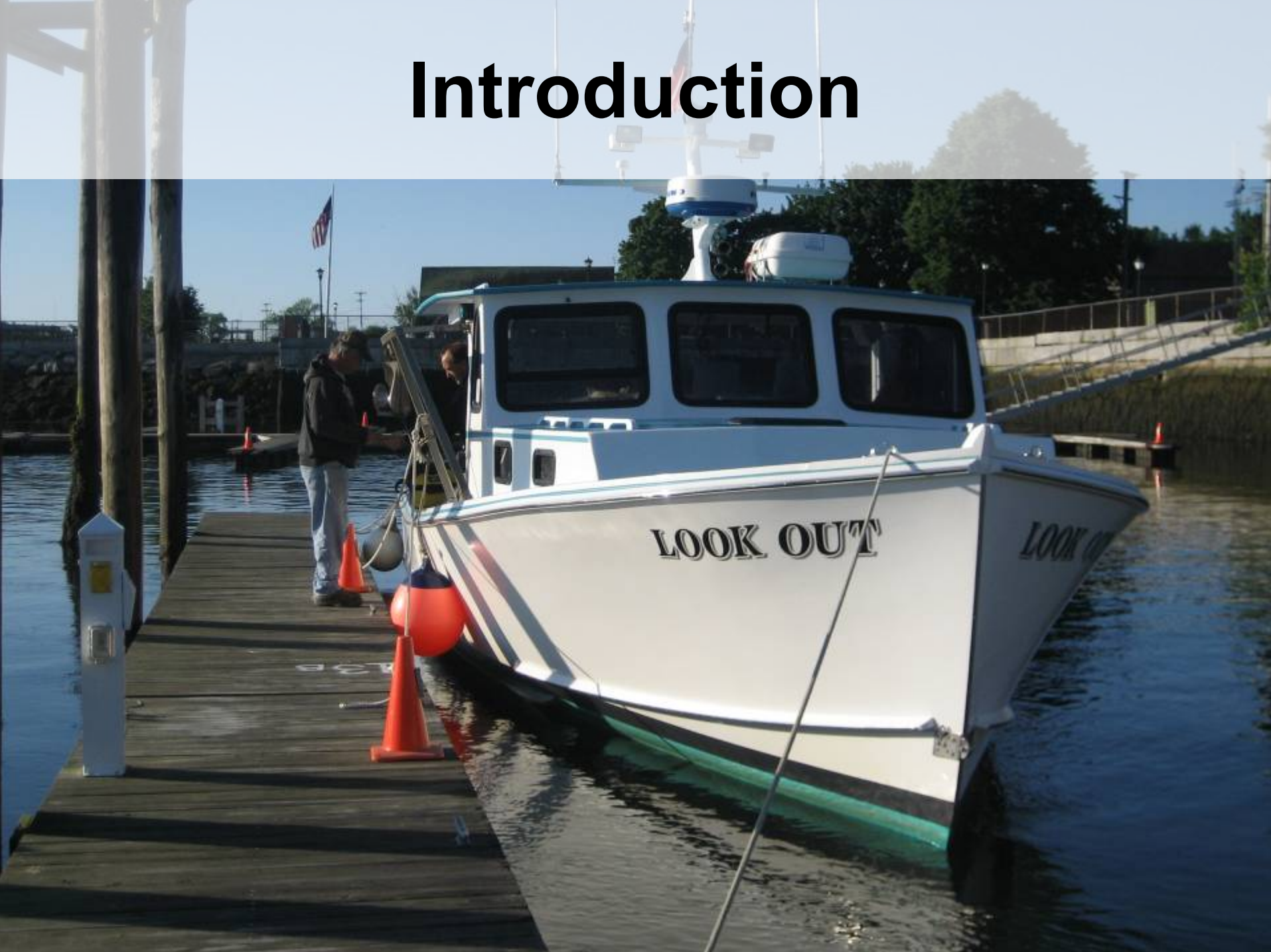


Overview of Atlantic Halibut: Research and Fishery



Introduction



Biology

Labrador to SNE

- 200-300 m
- 3-9 °C

Largest

- 220 cm (87")

Longest Lived

- 50 years

Spawn Winter/Spring

Late Maturing

- ♀ 7.3 years
- ♂ 6 years

Fishery

1800s to 1880's

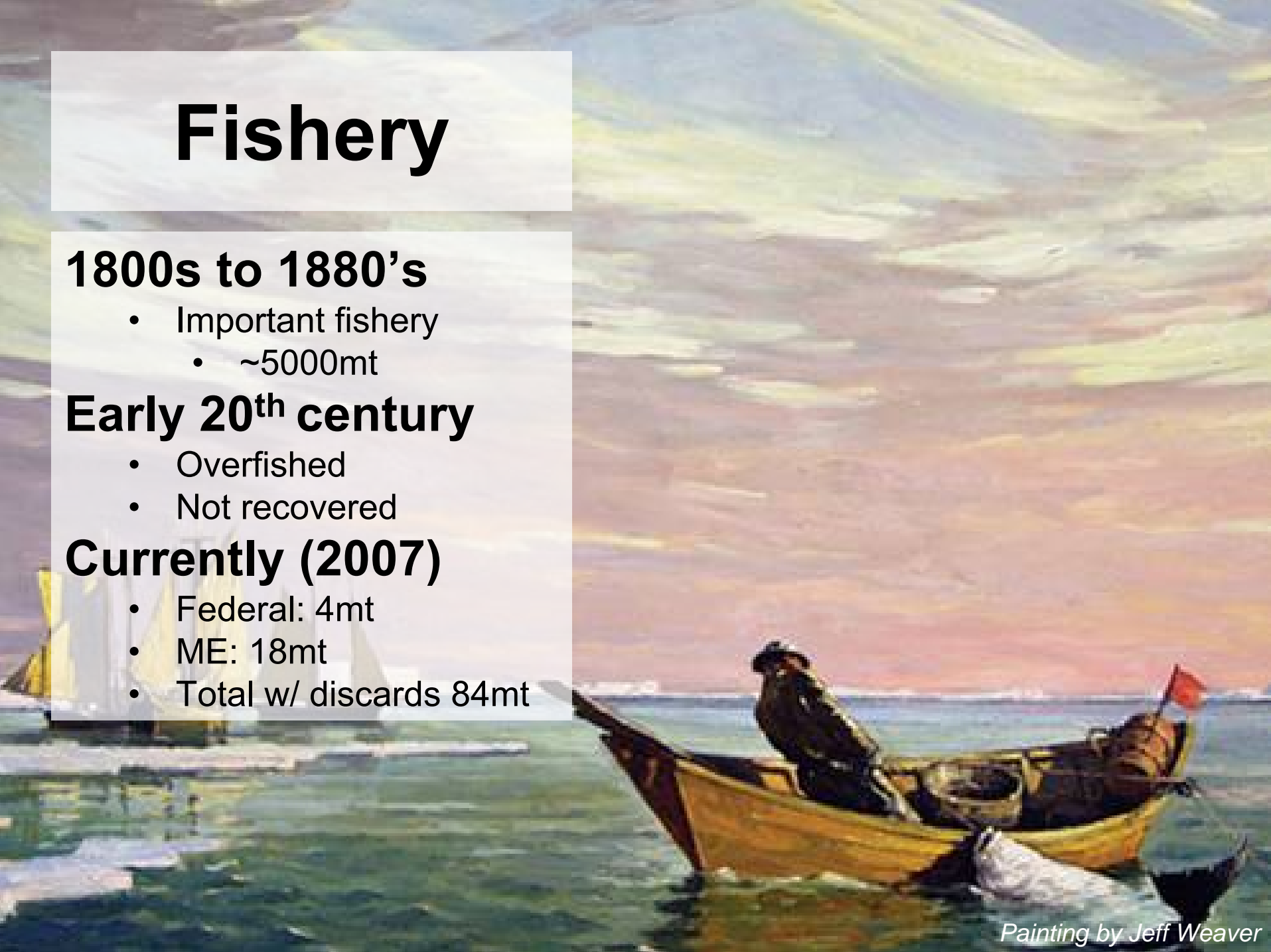
- Important fishery
 - ~5000mt

Early 20th century

- Overfished
- Not recovered

Currently (2007)

- Federal: 4mt
- ME: 18mt
- Total w/ discards 84mt



Management

Federal Waters

- NEFMC MUL FMP
- Direct moratorium
- 1 fish by-catch limit
- 36" min. size

Maine State Waters

- Seasonal Fishery
- 38" min. size
- 50 fish/year
- Gear type (circle hooks)
- 450 hook limit
- Mandatory training program

Other State Waters



Research

Exp. Federal Fishery (2000-04)

- Quota and Logbooks
- Biological Data and Tagging

Longline Survey (2007-08)

- Fishery Independent Survey
- Standard Random Grid Survey
- Tagged ALL Fish
- Biological Data (No Maturity)

State Waters Fishery (2000-On)

- Tagging of Sublegal Fish
- Collection of Otoliths
- Mandatory Logbooks

Canadian Efforts

- Longline Surveys
- Tagging





Research

Maturity

Federal Exp. Fishery

- Gonads Preserved @ Sea
- Maturity by DMR Staff

Mature/Not mature

- Stages (IPHC)

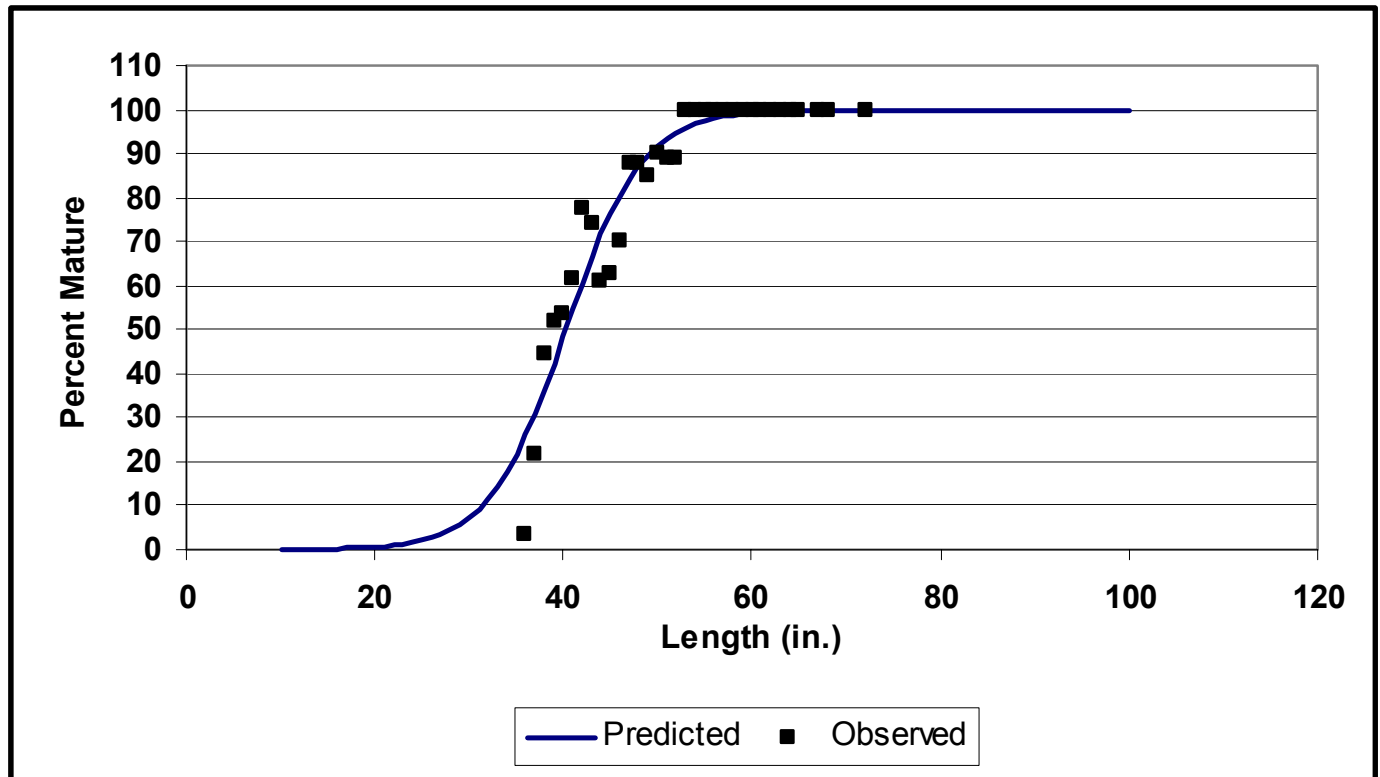
Analysis

- Minimizing Sum of Squares



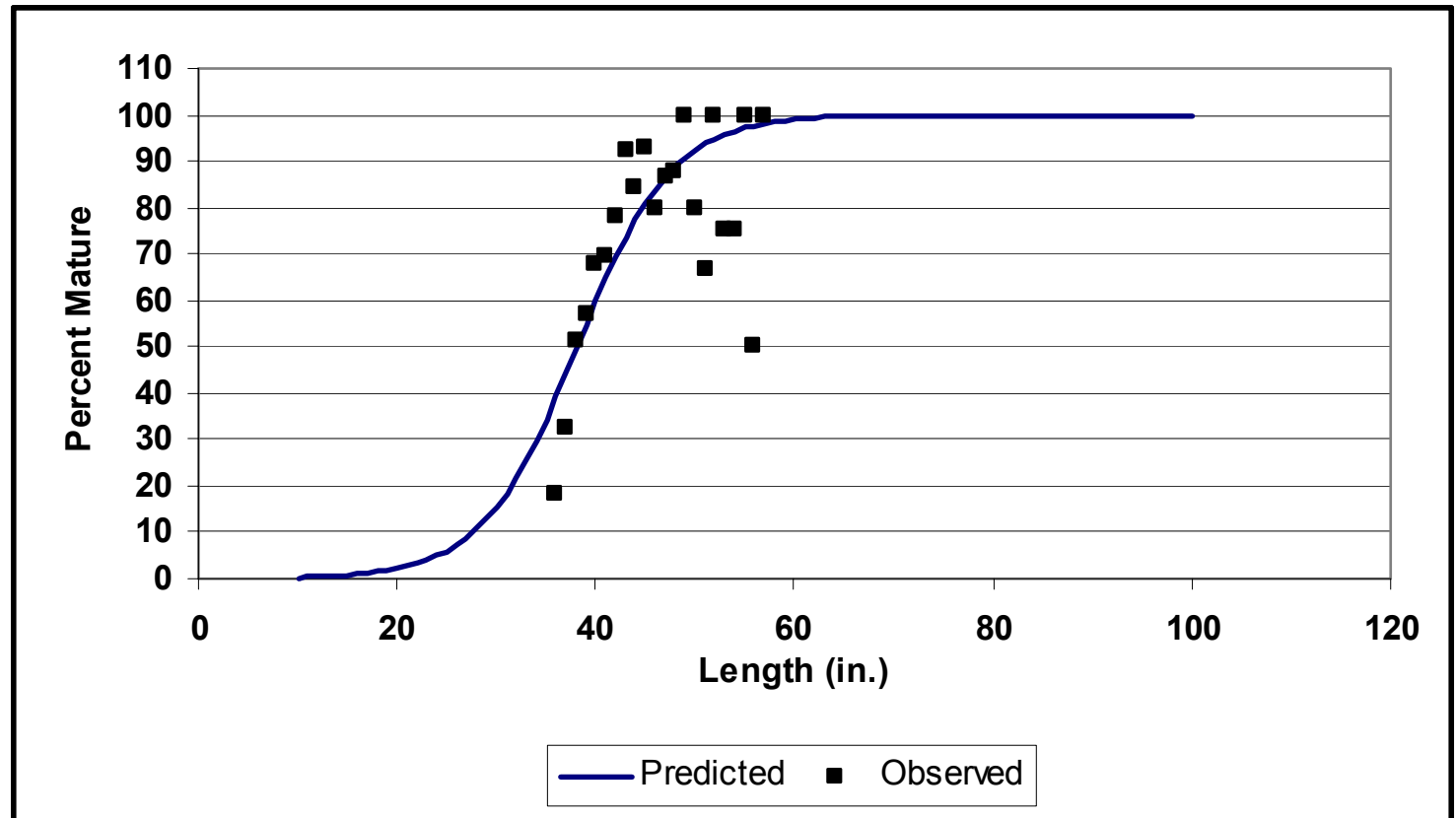
Females

- **L50 = 40.24" (102.2 cm)**
 - 41" (103 cm) Sigourney *et al.* (2006)
- **N = 772**



Males

- **L50 = 38.10" (96.77 cm)**
 - 31" (80 cm) Sigourney *et al.* (2006)
- **N = 363**



Maturity


Females Larger Than Males

- ♀ L50 = 40" (102 cm)
 - Supports Sigourney *et al.* (2006)
- ♂ L50 = 38" (97 cm)
 - Larger than Sigourney *et al.* (2006)

Females More Prevalent

- 2:1 Sex Ratio

Movement

A person with long brown hair, wearing a blue long-sleeved shirt and an orange apron, is kneeling on a boat deck. They are handling a large, flat, brown fish (likely a flounder) that is lying in a tan mesh net. The person's hands are on the fish, and they appear to be examining it. In the background, there is a white buoy and a blue bucket. The boat deck is made of metal grating.

Tagging to study

- Growth
- Movement
- Habitat preference
 - (electronic tags)
- **Not designed for**
 - Natural mortality
 - Fishing mortality



Conventional Wire Tags

All Tagging Programs

First Operculum

DMR Contact Info

Token Rewards

Fishermen Report

- Length
- Weight
- Lat/Lon
- Otoliths





Data Storage Tags

Habitat Preferences

- Temperature
- Depth

Longline Survey

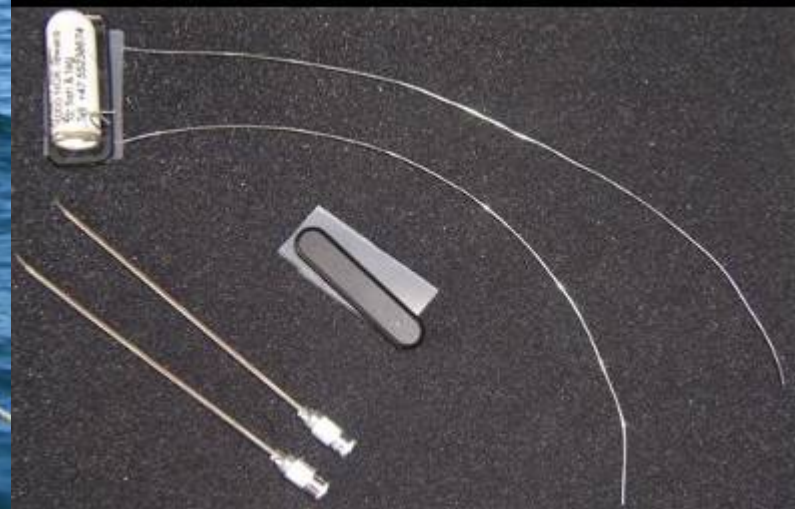
Harness System

DMR Contact Info

\$250 Rewards

Fishermen Report

- Length/Weight
- Lat/Lon
- Otoliths





Pop-up Sat Archival Tags

Habitat Preferences

Subset of Fish (Longline)

- >42" (106cm) fish

DMR Contact Info

\$500 Reward if Recaptured

Data

- Temperature
- Depth
- Lat/Lon @ Release

Doesn't Require Recapture



Wire Tag Returns



1681 Tagged & Released

- 192 Recovered
 - 11% Return Rate
 - Maine State Waters (**35%**)
 - Federal Experimental (**33%**)
 - Canadian Hook/Gillnet (**30%**)
 - US Commercial Trawl (**2%**)

Size Range

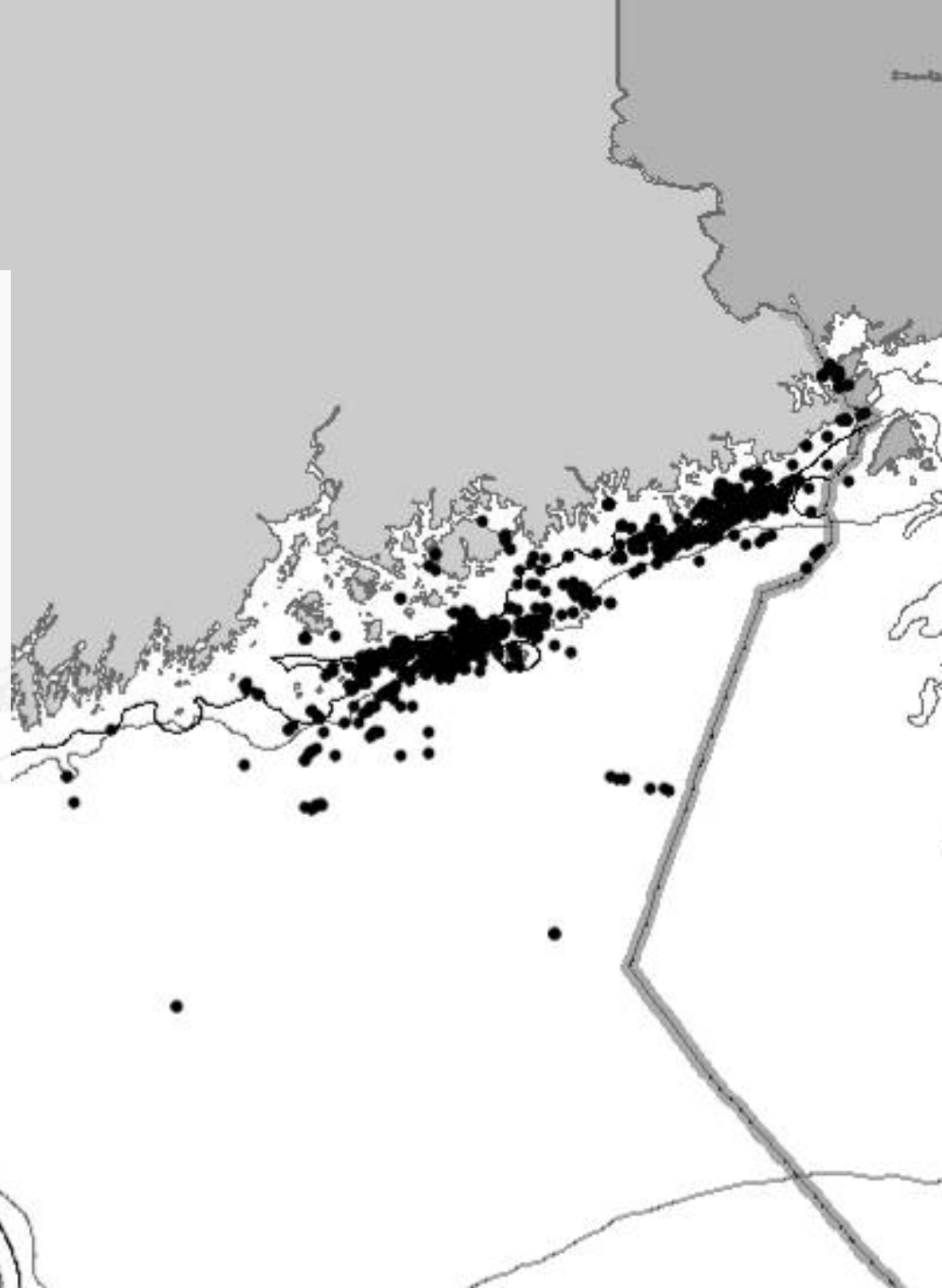
- 11 - 72" (30 – 185 cm)

Avg. Recapture Size

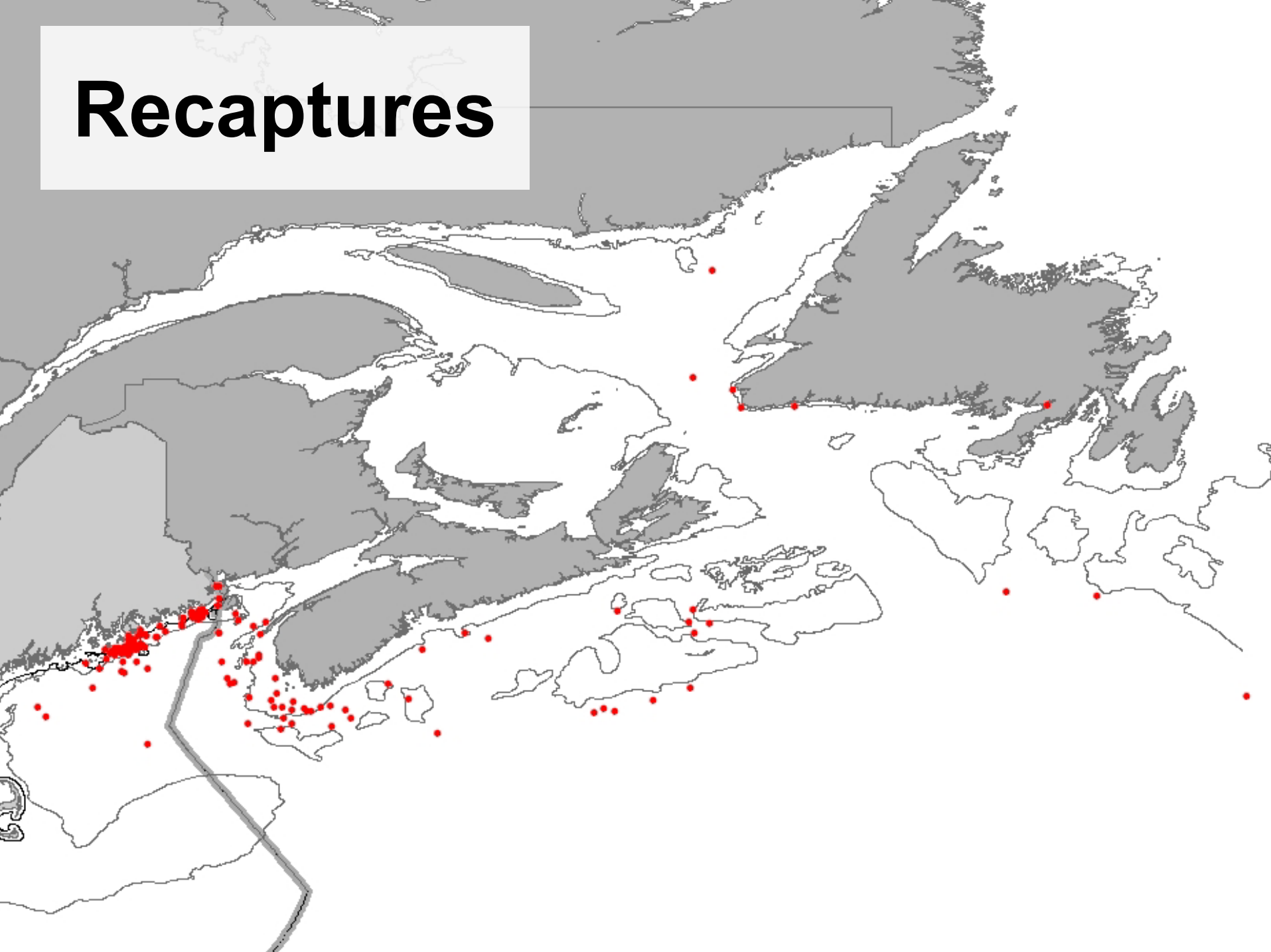
- 38" (96 cm)

Releases

Federal Exp. Fishery
Maine State Fishery
Longline Survey
Cod Tagging Program
ME/NH Trawl Survey
MA Trawl Survey



Recaptures



Distance

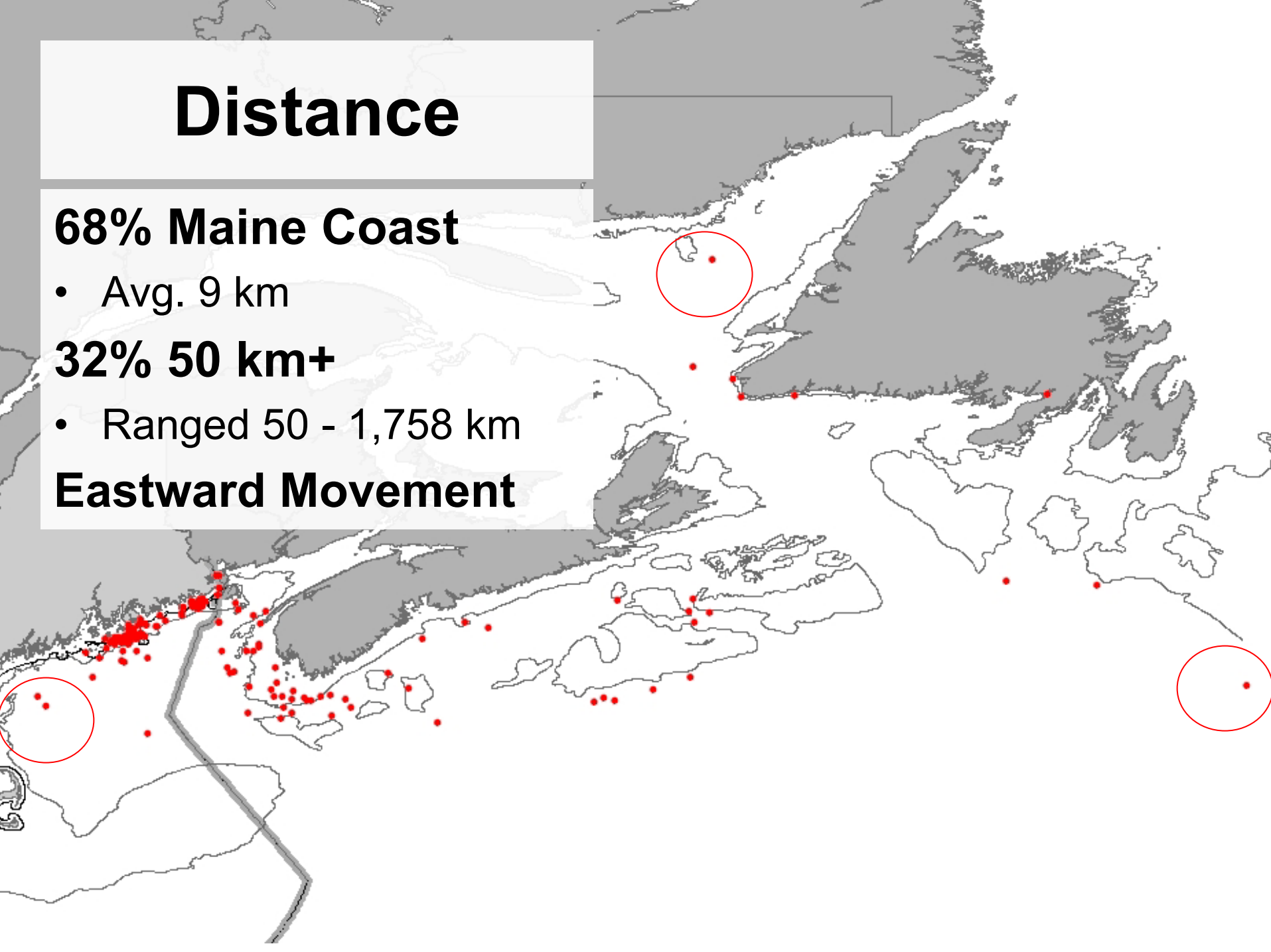
68% Maine Coast

- Avg. 9 km

32% 50 km+

- Ranged 50 - 1,758 km

Eastward Movement



DAL & Growth

A close-up photograph of a fisherman in a purple hoodie and tan work gloves measuring a large, flat, brown fish on a white table. The fisherman is using a yellow measuring tape. In the background, another person in a red jacket is visible. A blue plastic crate and a yellow tool are on the left, and a long metal rod with a T-handle is on the right.

Days At Large

- 1 to 2,559 days
- Avg. 613 days

Avg. Growth 5"/year

Electronic Tags



60 DSTs

- Longline Survey
 - 4 Recaptured
 - 6% Return Rate

7 PSATs

- Longline Survey
 - 2007
 - 2 Released Early
 - 2 Failed
 - 2008
 - 1 Recovered, no data
 - 2 Still At Large

Tank Study

Retention & Mortality 7 Halibut Tagged

- 4 DSTs
- 3 PSATs

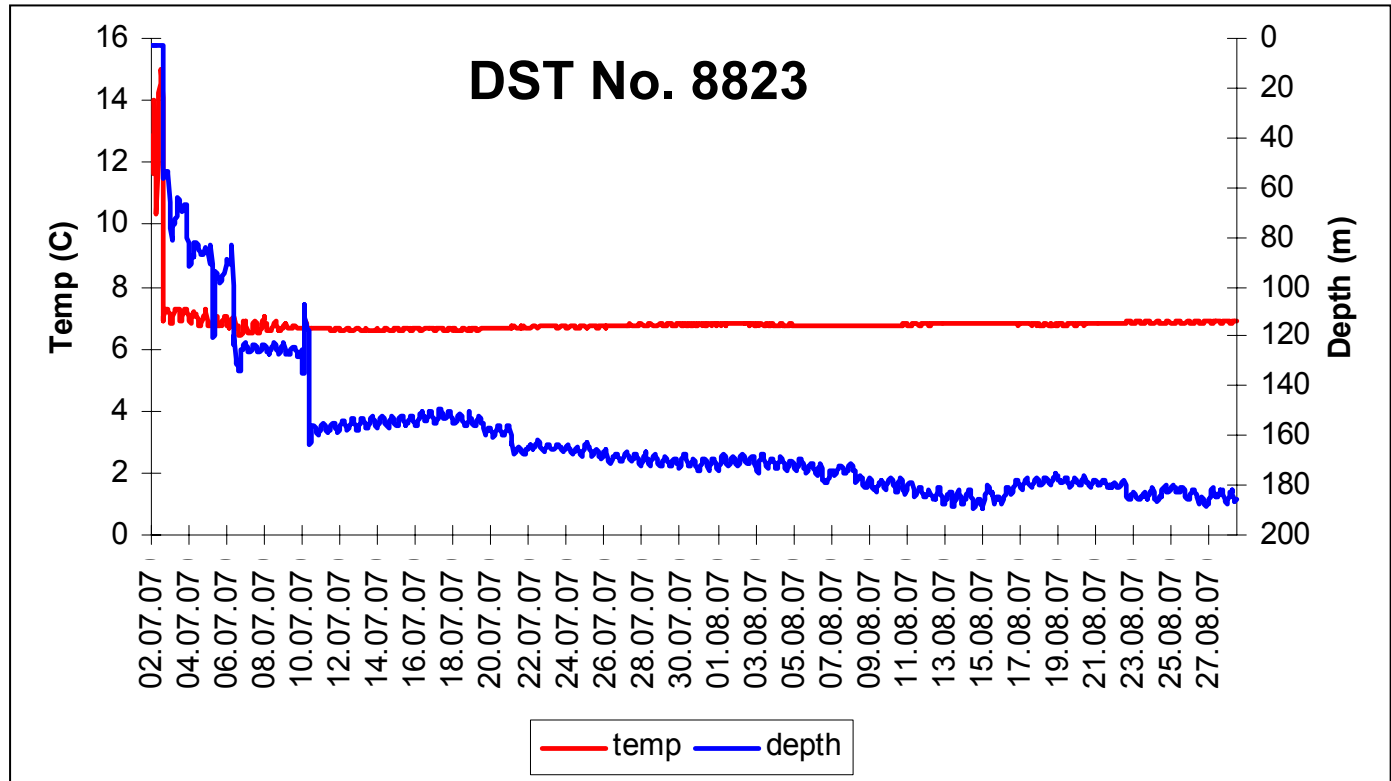
All Tags Retained

- 1 DST Fell Off @ 4 mo.

No Mortality



DST Data



Movement

DST

- Reliable
- Cost Effective
- 6% Return Rate
- Rewards
- \$250 each

Conclusion

Movement & Habitat Preferences

- Long Distance Emigrations
- Local Seasonal Migrations
- Large Changes in Depth/Constant Temperature

Interchange US & SS/GB Stocks

- 30% Recaptures in Canadian Waters
 - No Fish from SS/GB Recaptured in GoM

Efforts Continue

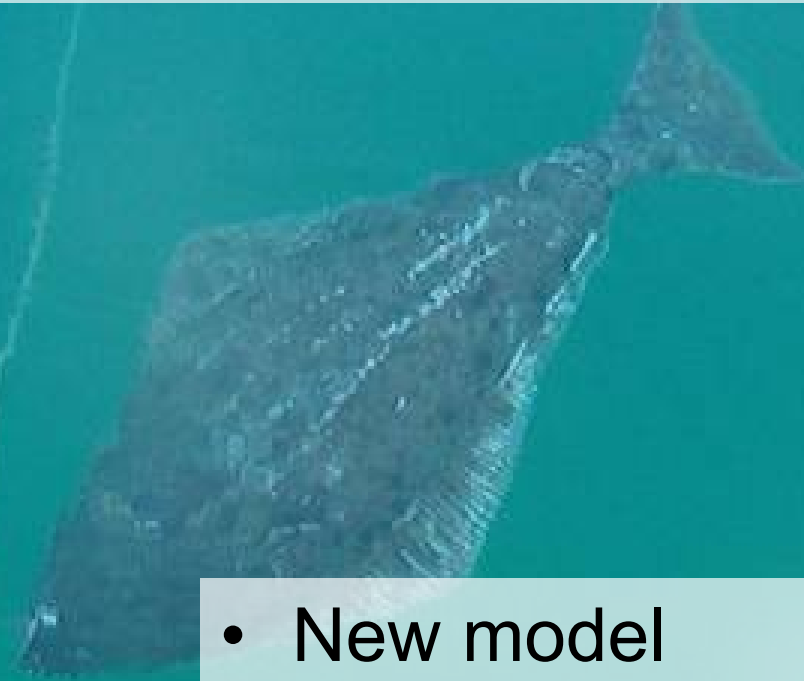
- Emigration Rates of Juveniles
- Migrations of Mature Fish
- Spawning Locations & Behavior

A fisherman with a mustache and sunglasses, wearing a dark blue shirt and bright orange overalls, stands on the deck of a boat. He is holding a large, flat fish vertically by its head. The fish is pale with a reddish-pink interior. The boat is moving through the ocean, with white wake visible behind it. In the background, the sea is grey and overcast. On the boat's deck, there are coiled ropes, a green bucket, and a black crate.

Fishery and Management

Status of the Resource

NMFS: GARM III Assessment



- New model
- Target biomass: 49,000 mt
- Threshold biomass: 24,000 mt
- Threshold F : 0.073

GARM III

- **Overfished but overfishing is not occurring**

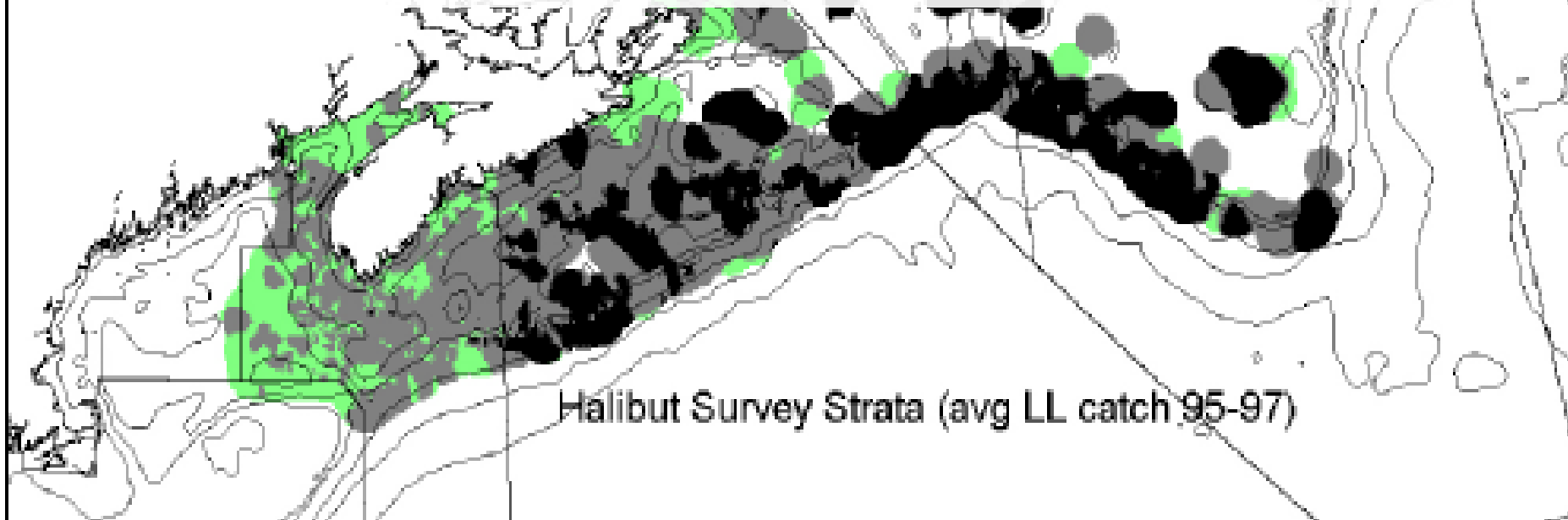
	Threshold	Target	Current Estimate	% Threshold
Fishing Mortality	0.073		0.065	89%
Stock Biomass	24,000 mt	49,000 mt	1,300 mt	5%

- Based on NMFS survey data & catch
- Catchability of 1
- 100% mortality on discards
- No selectivity

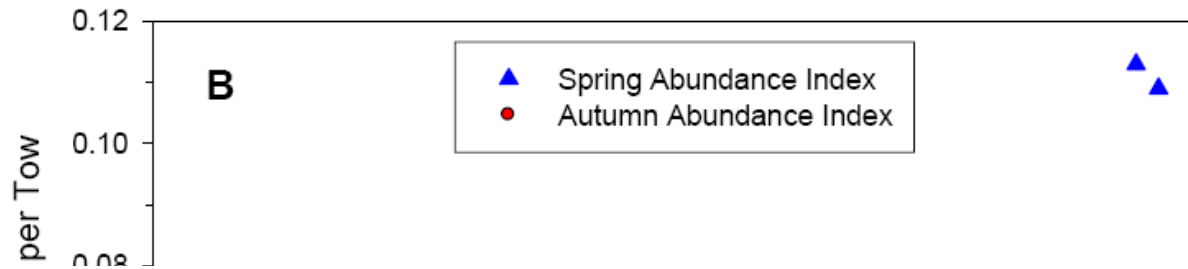
Canadian assessment

- Scotian Shelf/Grand Banks stock
- Completed at the end of March

“...there has been some recovery...., but hitting them too hard too early
▪ could have major costs in sock productivity and long-term recovery.”



Surveys – NMFS Trawl



“The assessment suggests that,there has been an increase in abundance in recent years. However the evidence for recovery is weak.”

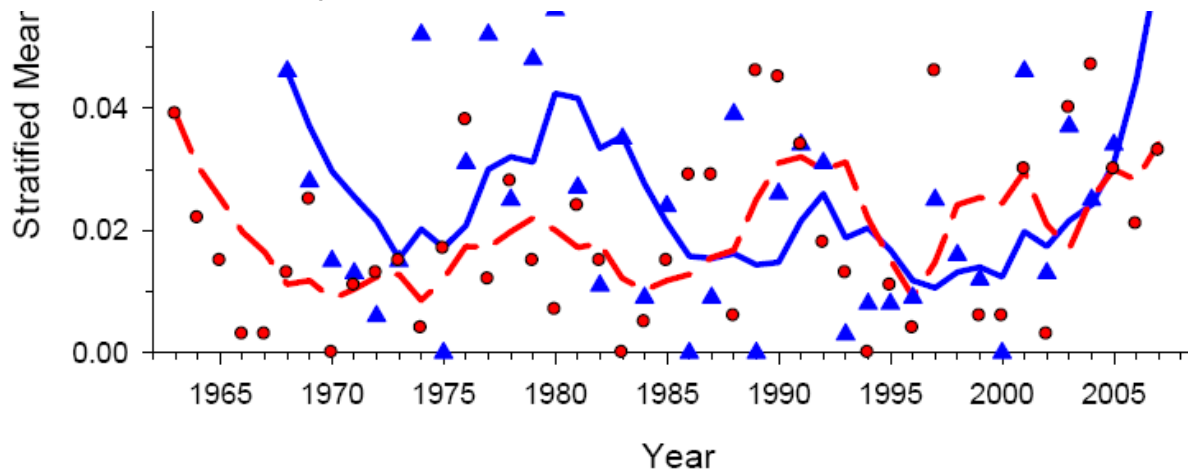
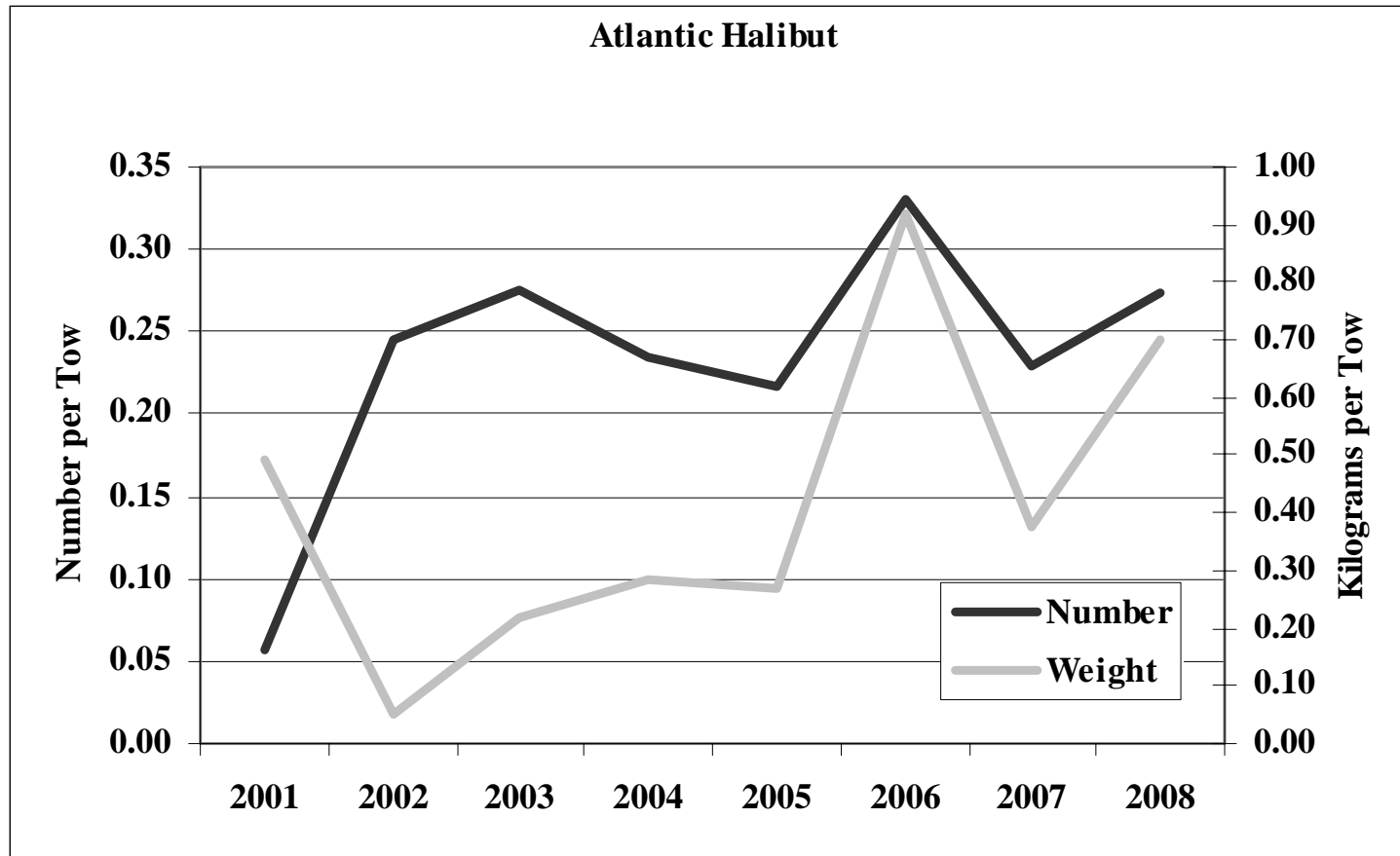
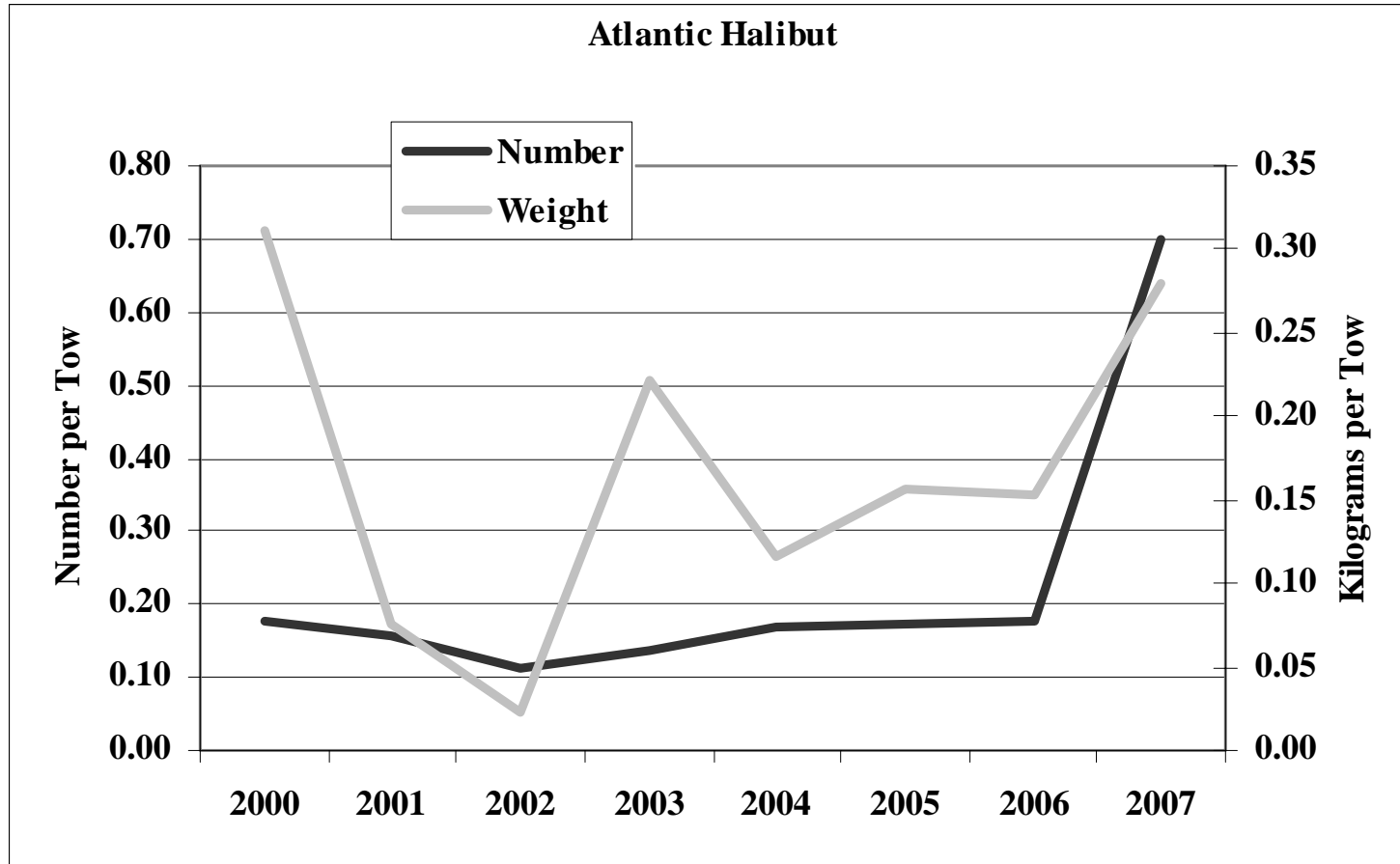


Figure S6. Northeast Fisheries Science Center spring and autumn survey trends for Atlantic halibut A) weight per tow indices and 5-year average swept-area biomass and B) number per tow indices and 5-year average number per tow from the Gulf of Maine-Georges Bank region, 1963-2008.

Surveys – ME/NH Trawl (spring)

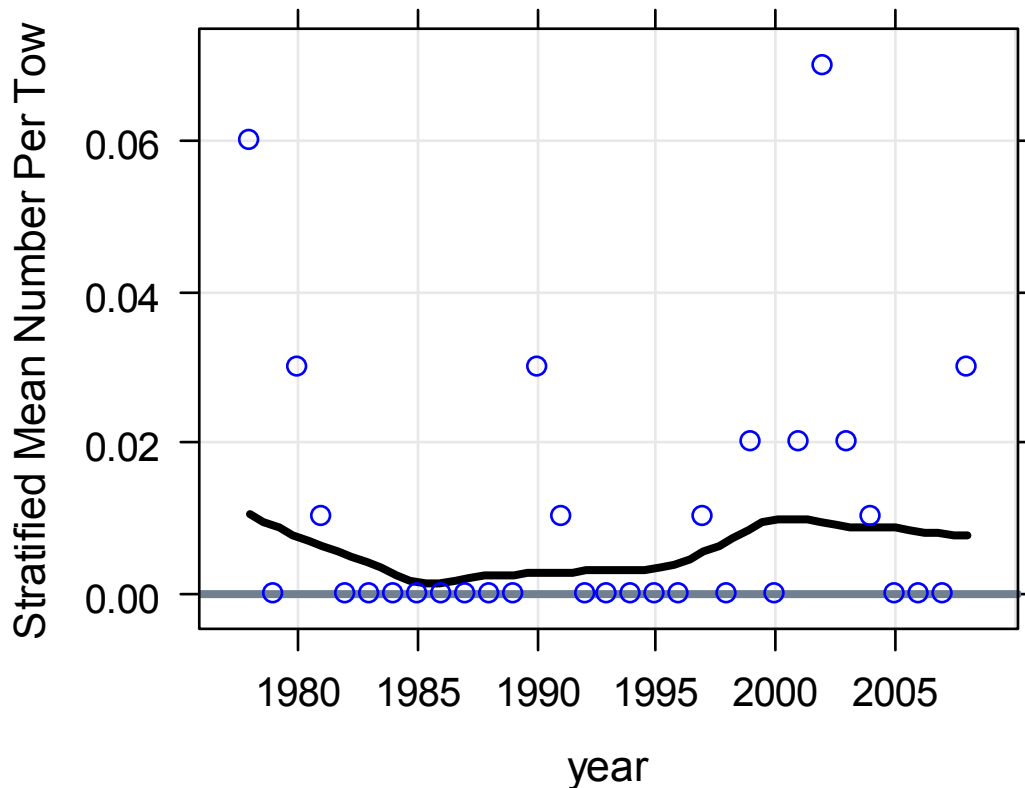


Surveys – ME/NH Trawl (fall)



Surveys – MA Trawl (spring)

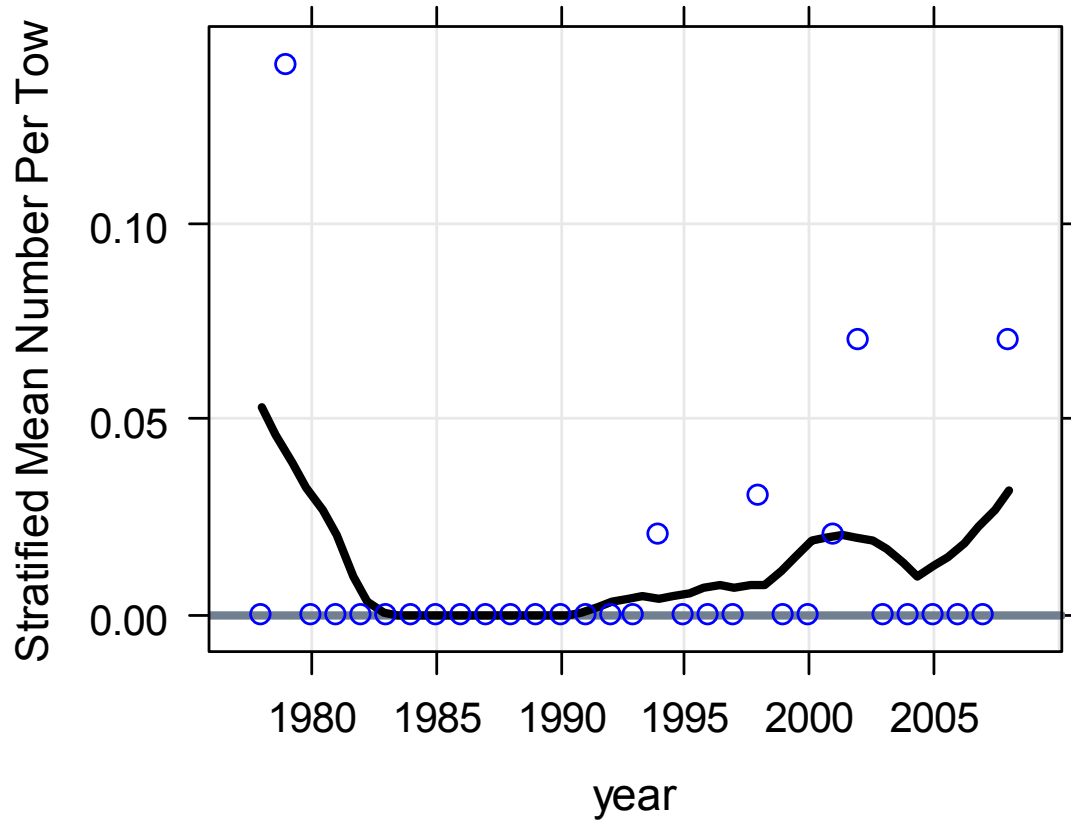
Atlantic Halibut Abundance MDMF Spring Survey Regions 3-5



Black line: Loess smoothed index, span=0.5, degree=1.
Grey Line: timeseries median.

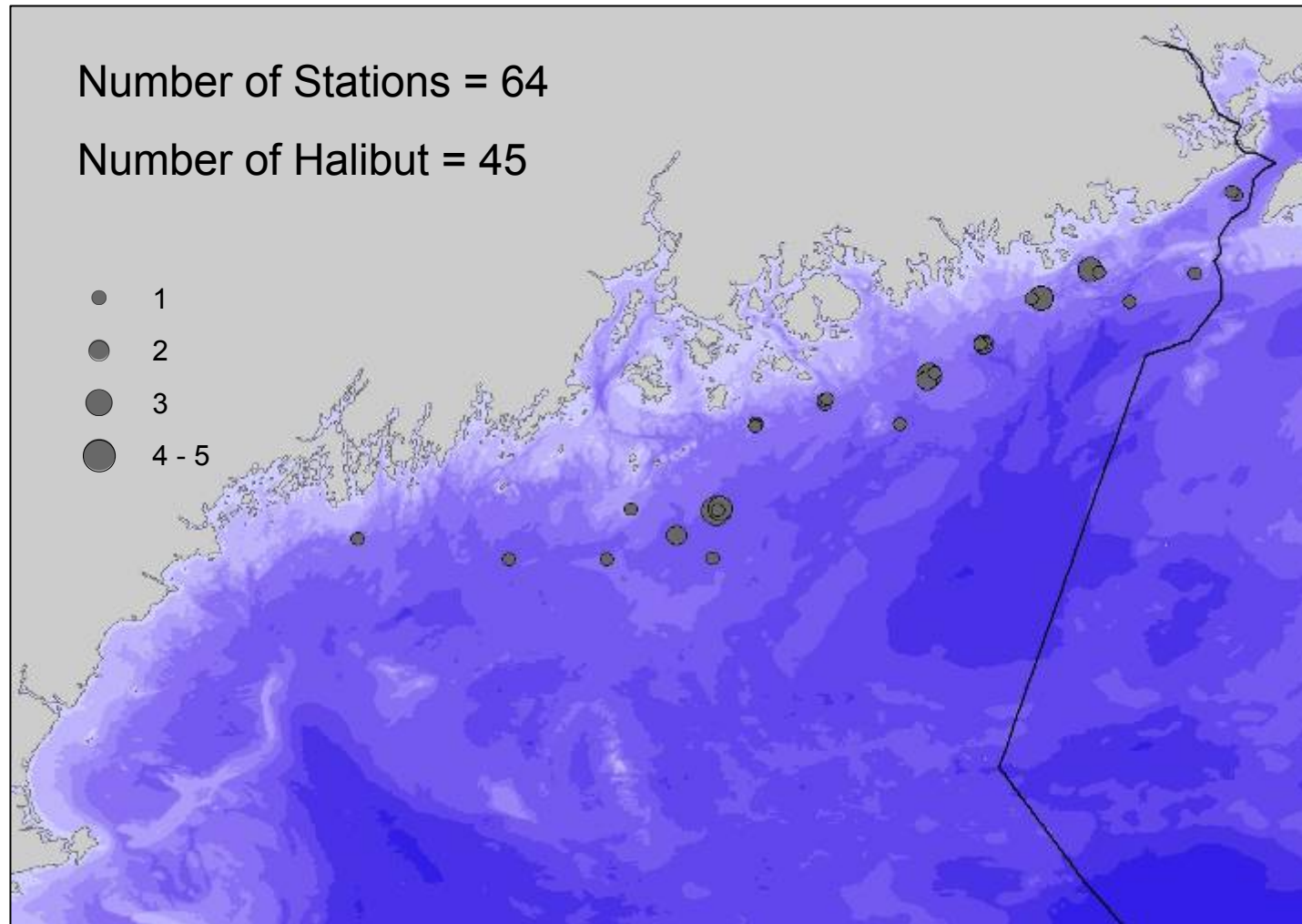
Surveys – MA Trawl (fall)

Atlantic Halibut Abundance MDMF Fall Survey Regions 3-5

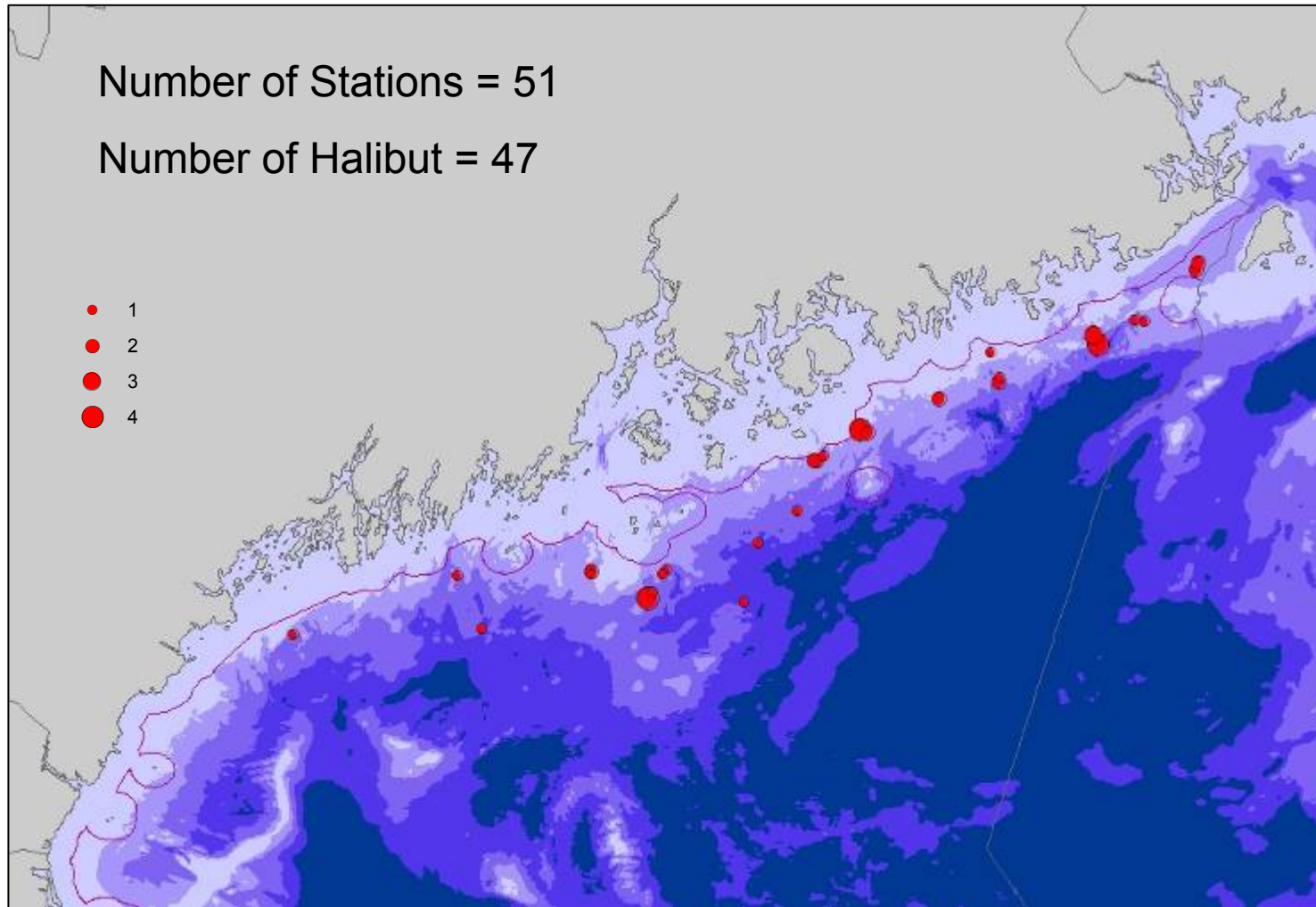


Black line: Loess smoothed index, span=0.3, degree=1.
Grey Line: timeseries median.

Surveys – ME Longline (2007)



Surveys – ME Longline (2008)



US/Canadian Catch (1950-2007)

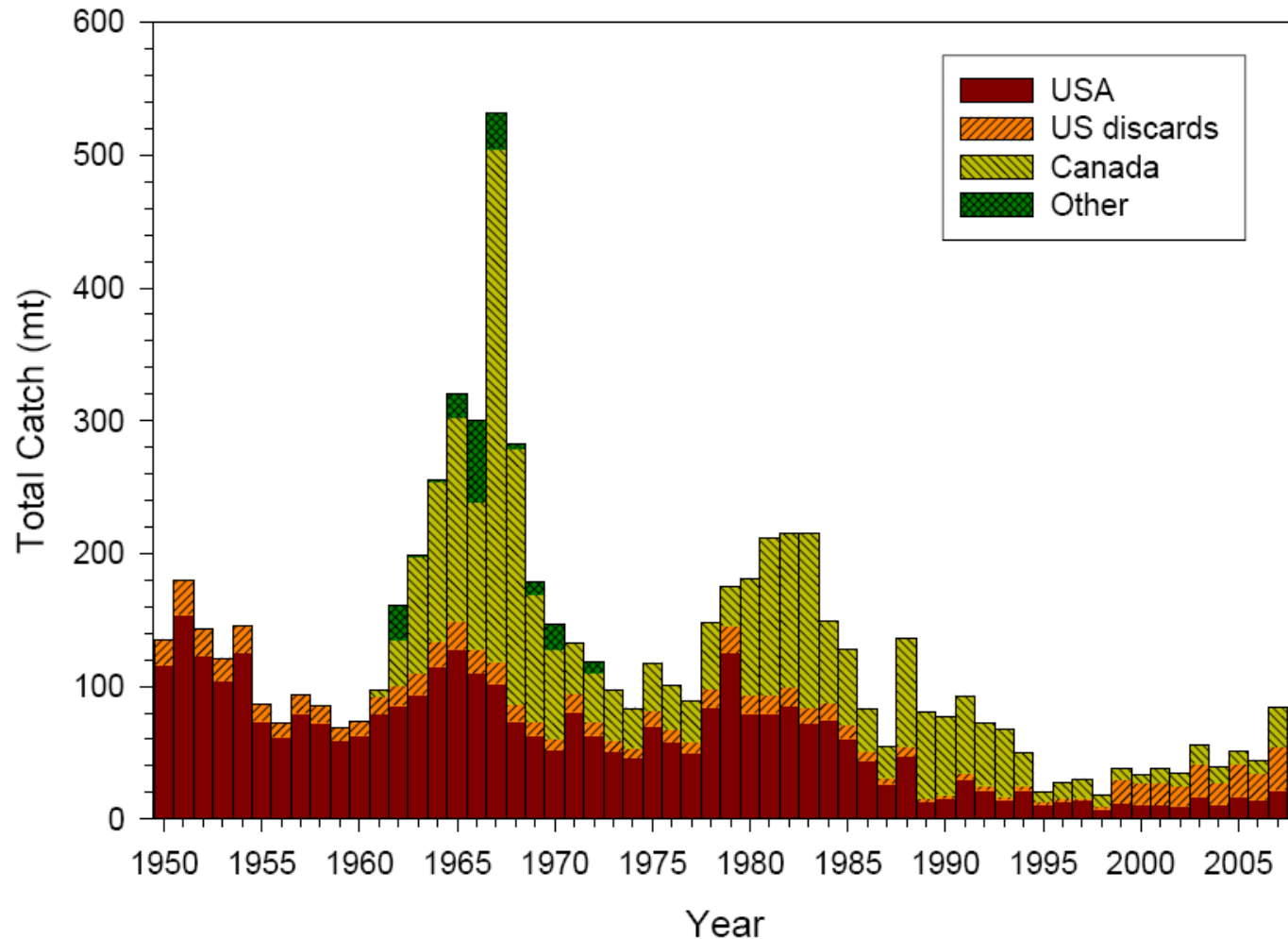


Figure S4. Atlantic halibut total catch (mt) by country, 1950-2007.

US Catch (1893-2007)

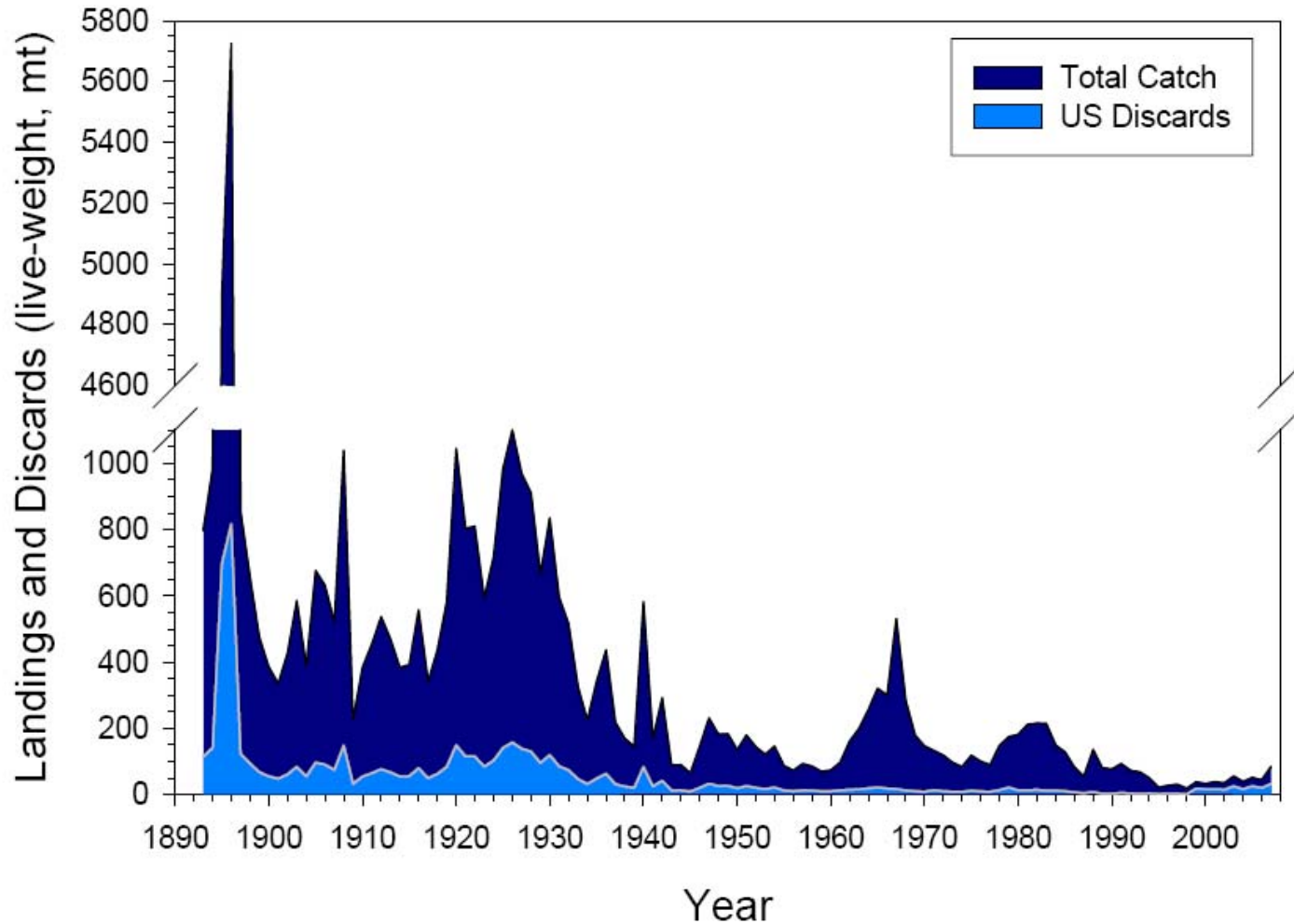
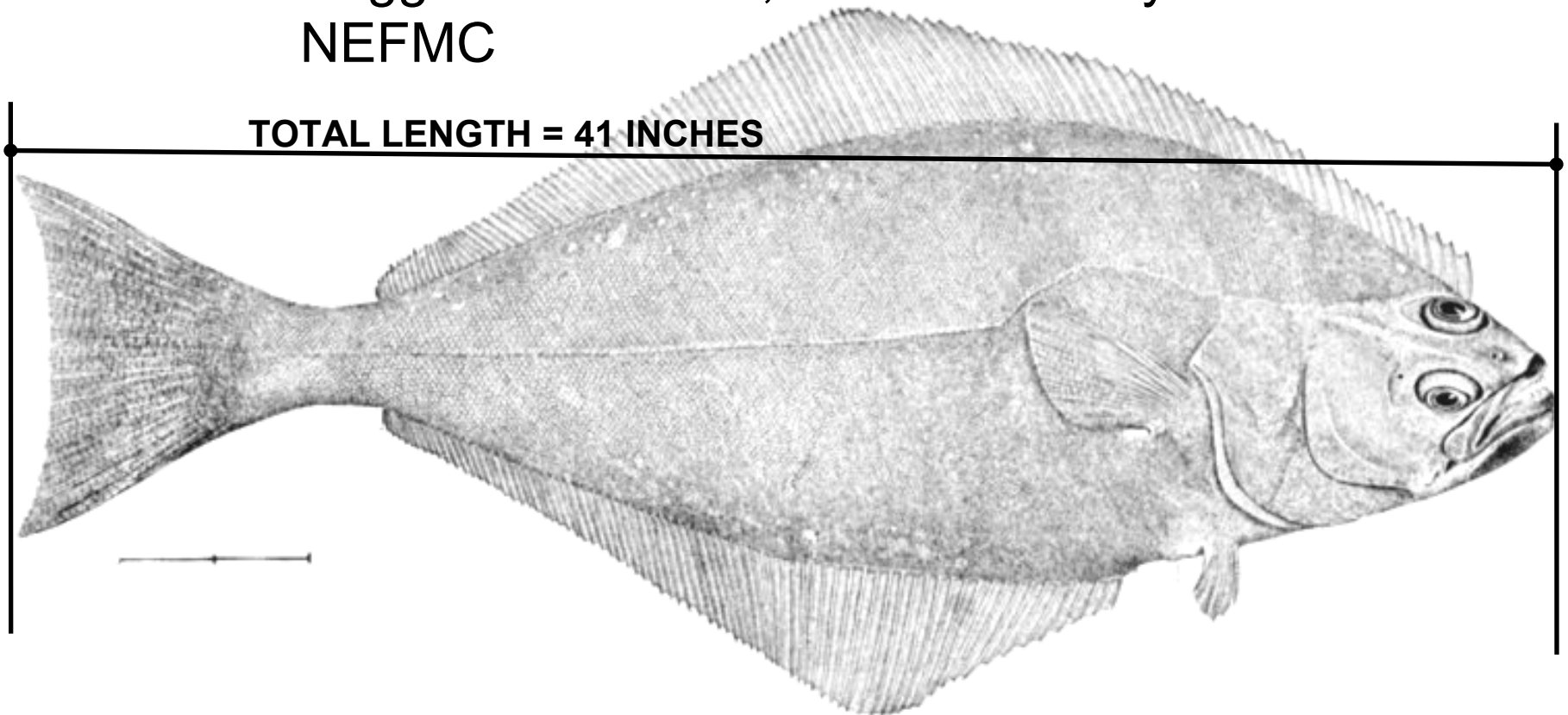


Figure S3. Atlantic halibut total catch (mt) from the Gulf of Maine-Georges Bank region (NAFO divisions 5Y and 5Z), 1893-2007.

Federal Fishery

- Changes in Amendment 16
 - Minimum size increase from 36" to 41"
 - Suggested no take, turned down by NEFMC

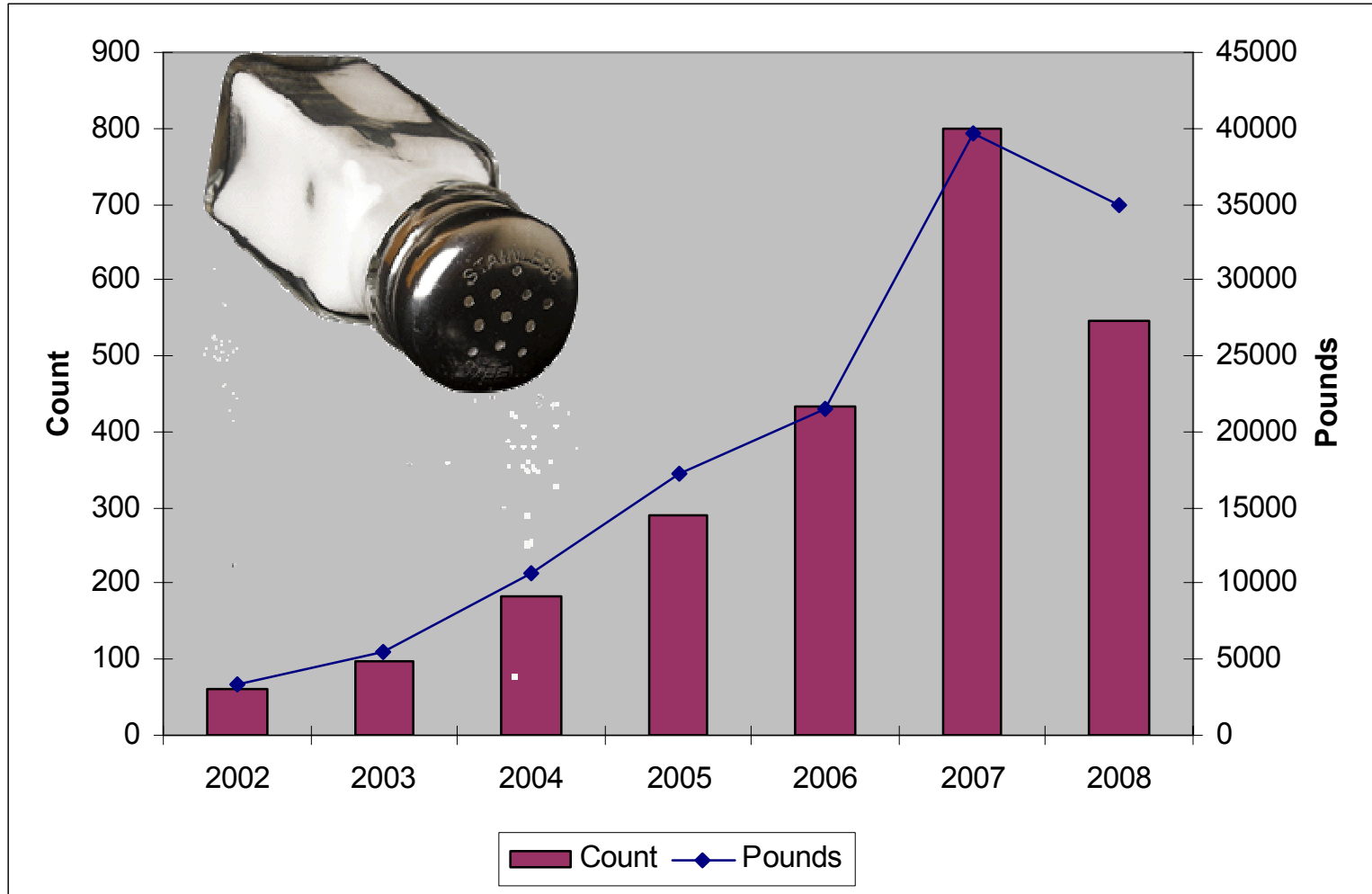


ME State Fishery

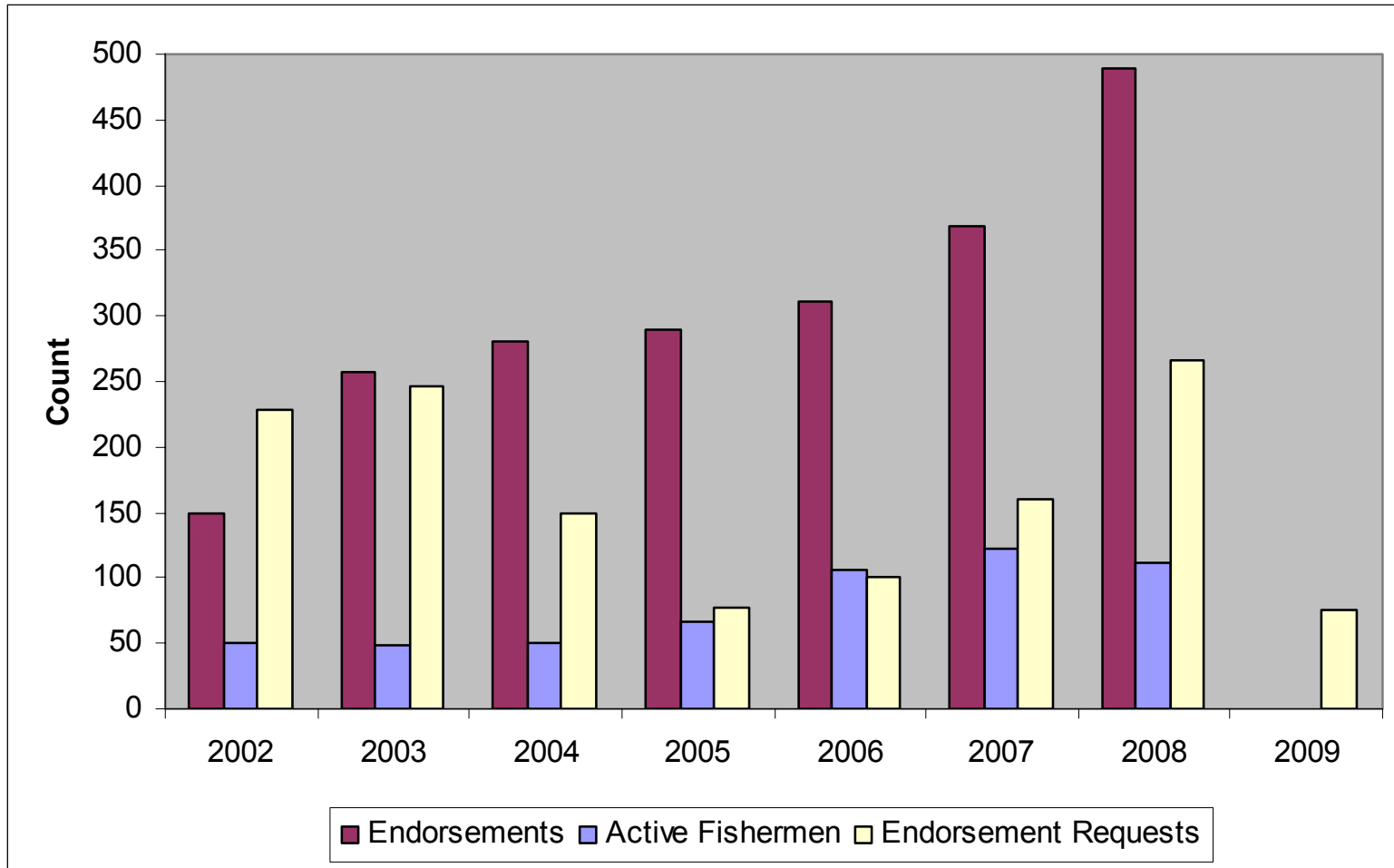


- Since colonial times
- Unregulated till 2002
 - Size limit, gear restrictions, season, annual limit
- New regulations 2008
 - Landings tags, > min. size
- 2009?
 - Limit tags to 30, then rescinded

ME State Fishery – Catch



ME State Fishery – Participation



The future.....



MAINE DEPARTMENT OF MARINE RESOURCES HARVESTER LOGBOOK

Form H2007C

Harvester Name: **Smith** Vessel Name: **Anne Marie**
 State License #: **999S** Hull ID: **ME 9999 X**
 Phone: **(207) 999-9999** Send More Logbooks:

Year: **2009**
 Month: **April**
 Did Not Fish This Month:

Day	# Of Crew	Gear Type	Gear Quantity	# Of Sets	Set Time (hrs)	Total Gear In Water	Depth (FA)	Area Fished (See Instructions)	Sea Time	Species (& HAL length)	Pounds	Dealer Lic # Or Use Code	Port Landed (Town)
15		B	100	1	3		25	44/00/00 69/00/00	5	HAL / 40	45	9998	Harpswell
17	1	LLB	100	1	4		25	44/00/00 69/00/00	6	HAL / 34	45	D	
"	"	"	"	"	"		"	" "	"	HAG	3	D	
"	"	"	"	"	"		"	" "	"	HAL / 40	45	PU	Harpswell
"	"	"	"	"	"		"	" "	"	HAL / 41	50	9998	Harpswell

Tagged previously with #H0012

SIGNATURE: Joseph Smith
 Send white copy of form to DMR; retain yellow copy for your records.
 Need forms? Call 207.633.9500 or check SEND MORE LOGBOOKS box in upper left corner of form.

COMMENTS:
Halibut caught on 17th released in great condition