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NORTHEST FISHERIES SCIENCE CENTER

# New Council Member Training

*Economic and Social Analysis in Fisheries Management*

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# The Importance of Fishery Resources

## *U.S. Fish*

- Highly migratory species
- Species on the continental shelf
- Anadromous species that spawn in rivers/estuaries

## ***Fish are Valuable, Renewable Resources***

- *Contribute to food supply, economy, health*
- *Provide recreational opportunities*

*MSA, Sec 2(a)*

# National Standards

## Standard 1

**Conservation and management to:**

- Prevent overfishing
- Achieve optimum yield
- Support U.S. fishing industry

## Standard 4

**Fishing privileges allocation to:**

- Be fair and equitable
- Be planned to promote conservation
- Avoid excessive share of privileges to a single entity

## Standard 5

**Conservation and management to:**

- Consider efficient use of fishery resources
- Not have economic allocation as only purpose

# National Standards

*continued*

## Standard 7

**Conservation and management to:**

- Minimize costs
- Avoid unnecessary duplication

## Standard 8

**Conservation and management to:**

- Use economic and social data to account for fishery resource importance to fishing communities
  - Provide for sustained community participation
  - Reduce unwanted economic impacts on communities



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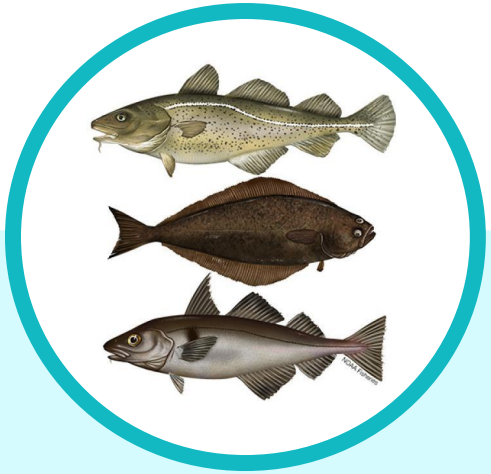
# Fishery Management Plan Requirements



## Requirements

- Incude Fishery Impact Statement
- Assess, specify, and analyze how conservation, management, and mitigation might effect economic, and social impacts to participants

*MSA, Sec 303 (a) (9)*

## Impacted Groups

### FISHERIES + FISHING COMMUNITIES

- Affected participants in fisheries and fishing communities

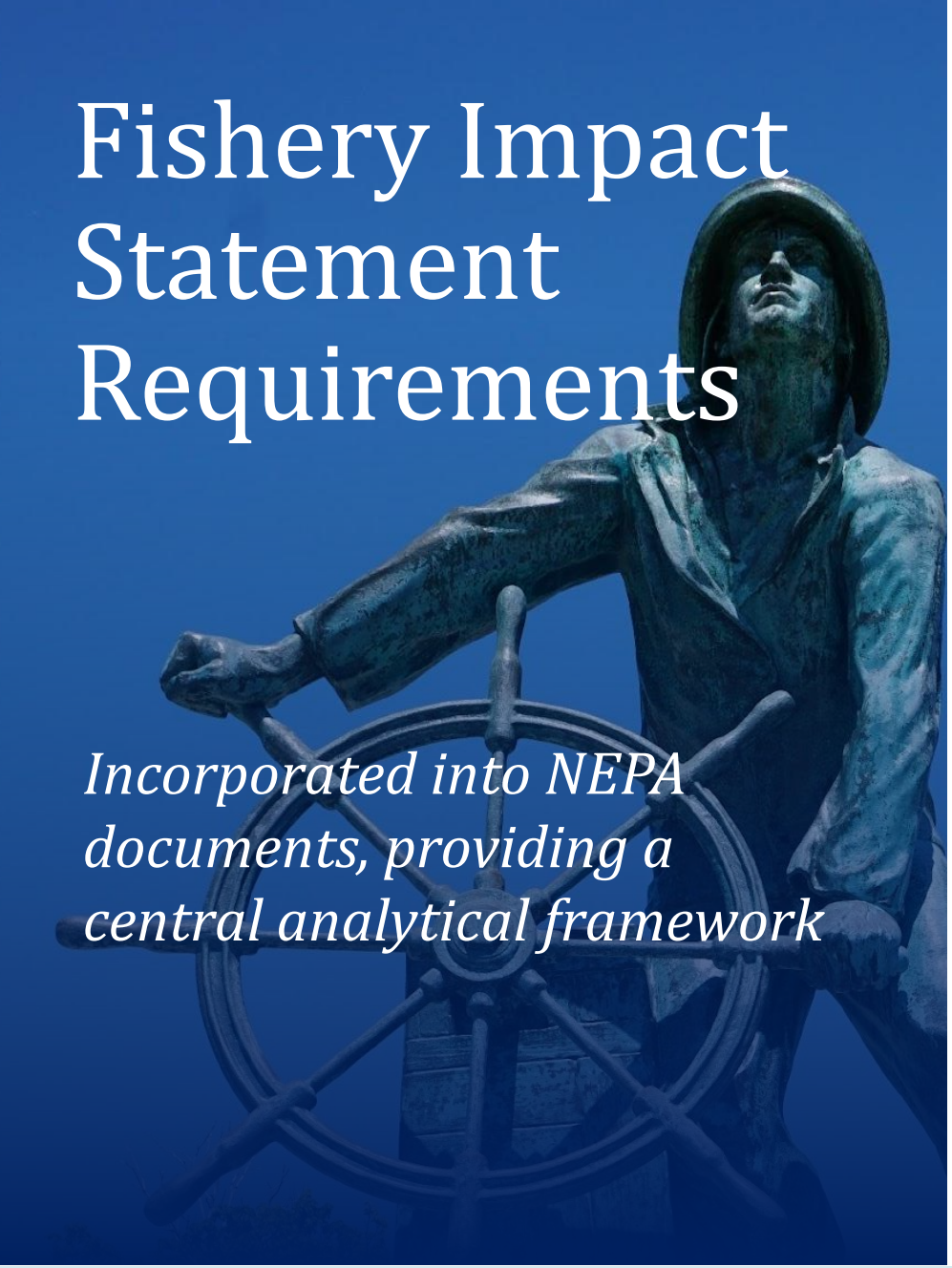
### ADJACENT FISHERIES

- Participants in adjacent fisheries under authority of another Council (after consultation)

### HUMAN LIFE AT SEA

- Safety at sea, including impacts to fishery participants

# Fishery Impact Statement Requirements



*Incorporated into NEPA documents, providing a central analytical framework*

## Historical Trends Included in Affected Environment

- Participation and count data, net or gross revenues, catch, etc.
- Disaggregated by state and/or port, gear type, vessel size, etc.

## Predicted Outcomes in Environmental Consequences and Impacts

- Use same/similar categories as Affected Environment to provide sufficient context

## Must Address

- Overall impacts of alternatives/options
- Differential impacts on sub-populations

# The Economics of Regulation

## Market-Based Options

- Catch rights auctions
- Tradeable Quotas (Catch Shares)
  - ITQ's
  - Effort allocations
- Tradeable fish/trap tags

## Command-and-Control Options

### PERFORMANCE STANDARDS

- TACs, ACLs, etc.
- Bycatch limits/allocations
- Estimate precision standards (ex: CV30)

### TECHNOLOGY STANDARDS

- Mesh size restrictions
- Min fish sizes, slot limits, etc.
- Bag limits
- Horsepower/Vessel size restrictions
- Fishing gear restrictions/requirements

# Framework for Analyses

## Types of Analyses

- Benefit/cost (B/CA)
- Cost Efficiency
- Impacts
- Input/Output
- Qualitative

## Units of Analysis

- Producers
- Consumers

## Regulatory Drivers

- MSA
- EO 12866
- RFA
- EO 12898 (Environmental Justice)

# Example 1

*Impacts Analysis*

ACL reductions in a multispecies fishery (NE groundfish)

**Aggregate stability**
*masks potential for serious distributional impacts*

## Aggregated Impacts

**RESULTS:** *4 stocks likely to be constraining: GOM cod, GB cod (west), SNE/MA yellowtail flounder, witch flounder*

**PREDICTIONS**

- **Gross revenues** to lower 7% (FY16 from FY15)
- **Variable costs** to lower $5M (FY15/16 from FY13/14; fuel prices down)
- **Gains from lower variable costs offset** by losses to ASM costs (~$3M)
- **Redfish landings increases** – major uncertainty, likely to over-estimate revenues by $1-2M

## Disaggregated Impacts

**GAINS PREDICTED**

- **Boston** (+33% to $17.2M)
- **Gloucester** (+35% to $11.1 M)
- **New Hampshire** (+23% to $1.6M)

**LOSSES PREDICTED**

- **New Bedford** (-46% to $9.2M)
- **Point Judith** (-58% to $0.8M)
- **NY + NJ** (-84% to $0.3M)

*Reference table on next slide*



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# Example 1

*Reference Table*

Disaggregated Impacts Predicted Gains and Losses for FY## from FY ##

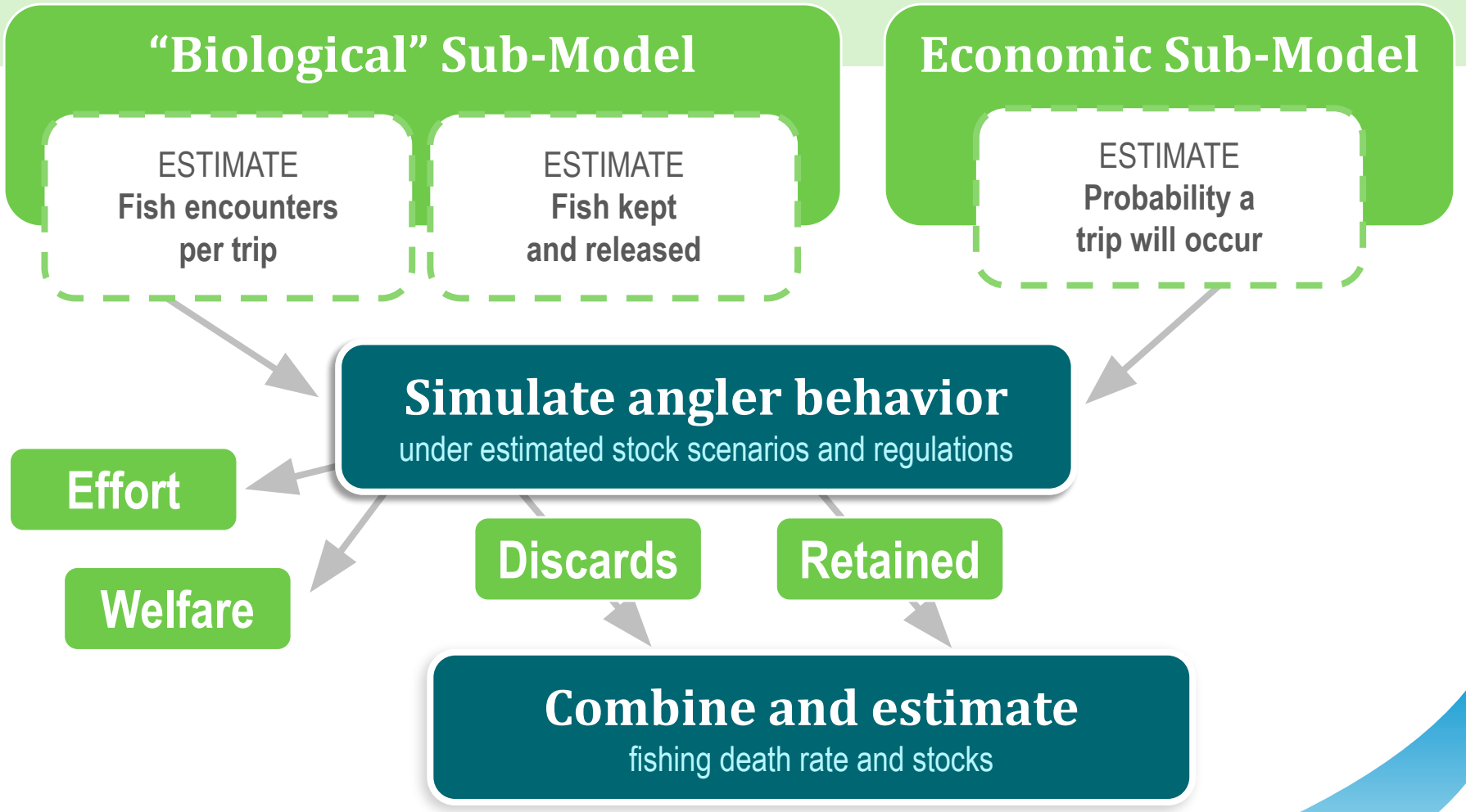
| Location | No Action (%) | With ASM (%) | No ASM (%) |
|---|---|---|---|
| **Connecticut** | — | — | — |
| **Massachusetts** | -92 | -3 | -3 |
| Boston | -90 | 33 | 33 |
| Gloucester | -91 | 35 | 32 |
| New Bedford | -94 | -46 | -45 |
| **Maine** | -94 | -9 | -11 |
| Portland | -94 | -8 | -10 |
| **New Hampshire** | -85 | 23 | 15 |
| **New Jersey** | -100 | -100 | -100 |
| **New York** | -100 | -70 | -80 |
| **Rhode Island** | -96 | -65 | -62 |
| Point Judith | -95 | -58 | -58 |
| **Other Northeast** | — | — | — |

# Example 2

*Prospective Analysis to Support Alternative Development*

Setting recreational size and bag limits

## Model Overview



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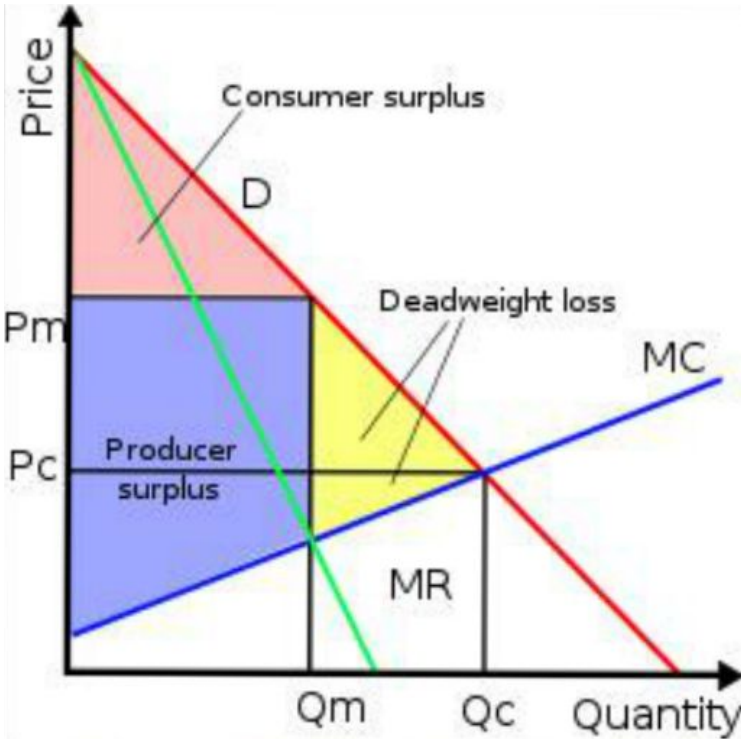
# Example 3

*Prospective Analysis to Support Alternative Development*

Establishing excessive share limits




Surpluses and **deadweight loss** created by monopoly price setting

## The Economics of Market Power

- Monopolist limits supply to increase producer benefits
  - Can decrease welfare / market benefits
- Only want to do this when benefits > costs
  - When 1% decrease in supply leads to >1% increase in price, maybe an incentive to withhold
- Math helps us figure this out



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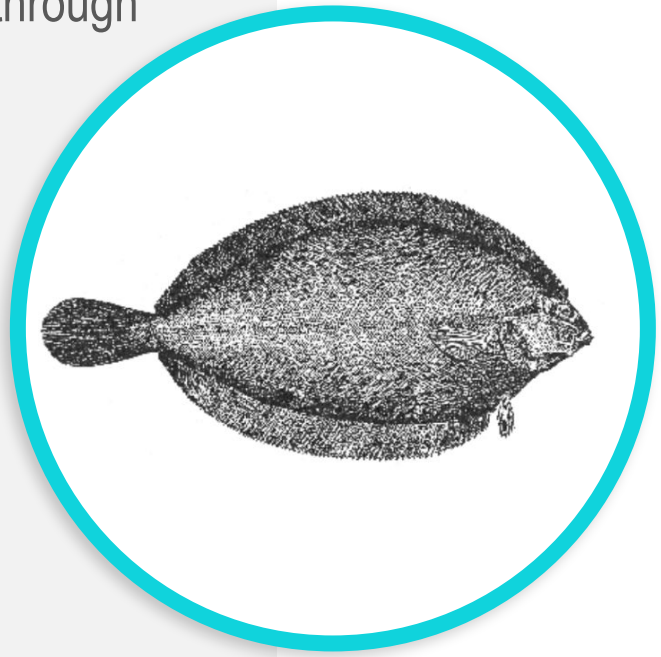
# Example 4

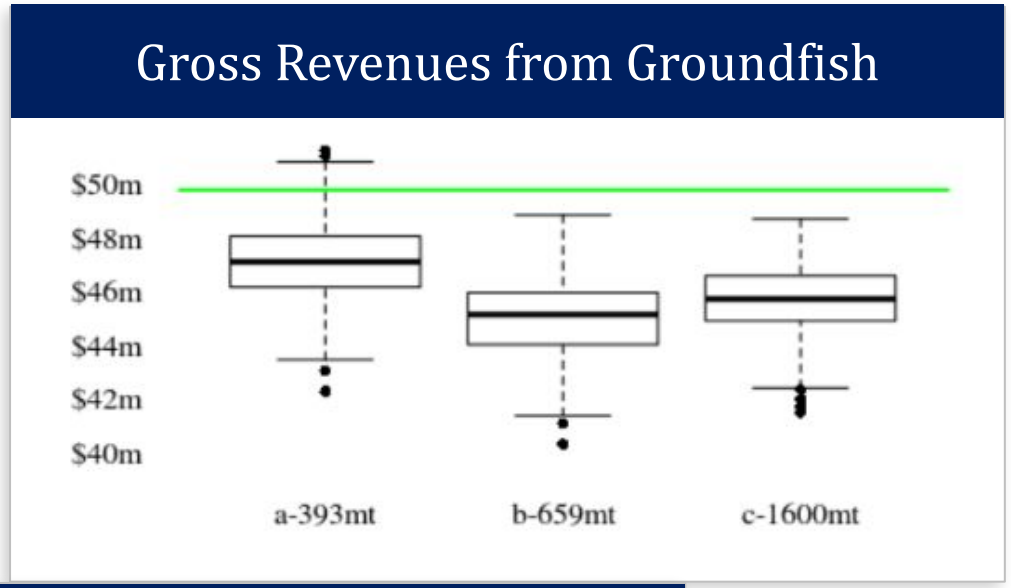
*Impacts Analysis*

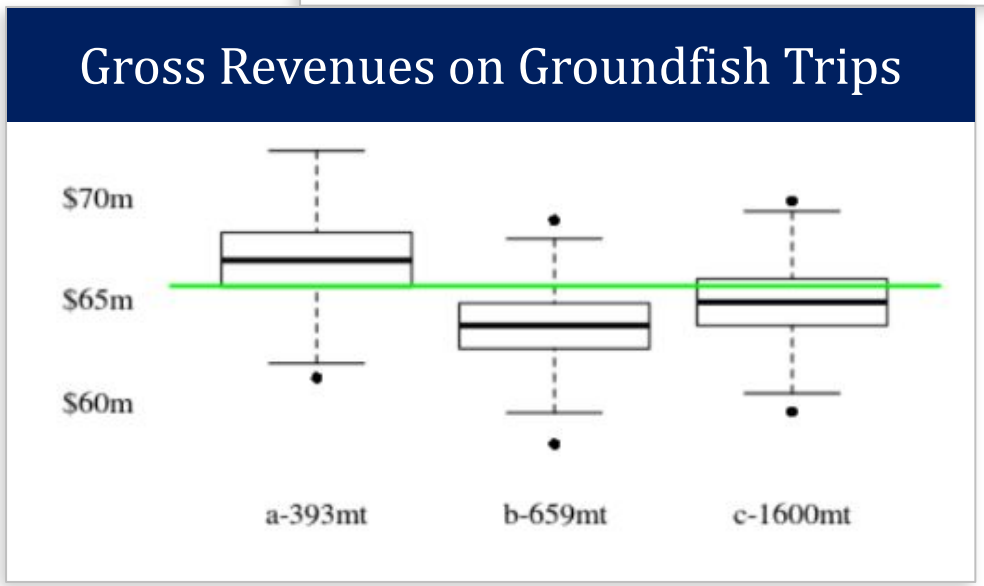
Informing Allowable Biological Catch through "risk policy"



## Three Potential ABCs Modeled

- 393mt
- 659mt
- 1600mt



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# Example 5

*Policy Analysis*

Shifting from subsidized observer coverage to industry-based funding

**Subsidy removal:**
Using cost survey data to estimate owner-level profitability

**Table 8** – Estimated returns to owner and ASM costs[1,2,3]

| | 2010 | 2011 | 2012 | 2013 | 2014* | 2015** |
|---|---|---|---|---|---|---|
| Total revenues | 114,759 | 124,942 | 96,942 | 80,813 | 79,348 | 72,081 |
| Variable costs | 30,840 | 39,868 | 35,761 | 30,718 | 24,108 | 23,700 |
| Crew share | 34,362 | 37,528 | 29,332 | 24,542 | 23,969 | 22,091 |
| RMUI | 8,736 | 8,245 | 8,069 | 7,290 | 7,112 | 6,178 |
| Business/Haul-out | 15,083 | 14,128 | 13,596 | 12,089 | 11,528 | 10,061 |
| Sector fees | 1,772 | 1,842 | 1,396 | 1,263 | 1,152 | 1,311 |
| Return-to-owner | 23,966 | 23,332 | 8,787 | 4,911 | 11,479 | 8,740 |
| ASM | 5,190 | 39,868 | 3,081 | 1,990 | 2,729 | 2,637 |
| *ASM as pct RTO* | *22%* | *26%* | *35%* | *41%* | *24%* | *30%* |
| Number active vessels | 440 | 384 | 379 | 319 | 298 | 221 |

**Table 9** – Estimated counts of vessels with positive and zero or negative returns to owner (ASM costs not included) by year[2,3]

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|
| # vessels RTO <=0 | 133 | 114 | 157 | 156 | 111 | 86 |
| # vessels RTO >0 | 307 | 270 | 222 | 163 | 187 | 135 |
| *proportion fleet <=0* | *30%* | *30%* | *41%* | *49%* | *37%* | *39%* |
| Total number of vessels | 440 | 384 | 379 | 319 | 298 | 221 |

**Table 10** – Estimated counts of vessels with positive and zero or negative returns to owner by year, including hypothetical ASM costs[2,3]

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|
| # vessels RTO <=0 | 159 | 136 | 173 | 164 | 120 | 130 |
| # vessels RTO >0 | 281 | 248 | 206 | 155 | 178 | 91 |
| *proportion fleet <=0* | *36%* | *35%* | *46%* | *51%* | *40%* | *59%* |
| Total number of vessels | 440 | 384 | 379 | 319 | 298 | 221 |

[1] Values in reports in constant 2014 $1,000
[2] 2014 data are preliminary
[3] 2015 data are predictions



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# Example 6

*Pacific Islands Management*

SEEM: An innovative framework to support setting Annual Catch Limits

## SEEM | Social, Economic, Ecological, and Management Uncertainty

### Working Group (est. 2019)

Develops methods to include uncertainty in management

### Benefits

- Decision support
- Get better expert and community input
- Engages community
- Informs research
- Considers ecosystem and social science in stock assessment

### Example Scoring Matrix

(Hospital et al, 2019)

| Concerns about effects | Importance: Low | Low | Med | Med | High | High |
|---|---|---|---|---|---|---|
| Low | | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 1 | 1 | 2 | 2 | 3 | 3 |
| Med | | 2 | 2 | 3 | 4 | 4 | 5 |
| | | 3 | 4 | 4 | 5 | 6 | 7 |
| High | | 4 | 5 | 6 | 7 | 8 | 9 |
| | | 5 | 6 | 7 | 8 | 9 | 10 |

**Figure A 1. Scoring matrix for social, economic, and ecological dimensions.**



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# Social Impact Assessment

*"...a scientific method of gauging the social and cultural consequences of alternative fishery management actions or policies"*

*Part of NEPA analysis, identical in structure to economic impacts analysis (often combined)*

## NATIONWIDE EFFORTS

**Defining NS8 fishing communities**

**Standardizing social indicators**

- Social Vulnerability
- Commercial and Recreational Fisheries Engagement and Reliance
- Gentrification Pressure Vulnerability



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# Non-NEPA Regulatory Requirements

## Regulatory Impact Review (EO 12866)

- Benefit/Cost analysis
- All affected sectors and fishing businesses
- Longer time horizon
  - Real dollars, discount rate
- Economically significant rule
  - >$100M annual effect
  - **OR** significant econ impact on region/sector

## Regulatory Flexibility Act (RFA)

- Short-term financial status change
- "Directly regulated entities"
  - owners, businesses, vessels
- Will rule have significant econ impact on substantial number of small entities?
  - Size standard (2016 = $11M for all commercial fishing businesses)



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# Best Practices

## Baseline data at same scale as impacts/predictions

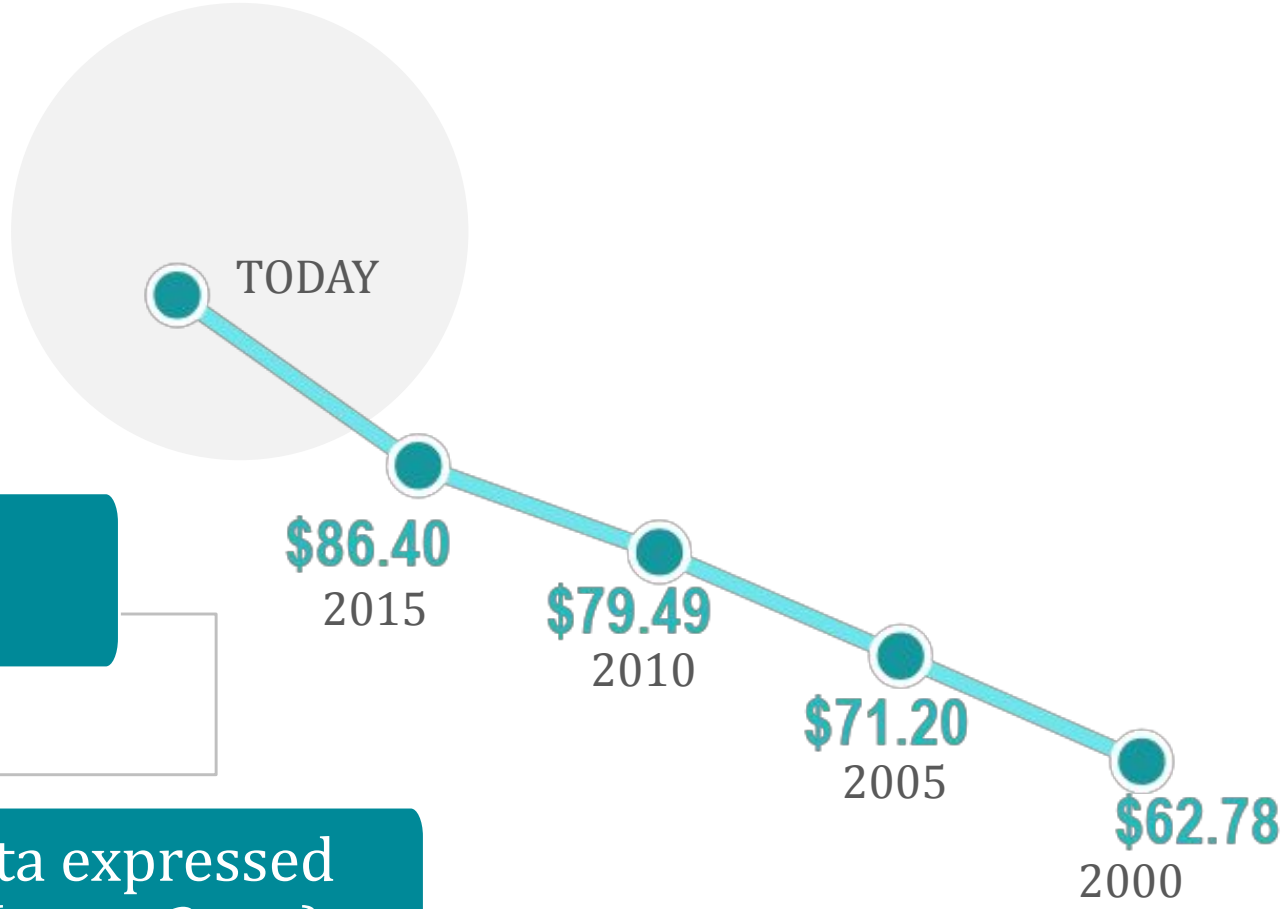
- NEPA: AE=EC

## Data, theory, model and results clearly explained

- Assumptions clearly specified

## Time-series data expressed in real dollars (say, > 3 yrs)

- nominal vs real dollars
- inflation distorts nominal dollars



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# Best Practices
*continued*

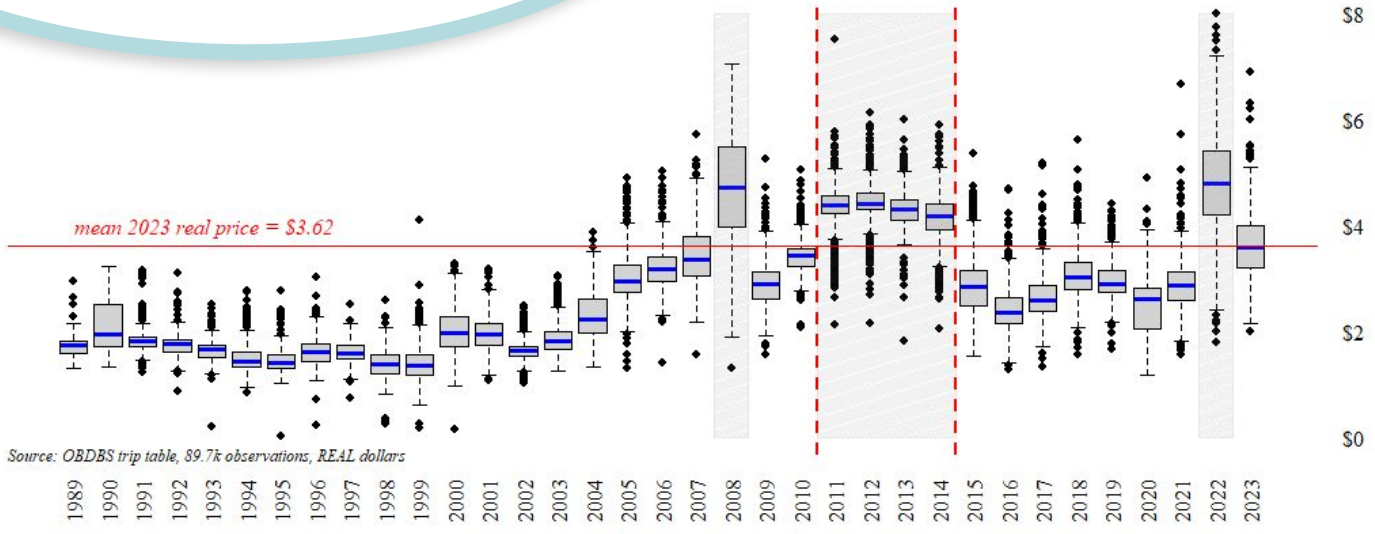
**Fuel Prices**

**2011-2014:** historic highs

**2015-today:** dropping fast

## Include costs whenever possible

- Revenue changes can mask cost increases and decreases
- Options may have different costs
  - Effort location shifts
  - Added admin. or regulatory compliance costs




A 500 VHP trawler spends nearly $200/day less in fuel today than they did last year



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# Common Questions

**Recreational vs. commercial valuation**

**Valuing goods that don't trade in markets**

- Willingness-to-pay v. Willingness-to-accept
- Stated preference v. Revealed preference

**Peer review and the role of the SSC**



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# Lying with Numbers, Part 1

## Costs and benefits with non-uniform time trends - THE DISCOUNT RATE

- The rate at which society may be willing to trade off between consumption today and consumption tomorrow
- Used whenever costs and benefits are estimated across time (e.g. Net Present Value calculations)
- "The higher the discount rate, the lower is the present value of future cash flows"
- NOAA has historically recommended two rates:
- (1) NOAA-defined "social rate of time preference" = 3%
- (2) OMB-defined "base-case discount rate" = 7%

*In cases where an industry is trading off consumption in a transactional sense,* ***discount rates in accordance with alternative investments (e.g. higher)*** *are appropriate*

*In cases where the trade-off is considered on behalf of society in a non-transactional sense* ***discount rates in accordance with the social rate of time preference (e.g. lower)*** *are appropriate*



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# Lying with Numbers, Part 2

## "Multipliers" and Input-Output Analysis

- These analyses apply mark-ups and second-order effects (jobs supported, etc) as products travel from initial to final point of sale
- "Generally, analyses should treat resources as if they were likely to be fully employed. Employment or output multipliers that purport to measure the secondary effects of government expenditures on employment and output **should not be included** in measured social benefits or costs"
- **Unusual case:** Carlos Rafael and the Lacey Act

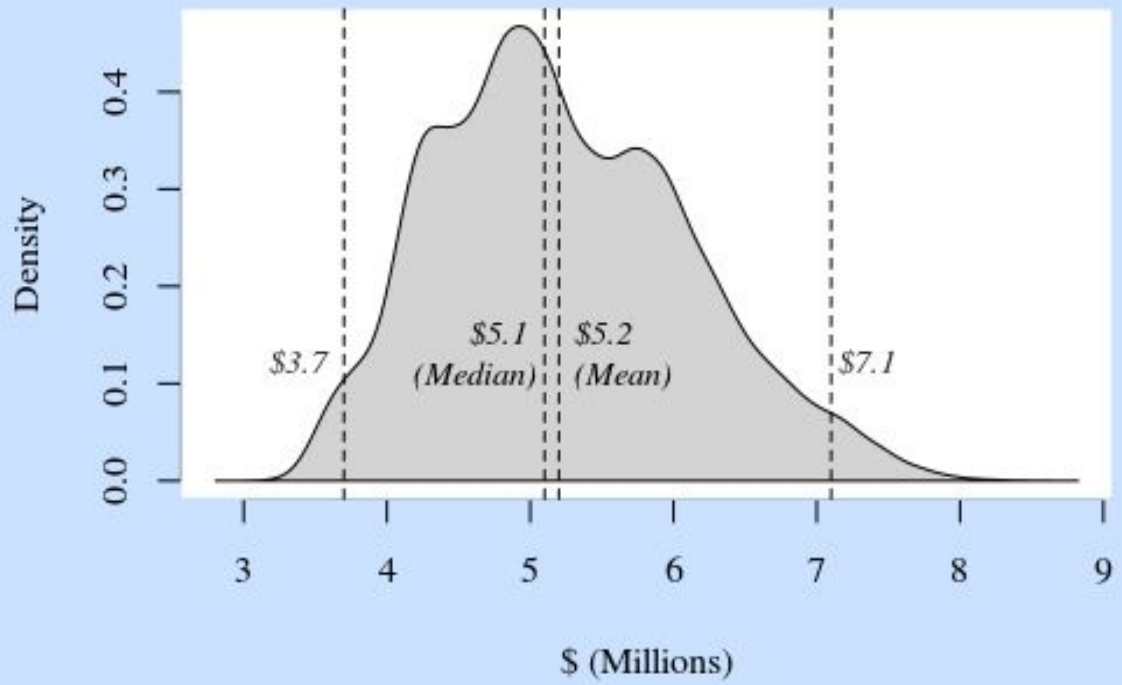
# Unusual Case

*Carlos Rafael and the Lacey Act*

**Carlos Rafael mis-reported 783K pounds of fish that he sold for $1.6M**

- Federal sentencing guidelines under the Lacey Act tie the sentence to the "fair-market retail value" of the product
- Traced the fish across secondary and tertiary dealers and through to restaurants in NYC

**Estimated Fair-Market Retail Value of Illegally Reported Fish Sold by Carlos Rafael**




*Density plot, 100,000 Monte Carlo simulations*
*Median, mean and 95% Baysian credibility intervals*



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# Questions?


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