Appendix D8: Protected Resources Research in the Northeast

Science, Service, Stewardship

PR Research in the Northeast
What has been done?
What was the point of the research?

Kathryn Bisack

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Outline

- Regulatory Support
  - CEA of Gear Research in VA Poundnet Fishery (Magnusson & Bisack)
  - Behavioral Model: Positive Math Programming Approach: CAM (Bisack & Magnusson)
- Value of Scientific Information (Bisack and Magnusson, 2014)
- Enhance PR Management
  - Policy Instruments
    - Closures and ITQs to Manage Porpoise(Bisack and Sutinen, 2006)
    - ITQs and DAS to Manage Porpoise & Cod (Bisack 2008)
  - Pinger Compliance (in review and in analysis) (Bisack, Das & Clay)

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1. CEA of Gear Research Relative to a Closure: Pound Nets and Sea Turtles

- Magnusson GM, Bisack KD, Milliken HO. 2012. The Cost-effectiveness of Gear Research Relative to a Closure: Pound Nets and Sea Turtles as an Example. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 12-01; 25 p
  - Demonstrates the cumulative present value of costs for a gear modification, including gear research costs, was lower than for a closure; than is, the gear modification was cost-effective relative to the closure

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2. Behavioral Model to Evaluate Area Closures (CAI

- Large amount of work over last several years looking at welfare losses associated with closed areas:
  - (Dupont, 1993; Hicks 1997, Curtis 1999, 2000 Holland and Sutinen, 1999 Hicks, Kirkley and Strand, 2004…
- Most used Random Utility models
- Work in the Northeast has used Math Programming (Optimization) Models.
  - Developed by John Walden to assess groundfish regulations
  - Closures was one of the policy instruments analyzed, thus the name CAM
  - Expanded to include non-groundfish vessels (Maine to North Carolina)
    - Bisack & Magnusson. 2010. Harbor Porpoise EA.
- Estimating changes in Harvest under each Management Option: Desirable features
  - A focus on 30 minute square blocks, and monthly time periods.
  - Estimate changes in harvest by species and area
  - Incorporate several policy instruments (days at sea limits, trip limit changes and area closures, gear modifications) simultaneously.
  - Focus on the individual vessel level, and profit changes.

tbm1

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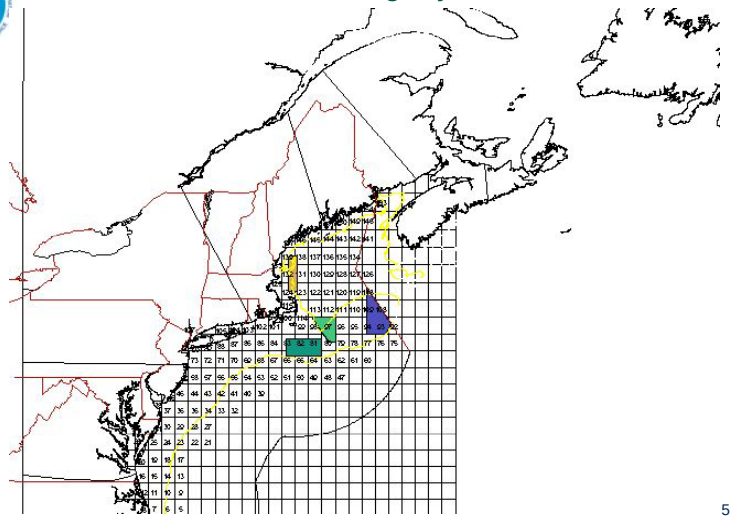
Northeast Region Grid Numbering System



tbm1 I am assuming these are the 30 minute blocks, correct?
Tammy B. Murphy, 11/16/2012

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2. Modeling Approach, Results and Future

- Originally Published in AJAE (1995)
- Approach uses a model, calibrated to observed conditions in a base year, to examine policy changes
- Models are widely used in Agriculture, particularly by the USDA.
- We use three stages –
  - Stage 1 uses a linear program to obtain dual values based on observed activity in a base year
  - Stage 2 uses the dual values along with average values to obtain yield function parameters.
  - Stage 3 uses base year data to construct the model.

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2. Model Result Process & Future Direction

- Model Result Process
  - Run Model with the status quo and proposed options
  - Changes in profits, landings and distributional impacts provided.
  - Model results should be interpreted as an ordinal ranking of alternatives. Information from the model helps managers choose alternative.
- Future Directions: Need to develop
  - Fleet models that evaluate alternative policy instruments (Bisack and Sutinen 2006)
  - Models that incorporate uncertainty, other behavioral responses such as decision choice models, compliance behavior
  - Models that assess commercial fishery and PR targets simultaneously (Bisack 2008).

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4. Policy Instruments

Bisack and Sutinen. 2006. Harbor Porpoise Bycatch: ITQs or Time/Area Closures in the New England Gillnet Fishery. Land Economics

- We investigate the implications of individual transferable quotas (ITQs) for reducing harbor porpoise bycatch in a multi-species fishery.
- Develop a numerical bio-economic model incorporating spatial and temporal patterns of abundance and harvest rates of 6 commercial fish species and harbor porpoise.
- Results indicate that porpoise ITQs, when compared to closures, are more profitable than closures, and distribute effort and profit reductions more evenly across seasons and areas.
- Price estimates for a unit of porpoise quota ranges from $1,395 to $5,782, for total allowable catches ranging from 951 to 209 porpoise, respectively.
- Total annual willingness to pay for porpoise quota is approximately $1.25 million.

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4. Policy Instruments

Bisack 2008. Integrating Porpoise and Cod Management: A Comparison of Days-at-Sea, ITQs and Closures. MRE

- The purpose is to determine if management measures based on effort reductions, in particular DAS controls, can approach a porpoise ITQ program in terms of efficiency.
- Expand upon Bisack and Sutinen (2006) to include additional policy instruments.
- Include year-round DAS charges and surcharges. Use a single policy instrument to manage both porpoise and cod.
- Results indicate
  - Several programs for porpoise protection can achieve the same conservation outcomes with modest difference in industry profits.
  - At the industry level, the program selection may then rest on the goal of cod management since reduction in cod landings are much greater under the DAS year-round (59-63%) versus seasonal (39-46%) programs.
  - Significant differences in vessel profits, however, may make consensus on the appropriate program difficult.

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3. Measuring the economic value of precision sampling for MM abundance and bycatch estimates: Case study of harbor porpoise and NE gillnet fishery

- Inconsistent government funding results in disruption of abundance survey frequency, survey length and levels of observer coverage; key inputs into PBR calculation.
- Higher funding results in higher precision ("better" information) and a higher PBR (management decision).
- Fishery responds to changes in PBR by changing amount and location of effort ("state of the world")
- These changes are accompanied by changes in the value (profitability) of fishing, which therefore determines (in part) the value of the higher precision of surveys.

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3. Value of scientific information

Protected Resource Economics

Economic value of scientific information

Because the risk of being wrong could result in extinction, protected species management must be risk averse. Thus, scientific information with a high degree of uncertainty results in stricter management measures.

All survey information includes some amount of statistical error and uncertainty. We know that the more data we collect, the more precise our estimate will be, and the more confident we can be in setting regulations that balance fishing activity and species protection.

A recent NOAA Fisheries study found that a modest annual increase of $217,000 for data collection could improve the precision of the Northwest Atlantic harbor porpoise stock assessment such that profits to commercial fishermen would increase by $850,000 per year.

	Column A Fleet Economic Profits	Column B Cost to improve precision	Net Benefits Column A less Column B
Option 1: Low Precision	$1,914,000	$221,000	$1,693,000
Option 2: High Precision	$2,764,000	$438,000	$2,326,000
Difference between options	$850,000	$217,000	$633,000

(Bisack and Magnusson. 2014)

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5. SSB Compliance Project

- Phase 1 – Empirical Compliance Model under 1998 TRT plan (2007-2010) (Bisack and Das)
- Phase 2 – Focus group ground-truthing & survey (2012) (Bisack & Clay)
- Phase 3 – Empirical Compliance Model under threat of Consequential Closures (2010-2012) (Bisack)
- Phase 4 – Focus group ground-truthing & survey (2013) (Bisack and Clay)

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5. Empirical Compliance Model Harbor Porpoise and the Gillnet Fishery

- Objective is to identify factors that may influence a vessel's compliance decision.
- Policy Instruments used to control porpoise bycatch
  - Performance Standard (Area Closures)
  - Technology Standard (Gear Modifications)
    - Pingers
- Problem: Pinger Non-Compliance too high
- Compliance measured via at-sea-observer program (~5% of fishing effort)
- Natural Experiment (Pre-CC and Post-CC)

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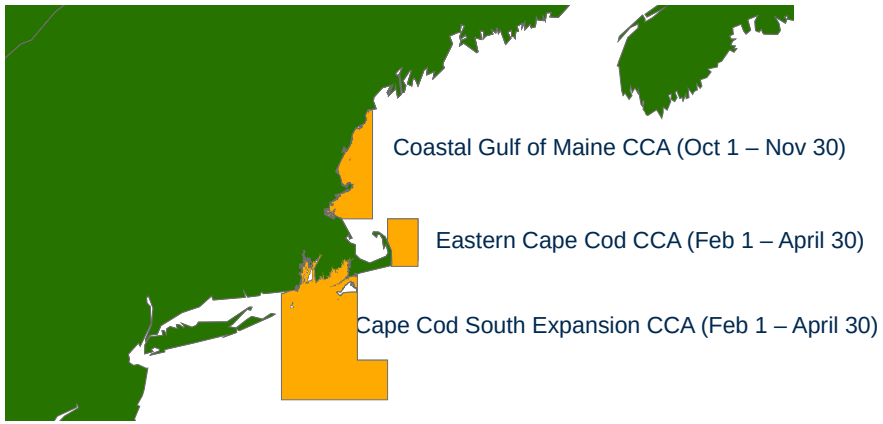
Consequential Closures If non-compliance too high!



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Questions

Q1: What factors influence the pinger compliance decision of a vessel operator/owner?

Economic, moral, social and legitimacy factors

Q2: Did compliance improve under the revised porpoise TRT plan (Post CC)?

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Model Variables

Dependent: V = 1 if violation observed at-sea between
- June 2009-May 2010 (Pre CC)
- June 2012-May 2013 (Post CC)

Independent
- Vessel Characteristics
  - Gross Tons, Horsepower/Vess Length, Captain Years, Revenues, Gillnet Gear Exclusively
- Deterrent Factor
  - Vessels perception of detection = 1 if sampled 2 consecutive years
- Normative Factors (Proxy)
  - Moral: Previous violations
  - Social: Port Behavior
  - Legitimacy: TRT member in vessel's port

Model Results
Q1: Influential Factors
(Parameter Estimates)

	Pre CC (2009-10)	Post CC (2012-13)	Pre & Post CC
Intercept	**0.61**	-1.66	**1.36**
Gross Tons	**0.09**	0.01	0.02
Horsepower/Foot	**-1.31**	0.04	**-0.24**
Gillnet Exclusive	**-5.14**	0.69	-0.42
Capt Years Gill	**0.09**	-0.02	<0.01
Revenues	**0.01**	<0.01	**0.39**
Detection	**-2.55**	**-1.64**	**-0.87**
Violation History	**3.11**	0.75	0.47
Port Behavior	1.41	**1.09**	0.47
TRT	-0.61	-0.25	
Post CC	Significant at 1% , 5% and 10%=*		**-0.95**

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Model Results Summary
Pre & Post CC Model

Q1: Vessels/Operators more likely to violate the pinger regulations
- High revenues
- Lower detection rate
- Lower horsepower per foot of vessel
- Pre-Consequential Closure Period

Q2: Compliance improved under Revised TRT
- The onset of sectors seems to have improved compliance.
- CC more of a "real" threat to sector vessels
  - Detection rate higher (NEFOP & ASM)
  - High Penalty if caught

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Focus Group Interview Findings (2012)

- Over and under sampling by observers influences compliance decisions
- They are aware of and know the "Repeat Violators"
- Perceive that punishments are non-existent
- Do not discuss pinger regulations in a group/sector setting as they do general fishery regulations
- Pinger compliance of other members not transparent
- Some sector members have a financial advantage over common pool and non-groundfish individuals.
- TRT – venue, membership, frequency was an issue

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2012 & 2013 Focus Group Compliance Research
What we talked about: Next meeting

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Future Direction

- Need more research on policy instruments in order to move toward EBM.
- While Portfolio Theory, FISHSET, CAM and other RUM models have been used, more research is necessary to understand the pros & cons of the various modeling approaches.
- More holistic types of analyses are needed:
  - Gjertson, Squires, Dutton and Eguchi. 2014. CEA of Alternative Conservation Strategies with Application to the Pacific Leatherback Turtle. Conservation Biology.