A method for improved utilization of data from experiments with fishing gear

AFS San Francisco

Sep. 4 2007

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Outline

- Fishing gear selectivity - notions and concepts
- Motivation - Data
- Methods - Non-technical
- Results
- Discussion
Selectivity - Single Haul

**Selectivity**: Probability of retention for a length $l$ fish given it has entered the codend $r(l)$

$$r(l; \beta) = \frac{\exp(\beta_0 + \beta_1 l)}{1 + \exp(\beta_0 + \beta_1 l)}$$
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Selectivity Curve

L50% = 40 cm.
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**Selectivity Curve**

- SR = 10 cm.
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r(l; \beta) = \frac{\exp(\beta_0 + \beta_1 l)}{1 + \exp(\beta_0 + \beta_1 l)}
\]

\((\beta_0, \beta_1)^T \leftrightarrow (L_{50}, SR)^T\)
Cruise - Multiple Hauls

Mean Curves

Length

Retention Probability
Mean Curves and Interpretations

Mean Curves
Mean Curves and Interpretations

Mean Curves

Retention Probability

Length

Mean Curves - varying mesh sizes

Discussion

In the end
Mean Curves and Interpretations

Mean Curves

Retention Probability

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Mean Curves - varying mesh sizes
Mean Curves and Interpretations

- Conditional Mean - **Subject Specific** - GLMM
- Marginal Mean - **Population Average** - GEE
Meta Analysis - Combine information from several sources
Multiple Cruises

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▲ Account for cluster structure in data
Multiple Cruises

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▲ PRAGMATIC APPROACH TO DATA!
Baltic Sea - Cod stock at critical level
Application

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● BACOMA Codend
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• T90 Codend
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▲ Request for advice from IBSC to ICES ACFM
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▲ Meta Analysis based on all available and relevant data
Data

25 Cruises
Data

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- 483 Hauls
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- Two experimental type
  - Covered Codend
  - Twin Trawls
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  ● Other variables
Method - Conditional Model

A proxy pragmatic approach:

▲ **SELECT Model:** Estimates of \((L_{50}, SR)\) for each haul in each cruise
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▲ **Apply Fryers method** to cruise level estimates
Method - Marginal Model

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- \( L_{50} \sim 0.3534 \times MeshSize \)
- \( SR \sim 0.05242 \times MeshSize + 3.107 \times I_{\text{CommercialVessel}} \)

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▲ Marginal Model:
- \( L_{50} \sim 7.2815 + 0.2944 \times MeshSize \)
- \( SR \sim -50.6758 + 0.503 \times MeshSize \)
Mean Curves - varying mesh sizes

Mean Selectivity Curves

Mesh Size=105 mm.

Mesh Size=120 mm.

Mesh Size=140 mm.

Conditional, Com. Vessel

Conditional, Res. Vessel

Marginal
Discussion

▲ Room and need for further development
▲ Integrate over catch weight
▲ How can we improve the quality of data?
▲ Bayesian Approach
In the end

"I was so much older then,
I’m younger than that now . . ."

Bob Dylan