Regulatory Impact Analysis Framework for Hawaii Pelagic Fishery Management

Presented by: Keiichi Nemoto

PFRP Project 657863
PI: Sam Pooley
Background

- Previous project: “A Multilevel Multi-objective Programming Model (MMPM) for the Hawaii Fisheries”
  - It was useful to evaluate ...
    - Tradeoff: recreational fishing trips vs. profit of commercial fisheries
    - Inshore closure of longline fishing
Features of MMPM

- **Mathematical Programming** (impl. by GAMS)
  - Objective function (Max fleet-wide profit)
  - Decision variables (effort)
    - # of vessels for each category
    - # of trips of fleet $i$ target $j$ in area $k$ during season $l$
- **Constraints**:
  - Vessel-owner, crew, trip entry conditions
  - Stock constraints (14 species $s$)
Fleet Categories in Hawaii Fishery

- Non-commercial
  - Catch Sold = 0
    - Fleet 1 (Recreational Boats)
  - Catch Sold > 0
    - Fleet 3 (Expense boats)

- Commercial
  - Charter Fishing
    - Handline
      - Fleet 2 (Charter Boats)
    - Trolling
    - Others
      - Pole-and-line
      - <= 56 ft
        - Fleet 6 (Small Multipurpose)
      - 56-74 ft
        - Fleet 7 (Medium Multipurpose)
      - >= 74 ft
        - Fleet 8 (Large Multipurpose)
Features of MMPM (Cont’d)

- Other relationships: CPUE-Effort, etc.

- Input Data
  - Vessel cost data ← Survey data
    - fixed and operational
    - Fishing and traveling days / trip
  - Price ← Auction Data
  - Stock and CPUE ← Logbook
CPUE profile

CPUE coefficient of CCR = 1

CPUE coefficient of VCR = 1 - \left( \frac{\text{catch}}{\text{stock}} \right)^{10}

(Catch/Stock Ratio)

(Current catch)
Features of MMPM (Cont’d)

- Other relationships: CPUE-Effort, etc.

**Input Data**

- Vessel cost data ← Survey data
  - fixed and operational
  - Fishing and traveling days / trip
- Price ← Auction Data
- Stock and CPUE ← Logbook
Limitations:

- Five concentric areas in MMPM is **not suitable** for recent and potential regulatory closures
- Difficult to update its data
Previous Definition of Areas

- Area 4
- Area 5

- EEZ

- 2,000 nmi
Previous Definition of Areas (Illustrated)
An Example for Recent Area Closure (Turtle Conservation)

Court-ordered Closures 8/03/2000

Area A: 44 North - 28 North, 168 West - 150 West

Area B: 44 North - 28 North, 173 East - 168 West and 150 West - 137 West

Area C: 28 North - Equator, 173 East - 137 West
Research Objective

- Make the previous model more *practical* and *comprehensive* to evaluate the impacts of existing and potential regulatory policies.

- Enable the model to incorporate more *flexibly-defined fishing areas*. 
Examples of Parameter Adjustments

Stock change
R = \frac{1}{4} B + \frac{1}{4} C + \frac{1}{4} D + \frac{1}{4} F
B' = \frac{3}{4} B
C' = \frac{3}{4} C
F' = \frac{3}{4} F

Price
R = \frac{1}{4} B + \frac{1}{4} C + \frac{1}{4} D + \frac{1}{4} F
B' = B
C' = C
F' = F

The sharp of R area is not necessary to be square.
Data Processing (longline)

- Logbook data summarized by month, area (1°x1° square), fleet size (L/M/S), and target (B/M/T) - already available
- Summarize catch and effort data in the above into 3-9 areas and 4 quarters. (use FoxPro SQL)
- No details for other data yet:
  - Price and vessel costs for LL; Other fleets
An Example (1 season = 1 quarter)
Fishing sets by area and year

- North
- West
- Central
- East
- South

Graph shows the number of fishing sets for each area from 1993 to 2000.
Summary

- Reuse existing data in NMFS-HL
  - Reduce time and costs to analyze for different years
  - The updated model could more flexibly and quickly evaluate the impacts of regulatory policies.
- Solid policy analysis should be available till the next Tuna Conference.