Fisheries Law Enforcement: Assessment of Deterrence

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Introduction

- **Study Sponsor: U.S. Coast Guard**
  - Initial phase completed in December 1999

- **Objective**
  - Examine the deterrence effects of Coast Guard fisheries-related enforcement activities

- **Outline**
  - A Model of Deterrence: Drug Smuggling and Counterdrug Operations
  - Deterrence in Fisheries Law Enforcement
    » Correlation between Coast Guard activities and observed violation rates
Conceptual Model of Deterrence: Developed for Drug Smuggling Into the U.S.

- Effort started in 1993 (for the Office of the Secretary of Defense)
  - Assess counterdrug operations, their impact (price, purity, usage), and develop a deterrence model

- Mathematical form:
  \[ P_t = 1 - (1 - P_I) \cdot W(P_I) \]

- Perceptions of potential perpetrators of illicit actions
  - Basic model assumes instantaneous perception
  - Perception lags deterrent action
  - Perception leads deterrent action
  - Perceptions not uniform within perpetrator population

- Feedback dynamics may be relevant to model extensions
Development of Counterdrug Deterrence Model

- **Case Studies, Calibration, and Validation**
  - Interviews of drug smugglers in federal penitentiaries
  - Air trafficking of coca from Peru to Colombia
  - Air trafficking in the Caribbean
  - Go-fasts in the Caribbean
  - Operation *Frontier Shield* (Puerto Rico)

- **Examined three models (mathematical functional forms)**
  - Risk perception model fits interview and counterdrug operations data remarkably well

- **Corroborating evidence**
  - Psychology of risk perception
  - Statistics from risk taking behavior
Willingness to Smuggle - Functional Form

$$W(P_I) = \left( \frac{P_I}{P_{\text{min}}} \right)^{-\alpha}$$

- **Analogous data: early automobile usage**
  - Risk-Benefit Decisions (Starr, 1972)
  - 1900 extreme “sport”
  - 1910 sport/prestige
  - Thereafter, necessity

- **Experimental psychology and psychophysics**
  - Conjoint Expected Risk (CER) model (Luce & Weber, 1997)
  - Power laws relating perceptual scales (S. S. Stevens, 1975)

*Human perception accurately judges ratios of intensities*
Deterrence of Drug Smuggling: Theory and Practice

\[ P_t = 1 - (1 - P_I) \cdot W(P_I) \]

W(PI) = \( \frac{P_{\text{min}}}{P_I} \)^\alpha
{\alpha = 1.03 \pm 0.07}

Relevant to fisheries enforcement?

Increasing Risk to Smuggler
Meetings and Discussions That Informed This Study

- **USCG fisheries enforcement personnel**
  - Districts 1 (Boston), 5 (Portsmouth), 11 (Alameda), 13 (Seattle), 14 (Herndon and Alameda), and 17 (Kodiak including Air Station Kodiak)
  - Visited *Morgenthau* (WHEC 722, Alameda), *Storis* (WMEC 38, Kodiak) and *Monomoy* (WPB 1326, Woods Hole)
  - Observed CG quarterly planning and assessment meeting (Herndon), LMR Enforcement Course (NEFTC, Air Station Cape Cod), and North Pacific Anadromous Fish Commission meeting (Kodiak)
  - Intelligence support at PACAREA (Alameda) and District 1 (Boston)

- **NOAA/NMFS personnel**
  - Enforcement personnel from Juneau and Woods Hole
  - Scientists from Alaska Fisheries Science Center (Seattle) and NE Fisheries Science Center (Woods Hole)
  - NOAA General Counsel’s office

- **Foreign fisheries enforcement representatives**
  - Canadian Dept. of Fisheries and Oceans
  - Russian Far East Border Patrol
  - New Zealand Ministry of Fisheries

- **Academics and industry representatives**
  - University of Rhode Island (Dept. of Environmental and Natural Resource Economics), University of Washington (School of Marine Affairs), University of California at Santa Cruz (Dept. of Environmental Studies)
  - Groundfish Forum Inc. and Alaskan Dragger’s Association
Databases That Were Obtained/Developed For This Study

- Living Marine Resource (LMR) enforcement weekly summaries
- Fishing activity
- U.S./Russian Maritime Boundary Line (MBL) 1997/8 case study data
- TED case study data
- Enforcement Management Information System (EMIS) queries
Analysis of Coast Guard LMR Enforcement Activities: Methodology

- **LMR enforcement weekly summaries**
  - Focussed on Districts 1, 5, 7, 8, and 17
  - Monthly, bimonthly, quarterly resolutions were examined
  - Coast Guard activities
    - Ship days, air hours (fixed-wing and rotary-wing), boardings
  - Significant violations
    - Violation rate (VR) = violations (detected) / boardings
    - Observed compliance rate (CR = 1-VR)

- **Fishing activity**
  - Estimated number of fishing vessels and vessel fishing days (D1)
  - Estimated landings (D1, D5, D7, D8, and D17) and value of landings (D5, D7, and D8)

- **Boarding rate surrogates - number of boardings per:**
  - Fishing vessels
  - Vessel fishing days
  - Estimated landings and estimated value of landings

  *Create indices and look for correlation.*
Violation Rate and Coast Guard Effort: District 1

Graph showing the violation rate (VR) and boarding rate (BR) over time from May-95 to Aug-99. The graph includes data points for VR (Nnwr) and BR (N(Nnwr)/NFV) with labels for each month and year.
Violation Rate and Boarding Rate: District 1

Figure 1. Significant Violation Rate and Boarding Rate: District 1, Monthly

Figure 2. Significant Violation Rate and Rotary-Wing Hours: District 1, Monthly

Figure 3. Scatter Plot of Observed Compliance Rate and BR: District 1, Monthly

Figure 4. Scatter Plot of VR and BR: District 1, Quarterly Minus Outlier \( \alpha = 0.97 \pm 0.15 \)

\[ y = 0.011x^{-0.97} \]

\[ R^2 = 0.72 \]
Violation Rate and Coast Guard Effort: District 7

Figure 1. Significant Violation Rate and BR2: District 7, Monthly

Figure 2. VR versus BR2: District 7, Bimonthly \( \alpha = 0.95 \pm 0.16 \)

Figure 3. OCR versus BR: District 7, Monthly
LMR Deterrence: Some Research Results

D17: 1997/8 evidence for deterrence at MBL

D1: Boardings and boarding rate (and helicopter hours) yield evidence,

D1: Penalties alone appear too low

Closed Areas

D5: Marginal evidence TED/BRD

D7: Boarding rate yields evidence

D8: Marginal evidence overall/little evidence of effect of Coast Guard activity on turtle strandings
LMR Enforcement Options: New, Continuing, and Revised Actions

- **Tactics**
  - Pulse operations
  - Unpredictable at-sea presence (helicopters / vertical insertion)
  - Increase LMR enforcement experience (in some Districts)

- **Coordination (CG, NMFS, States, industry, foreign enforcement)**
  - FMC guidance
  - Industry partners (yearly surveys and increased observer programs)
  - Intell cells / develop intell reporting (and analysis) system
  - Individual quota enforcement issues
  - Increase joint NMFS/CG operations

- **Technology**
  - FLIR, VMS, improved communications, tilt-rotor, UAVs

- **Near-term analytical efforts**
Begin Backups