TOWARD GREEN GROWTH IN VIETNAM: THE CASE OF MARINE CAPTURE FISHERIES

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OUTLINE
- Introduction
- Models
- Data
- Results
- Discussion

INTRODUCTION
- Green growth:
- Fostering economic growth and development;
- Ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies;
- Could be seen as a part of sustainable development;
- A subset of the capital stocks relevant to meeting the needs of future generations is explicitly considered.

OECD, 2011; Schmalensee, 2012;
INTRODUCTION

- **Green growth in fisheries:**
  - Moving from the current situation where fishing is unsustainable to one sustainable;
  - Fishing is equal to or less than the growth of wild stocks.
  - Correcting for externalities in fisheries:
    - Habitat degradation
    - Destructive gears
    - Crowded fishing

OECD, 2011; Sumaila, 2011.

INTRODUCTION

- Seafood export value has tripled in the past 10 years and reached 6.7 billion in 2013.
- However, most of the coastal areas are overfishing and fishing effort should be reduced in order to maintain Maximum Sustainable Yield (MSY).

INTRODUCTION

- It is estimated that the real catches in the Gulf of Tonkin has exceeded MSY since 1994 (Long 2001).
- Thanh (2011) estimated that shrimp trawl fishery in Tonkin Gulf was overexploited and the fishing effort should be reduced
  - By 12-44% to achieve the MSY
  - By 46-61% to reach the MEY.
- Percentage (%) of trash fish in landings by pair trawl in the North area is about 70% and in the Southeast area ranged from 21.1% to 42.1% (Son et al. 2005).
INTRODUCTION

• The objective of this study is to investigate the sustainability of the marine capture fisheries.
• Aggregate catch and effort data from 1976 to 2010 and economic data of the fisheries were collected MARD.
• Standard reference points of the fisheries are analyzed and policy implications are indicated.

MODELS

Verhulst-Schaefer (1954)

\[
\frac{dK}{dt} = P(X) - H(E, X)
\]

Where

- \( P(X) \) the biological growth of the stock
- \( H(E, X) \) the harvest function, which depend on fishing effort \( E \) and stock biomass \( X \).

In equilibrium, the stock remains at a constant level. In other words, the natural growth \( F(X) \) equals the sustainable yield that can be harvested while maintaining a fixed stock level \( X \) (Clark, 1990).

MODELS

- Constant price per unit of harvested biomass and constant cost per unit effort are used in this study
- Total sustainable revenue \( (TR) \) and total cost \( (TC) \) of the fishery are defined (Schaefer 1954, Clark 1990):

\[
TR = P(E) \cdot X(E) \quad TC = C(E) \cdot E
\]

- The Verhulst-Schaefer model assumes that the biological growth follows the Logistic growth function

\[
x(t) = x(0) \cdot \frac{e^{r \cdot t}}{K} + X(0) - X \cdot \frac{K - x(0)}{r}
\]
MODELS

The sustainable yield for a given level of effort:

\[ H_{S}(E) = qKE^2 \]

The relationship between CPUE and effort is linear as derived from the sustainable yield equation

\[ CPUE = H_{S}(E) = qKE^2 \]

where \( E = \frac{H_{S}(E)}{qK} \)

Modelling effort at MSY (\( E_{MSY} \)) for Verhulst-Schaefer model:

\[ E_{MSY} = \frac{\gamma - \frac{qK}{q}}{\frac{qK}{q}} \]

MEY and EMEY for Verhulst-Schaefer models

\[ E_{MEY} = \frac{\gamma - \frac{qK}{q}}{\frac{qK}{q}} \]

DATA

Fishing effort

Khang et al., 2011, Tuan et al., 2012
DATA

• Fleet structure

Khang et al., 2011, Tuân et al., 2012

DATA

• Description of data used in the study (1976-2010)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Observations</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Min value</th>
<th>Max value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catch (tons)</td>
<td>35</td>
<td>107771</td>
<td>626865</td>
<td>177192</td>
<td>2420800</td>
</tr>
<tr>
<td>Effort (HP)</td>
<td>35</td>
<td>206261</td>
<td>183244</td>
<td>453371</td>
<td>6127000</td>
</tr>
<tr>
<td>CPU/E</td>
<td>35</td>
<td>0.74</td>
<td>0.39</td>
<td>0.35</td>
<td>1.22</td>
</tr>
</tbody>
</table>

• We use VHLSS 2010 to estimate \( p \) and \( c \):
  - \( p = 44.5 \) (1000 VND / kg) = 44.5 million VND / ton
  - \( c = 13 \) (1000 VND / kg) = 13 million VND / ton

RESULTS

• Estimated coefficients for Verhulst-Schaefer model

<table>
<thead>
<tr>
<th>Variables</th>
<th>Estimates (standard deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \hat{c} )</td>
<td>1.835 * (1.122)</td>
</tr>
<tr>
<td>( \hat{r} )</td>
<td>-1.21E-3 * (3.19E-9)</td>
</tr>
<tr>
<td>( \hat{F} )</td>
<td>0.55</td>
</tr>
<tr>
<td>( \hat{F} )</td>
<td>38.42</td>
</tr>
<tr>
<td>( \hat{A} )</td>
<td>1.88</td>
</tr>
<tr>
<td>( \hat{A} )</td>
<td>0.88</td>
</tr>
</tbody>
</table>

• MSY, MEY, \( E_{\text{MSY}} \), and \( E_{\text{MEY}} \) for Verhulst-Schaefer model

<table>
<thead>
<tr>
<th>MSY (tons)</th>
<th>( E_{\text{MSY}} ) (HP)</th>
<th>MEY (tons)</th>
<th>( E_{\text{MEY}} ) (HP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,221.014</td>
<td>4,284.330</td>
<td>1,860.000</td>
<td>2,570.000</td>
</tr>
</tbody>
</table>
RESULTS

Fishing effort (2010):
- 1.4 times higher than the maximum sustainable yield (MSY)
- 2.4 times higher than the maximum economic yield (MEY).
- Fishing in Vietnam is unsustainable.

Source: Tharth et al, 2014

DISCUSSION

- **Green growth policy actions in general:**
  - Improving Fisheries Management
  - Reducing overcapacity and abolish subsidies
  - Reducing IUU fishing
  - Reducing waste, better handling and increasing value added
  - Energy use and climate change: more efficient engines should be developed and used

OECD, 2011; Sumaila, 2011;

- **Green growth policy actions for Vietnam:**
  - The intensity of fishing in coastal areas should be reduced.
  - The number of small fishing boats which are less selective, illegal and inefficient should decrease in coastal areas.
  - Fishermen could switch to aquaculture, tourism, seafood processing and some other appropriate trades.