Profitability in a multispecies, multigear fishery
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Background

- 2011 – West Coast groundfish trawl fishery became a catch share program (IFQ)
- Quota allocated based on historical participation for 29 different quota stocks
- Gear switching provision
  - Use trawl quota to catch groundfish with fixed gear – longline and pots
  - Sablefish quota split N/S
Research Objectives

• Cost earnings data:
  • How has gear switching impacted how sablefish is harvested?
  • What is the role of lower value stocks?

• Simulation analysis:
  • How do changes in input and output prices affect net revenue?
  • Do quota prices reflect the net revenue observed?
DTS sector of the IFQ fishery

- Landings
  - Trawl
  - Longline
  - Pot

- Ex-vessel revenue
  - Trawl
  - Longline
  - Pot

Legend:
- Sablefish
- Dover
- Thornyheads
- OtherQuota
- OtherNonQuota

Year Comparison:
- 2011
- 2012
Average sablefish price by fishery

- LE or IFQ Trawl
- LE longline
- IFQ longline
- LE pot
- IFQ pot

Average price (2003 $)

\[\text{Average price (2003 $)}\]
Quota utilization

Sablefish North | Sablefish South | Dover sole | Thornyheads | Other

2011

2012
Total sablefish landings by gear and quota

2011

North

South

Landings (millions of lbs)

2012

North

South

Landings (millions of lbs)
Methods
Calculate net revenue per trip

\[ NR_{vtyf} = R_{vtyf} - \overline{C}_{vyf} L_{vtyf} \]
Calculate net revenue per trip

\[ NR_{vtyf} = R_{vtyf} - \overline{C}_{vyf} L_{vtyf} \]

Net revenue per trip

Ex-vessel revenue per trip
Calculate net revenue per trip

\[ NR_{vt\text{y}f} = R_{vt\text{y}f} - \bar{C}_{vyf} L_{vt\text{y}f} \]

Net revenue per trip
Ex-vessel revenue per trip
Daily costs
Trip length
Calculate net revenue per trip

\[ NR_{vt\text{y}f} = R_{vt\text{y}f} - \bar{C}_{vyf}L_{vt\text{y}f} \]

Net revenue per trip

Ex-vessel revenue per trip

Daily costs
- Wages
- Fuel
- Bait
- Gear R&M
- Other

Trip length
Simulate changes in input costs

\[ NR_{vtyf} = R_{vtyf} - \overline{C}_{vyf}L_{vtyf} \]

Net revenue per trip

Ex-vessel revenue per trip

Daily costs
- Wages
- Fuel
- Bait
- Gear R&M
- Other
- Quota

Trip length
Simulate changes in output prices

\[ NR_{vtyf} = R_{vtyf} - \bar{C}_{vyf} L_{vtyf} \]

- Net revenue per trip
- Ex-vessel revenue per trip
  - Sablefish price
  - Dover sole price
- Daily costs
  - Wages
  - Fuel
  - Bait
  - Gear R&M
  - Other
- Trip length
Results
Variability in net revenue per day

Net revenue (1000 $) per day

Trawl | Longline | Pot

2011

2012

Net revenue (1000 $) per day
Variability in net revenue per lb of sablefish

Net revenue per lb of sablefish

- Trawl
- Longline
- Pot
△ Input Price: Net revenue per day and per lb

- Median net revenue per day fishing (thousands of $/day)
  - Trawl
  - Longline
  - Pot

- Median net revenue per pound of sablefish
  - Trawl
  - Longline
  - Pot

% change in fuel price
Output Prices: Net revenue per day

Median net revenue per day fishing (thousands of $/day)

<table>
<thead>
<tr>
<th></th>
<th>Trawl</th>
<th>Longline</th>
<th>Pot</th>
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</thead>
<tbody>
<tr>
<td>dover price (%)</td>
<td>0.0</td>
<td>2.5</td>
<td>5.0</td>
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<tr>
<td>sablefish price (%)</td>
<td>0.0</td>
<td>2.5</td>
<td>5.0</td>
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</tbody>
</table>

% change in price

2011

2012

Trawl
Longline
Pot
Output Prices: Net revenue per lb of sablefish

% change in price

Median net revenue per pound of sablefish

- dover price (%)
- sablefish price (%)

2011 2012

Trawl Longline Pot

NOAA Fisheries
National Oceanic and Atmospheric Administration
U.S. Department of Commerce
Input Price: Net revenue per day fishing

Median net revenue per day fishing (thousands of $/day)

Average quota price

Sablefish quota price ($/lb)
Conclusions

• Although dover sole yields a much lower price and has a limited market, it is an important component of trawl revenue

• Changes in input and output prices could alter the distribution of fishing between the trawl and fixed gear fisheries

• Gear switching exacerbates quota underutilization

• Suggestion that vessels aren’t taking into account the opportunity cost of the quota
Sablefish on the West Coast

![Graph showing landings weight (millions of lbs) for Trawl, Longline, Pot, and Other methods from 1995 to 2010.](image-url)
Sablefish catch in the trawl fishery

![Graph showing landings, revenue, and number of vessels over time.]

- Landings (millions of lbs)
- Revenue (millions of $)
- Number of vessels

Legend:
- Longline
- Pot
- Trawl

- Buyback program
- IFQ + gear switching
Variable Profit

• Variable cost net revenue = Ex-vessel revenue – variable costs
• Do we need to say anything else about variable profit?
Data

- 2011-12 Economic Data Collection Program
- State fish ticket data
  - Catch and revenue by species
- Observer data (all IFQ trips)
  - Length of trips
- Quota account data

<table>
<thead>
<tr>
<th>Gear</th>
<th>Year</th>
<th>Vessels</th>
<th>Trips</th>
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<tbody>
<tr>
<td>Trawl</td>
<td>2011</td>
<td>58</td>
<td>767</td>
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<tr>
<td>Trawl</td>
<td>2012</td>
<td>54</td>
<td>640</td>
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<tr>
<td>Pot</td>
<td>2011</td>
<td>13</td>
<td>119</td>
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<tr>
<td>Pot</td>
<td>2012</td>
<td>17</td>
<td>128</td>
</tr>
<tr>
<td>Longline</td>
<td>2011</td>
<td>10</td>
<td>66</td>
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<tr>
<td>Longline</td>
<td>2012</td>
<td>8</td>
<td>18</td>
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</table>
Varying Output prices

Dover sole

Sablefish

Varying Output prices

Dover sole

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Varying Output prices

Dover sole

Sablefish
Sectors

Number of vessels

Days at sea

2011 | 2012
---|---
Trawl | 0 | 500
Longline-N | 500 | 1000
Longline-S | 1000 | 1500
Pot-N | 1500 | 2000
Pot-S | 2000 | 2500
Varying Output prices

**Dover sole**

<table>
<thead>
<tr>
<th>Year</th>
<th>2011</th>
<th>2012</th>
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<tr>
<td>Price ($/lb)</td>
<td>0.00</td>
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<td></td>
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<td></td>
<td>1.00</td>
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**Sablefish**

<table>
<thead>
<tr>
<th>Year</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price ($/lb)</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>N</td>
</tr>
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<td></td>
<td>4</td>
<td>N</td>
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<td>N</td>
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**Varying Output prices**

U.S. Department of Commerce | National Oceanic and Atmospheric Administration | NOAA Fisheries
Data Summary

Number of vessels

Average trip revenue (1000s $)

Average trip landings (1000s lbs)

Average Number of trips

Vessel length

Average variable costs (1000s $)
Quota Utilization (2011)

Percent utilization

Arrowtooth flounder
Bocaccio rockfish South of 40°10' N
Canary rockfish
Chilipepper rockfish South of 40°10' N
Cowcod South of 40°10' N
Darkblotched rockfish
Dover sole
English sole
Lingcod
Longspine thornyheads North of 34°27' N
Minor slope rockfish South of 40°10' N
Minor slope rockfish North of 40°10' N
Minor shelf rockfish South of 40°10' N
Minor shelf rockfish North of 40°10' N
Longspine thornyheads North of 34°27' N
Lingcod
English sole
Dover sole
Darkblotched rockfish
Cowcod South of 40°10' N
Chilipepper rockfish South of 40°10' N
Canary rockfish
Bocaccio rockfish South of 40°10' N
Arrowtooth flounder

Yellowtail rockfish North of 40°10' N

Percent utilization