Pollock fishery characteristics and salmon bycatch patterns

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Prohibited species bycatch

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>Herring (t)</td>
<td>1,089</td>
<td>821</td>
<td>785</td>
<td>482</td>
<td>224</td>
<td>105</td>
<td>895</td>
<td>963</td>
</tr>
<tr>
<td>Red king crab (n)</td>
<td>0</td>
<td>5,098</td>
<td>0</td>
<td>0</td>
<td>38</td>
<td>6</td>
<td>53</td>
<td>10</td>
</tr>
<tr>
<td>Other king crab (n)</td>
<td>156</td>
<td>1,832</td>
<td>2</td>
<td>104</td>
<td>5,135</td>
<td>81</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Bairdi crab (n)</td>
<td>6,525</td>
<td>35,594</td>
<td>1,078</td>
<td>173</td>
<td>86</td>
<td>651</td>
<td>784</td>
<td>1,200</td>
</tr>
<tr>
<td>Other tanner crab (n)</td>
<td>88,588</td>
<td>45,623</td>
<td>12,778</td>
<td>1,807</td>
<td>2,179</td>
<td>1,667</td>
<td>761</td>
<td>740</td>
</tr>
<tr>
<td>Chinook salmon (n)</td>
<td>43,336</td>
<td>49,373</td>
<td>10,187</td>
<td>3,966</td>
<td>30,107</td>
<td>32,222</td>
<td>46,044</td>
<td>53,343</td>
</tr>
<tr>
<td>Other salmon (n)</td>
<td>61,504</td>
<td>62,276</td>
<td>44,585</td>
<td>56,707</td>
<td>52,835</td>
<td>76,998</td>
<td>190,146</td>
<td>436,176</td>
</tr>
<tr>
<td>Halibut (t)</td>
<td>127</td>
<td>144</td>
<td>69</td>
<td>80</td>
<td>164</td>
<td>127</td>
<td>97</td>
<td>92</td>
</tr>
</tbody>
</table>
Catch and bycatch trends
(NORPAC data)

Number of salmon

Pollock catch (t)

Pollock
Chinook
Chum

Catch and bycatch trends
relative to annual maxima

Pollock
Chinook
Chum
Pollock fishery description

Proportion of catch in A season

Year


Pollock
Chinook
Chum

General features of pollock distribution

• Fishery patterns
• Bottom trawl surveys
Winter pollock fishery distributions

Summer fishery distribution
Pollock bottom-trawl survey CPUE relative to bottom temperature
Key question

• Has the EBS pollock fishery changed in a way that affects salmon bycatch?
  - Details on fishery bycatch
    • By fleet
    • By time of year
    • Time of day
    • Depth
  - Spatial bycatch trends
  - Spatial extent

Pollock fishery patterns

• Approaches
  - Incidence: proportion of tows where salmon observed
  - Number of salmon caught per ton of pollock
  - CPUE weighted distributions (centers of mass)
    • Weights based on species CPUE
      (Note: "chum" refers to non-chinook salmon)
Methods: data screening

As a fraction of total catch
80% used as cut-off for “pollock” tows

Distribution of pollock relative to total catch

Salmon incidence rate (by year)

Proportion of tows observed with salmon

Note: Catch-vessel data based on port-sampler assignments to tows
Fishery characteristics

Salmon incidence by depth

Catcher processor

Catcher vessel

Depth (m)

Proportion of tows observed with salmon

Chinook incidence rate
Chum incidence rate
Proportion of all tows

Pollock fishery characteristics

- Depth of effort (A season) and Chinook bycatch

Pollock fishery characteristics

- Depth of effort (A season) and Chinook bycatch
Non-zero \( \ln(\text{salmon/kt of pollock}) \)

Chinook salmon

Chum salmon

Chinook per kt of pollock (ln-scale)
Chum per kt of pollock (ln-scale)

Pollock fishery and time of day

- Tow duration and frequency (1990-2006)

- Longer tows at night, most tows in mid afternoon
Pollock fishery characteristics

• Pollock catch

Best CPUE and most pollock caught in mid afternoon

Pollock fishery characteristics

• Salmon bycatch and pollock catch

Most salmon caught in mid afternoon
Pollock fishery characteristics

- Salmon and pollock catch rates

Salmon CPUE drops more during night

Pollock A season, 1999-2002
Pollock A season, 2003-2006

Chinook

- Chinook / kt of pollock variable can be higher inside CSSA
Pollock and chinook A-season

• Chinook bycatch often at fringe of pollock catch
Pollock and chinook B-season

*Chinook bycatch often at fringe of pollock catch*
Pollock & chinook, 2004-05 shifts

Chum salmon

- Chum / kt of pollock variable can be higher inside CSSA
Chum B season, 1998-2001

1998

1999

2000

2001

Chum B season, 2002-2005

2002

2003

2004

2005
Pollock & chum B season, 2004-05

2004

2005

Pollock & chum B season, 2004-05 shifts

2004

2005

Pollock & chum B season, 2004-05 shifts
Pollock and chum B-season

Pollock and chum B-season
Centers of effort
(A and B seasons)

Fleet dispersion

Catcher vessels
First month CV
Spatial extent

Pollock
Chinook

Second month CV
Spatial extent

Pollock
Chinook

Catcher processors
First month CP
Spatial extent

Pollock
Chinook

Second month CP
Spatial extent

Pollock
Chinook

\[ S = \frac{\sum_{i=1}^{n} D_i}{n} \]
Conclusions

• Salmon bycatch rates have increased
  - Both numerically and by incidence
• Pollock fishery patterns are variable
  - But show little trend related to salmon bycatch rates
• Some diurnal patterns are evident
• Spatial patterns of salmon bycatch difficult to predict