SUPPLY MARKET STUDY –
Pacific Salmon Prospects

Market Analysis
Prepared By: Kris Terauds

April 2006
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1. DISCLAIMER

The information in this report is for informational purposes only. The conclusions herein are forward looking and represent Tradex Foods’ best estimate based on current available information. We have used data from sources we believe to be reliable but we can not guarantee that they are complete or accurate. Although we believe the expectations reflected in our forward-looking statements are reasonable, results may vary, and we cannot guarantee future results.
2. EXECUTIVE SUMMARY

2.1. Introduction

- As at 2001, four countries harvested Pacific salmon species:
  - Canada
  - Japan
  - Russia
  - USA
- In 2001 US harvesters held the largest share of global salmon harvest at 36% of the global harvest in 2001.
- For sockeye salmon, the world’s most valuable salmon harvest, the USA accounted for a dominant 71% of the total.
- Russia and Japan were also large harvesters, but their harvests depend on lower value species: chum (Japan) and pink (Russia).

<table>
<thead>
<tr>
<th>Species</th>
<th>Canada Harvest</th>
<th>% of world</th>
<th>Japan Harvest</th>
<th>% of world</th>
<th>Russia Harvest</th>
<th>% of world</th>
<th>USA Harvest</th>
<th>% of world</th>
<th>Total Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinook</td>
<td>636</td>
<td>7.3%</td>
<td>111</td>
<td>1.3%</td>
<td>499</td>
<td>5.7%</td>
<td>7,524</td>
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<td>8,770</td>
</tr>
<tr>
<td>Chum</td>
<td>5,549</td>
<td>1.8%</td>
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<td>10.4%</td>
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<tr>
<td>Coho</td>
<td>42</td>
<td>0.2%</td>
<td>502</td>
<td>2.5%</td>
<td>2,034</td>
<td>10.2%</td>
<td>17,423</td>
<td>87.1%</td>
<td>20,001</td>
</tr>
<tr>
<td>Pink</td>
<td>10,575</td>
<td>2.9%</td>
<td>9,765</td>
<td>2.7%</td>
<td>167,566</td>
<td>46.4%</td>
<td>173,067</td>
<td>47.9%</td>
<td>360,973</td>
</tr>
<tr>
<td>Sockeye</td>
<td>6,231</td>
<td>5.7%</td>
<td>2,740</td>
<td>2.5%</td>
<td>22,475</td>
<td>20.7%</td>
<td>77,172</td>
<td>71.0%</td>
<td>108,618</td>
</tr>
<tr>
<td>Total</td>
<td>16,802</td>
<td>2.4%</td>
<td>227,737</td>
<td>32.7%</td>
<td>202,166</td>
<td>29.0%</td>
<td>250,701</td>
<td>35.9%</td>
<td>697,406</td>
</tr>
</tbody>
</table>

- Since the USA is the world’s largest salmon producer and in particular due to its dominance in the sockeye market, this report will focus on exclusively on the US fishery.

2.2. Management

- Alaska’s Department of Fisheries and Game (ADF&G) acts as both governing body and fisheries manager for Alaska’s state fisheries, including those for all salmon species.
- In addition to its management duties ADF&G conducts the scientific fisheries research that underpins its policy decisions.

2.3. Harvest areas

- ADF&G divides Alaska’s state fisheries into four regions:
The Southeast and Central regions host the primary salmon fisheries such as:
- Southeast pinks (Southeast)
- Bristol Bay sockeye (Central)
- Prince William Sound pinks (Central)

2.4. Historical

2.4.1. Harvests
- Pink and sockeye salmon dominate Alaska’s total salmon harvests.
- 2005 in particular was a bumper year for pink harvests, with 147 million fish.
- Sockeye harvests were also healthy in 2004 and 2005.
- Alaska’s 2005 salmon harvest of 206 million fish was the highest total since 1999.
- It is also well above the 2000-2005 average harvest of 166 million fish.

2.4.2. Quotas
- **All species:** From 2002-2005 the accuracy of individual year forecasts have varied approximately 15% above or below the mean variance. We therefore expect that ADF&G’s 2006 all species forecasts will fall within 15% of the eventual harvest.
- **Chinook:** Since the three most recent years show a consistent overestimation of the harvest by an average of 20%, we will adjust ADF&G’s 2006 projection down by this figure.
- **Chum:** Since the three most recent years show a consistent overestimation of the harvest by an average of 25%, we will adjust ADF&G’s 2006 projection down by this figure.
- **Coho:** Since the average variance in recent years is less than 10% in either direction, and since there is no clear trend, we will use ADF&G’s coho projections at par.
- **Pink:** Since pink salmon demonstrate large variations in biomass between odd and even year classes, and since 2005 was a bumper
year, we will assume that 2006 projections will overestimate the actual harvest by 20%.

- **Sockeye:** Since the year-to-year differences between ADF&G harvest projections and actual harvests have been small, and since the average difference is only (2%), we will use ADF&G’s sockeye harvest projections at par.

### 2.5. Forecasts

#### 2.5.1. 2006 Season

- ADF&G announced a 2006 forecast of 167 million fish for Alaska’s salmon fisheries.
- This is a (7.5%) drop from its 2005 forecasts and a much larger drop from actual 2005 harvests.
- The agency expects lower harvests for pink and sockeye salmon, Alaska’s two large volume salmon species.

<table>
<thead>
<tr>
<th></th>
<th>2006 Catch/Forecast factor</th>
<th>2005 Forecast</th>
<th>Actual catch</th>
<th>2006 (proj.) Forecast</th>
<th>Proj. catch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinook</td>
<td>1.20</td>
<td>765</td>
<td>662</td>
<td>780</td>
<td>936</td>
</tr>
<tr>
<td>Chum</td>
<td>0.75</td>
<td>17,623</td>
<td>10,853</td>
<td>17,552</td>
<td>13,164</td>
</tr>
<tr>
<td>Coho</td>
<td>1.00</td>
<td>5,092</td>
<td>4,662</td>
<td>4,959</td>
<td>4,959</td>
</tr>
<tr>
<td>Pink</td>
<td>0.80</td>
<td>114,386</td>
<td>146,931</td>
<td>108,005</td>
<td>86,404</td>
</tr>
<tr>
<td>Sockeye</td>
<td>1.00</td>
<td>42,805</td>
<td>43,007</td>
<td>35,636</td>
<td>35,636</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>180,671</td>
<td>206,115</td>
<td>166,932</td>
<td>141,099</td>
</tr>
</tbody>
</table>

- Using the adjustment factors determined in the last section, we project a 2006 salmon harvest of 141 million fish.
- This harvest would be a major drop (~30%) drop from the actual 2005 harvest of 206 million fish.
- Our estimate is approximately (15%) lower than ADF&G’s estimate of 167 million fish.
- This difference is within the range of 2002-2005 variances between ADF&G projections and eventual actual harvests (the range was -15% to +15%).
- **Sockeye:** We anticipate a medium drop (20%) in sockeye harvests to 36 million fish.
• **Pink:** We anticipate the largest drop in pinks salmon harvests, by (41%) to 86 million fish. This drop represents nearly the entire difference between 2005 harvests and our 2006 projections.

### 2.5.2. Future seasons (2007-2009)

- To arrive at our forecasts we have created a multiplier that accounts for:
  - Abundance of the parent year classes in the major individual salmon fisheries
  - Effort-limiting factors such as traditionally poor market conditions, processing constraints and effort restrictions
- We have averaged this multiplier across the various year classes represented in a given run (e.g. the 2008 chum run will be comprised mainly of 2003-2005 year classes)
- Finally we have multiplied this factor into 5-year harvest averages for the major Alaskan salmon fisheries
- We have produced forecasts for a species only in years for which the parent year spawning run is known
- For example chum salmon spawn between 3-5 years of age, and 2005 is the last known parent year class, so the furthest we can predict is the 2008 run (comprised of 2003-2005 year classes)

#### HARVEST FORECASTS, 2007-2009

<table>
<thead>
<tr>
<th>Species</th>
<th>2000-2005</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg</td>
<td>Low</td>
<td>High</td>
<td>Mid</td>
</tr>
<tr>
<td>Chinook</td>
<td>561</td>
<td>502</td>
<td>679</td>
<td>590</td>
</tr>
<tr>
<td>Chum</td>
<td>16,906</td>
<td>11,637</td>
<td>15,744</td>
<td>13,690</td>
</tr>
<tr>
<td>Coho</td>
<td>4,758</td>
<td>4,905</td>
<td>6,637</td>
<td>5,771</td>
</tr>
<tr>
<td>Pink</td>
<td>110,242</td>
<td>131,299</td>
<td>177,640</td>
<td>154,470</td>
</tr>
<tr>
<td>Sockeye</td>
<td>33,662</td>
<td>28,664</td>
<td>38,781</td>
<td>33,722</td>
</tr>
</tbody>
</table>

- ADF&G’s forecasts generally fall within 15% of the eventual harvest, so we have shown a “low” and “high” forecast of +/- 15% of our “mid” forecast
- Relative to 5-year averages we predict **above average** Alaska-wide harvests for:
  - 2007 cohos
  - 2007 pinks
  - 2008 chinooks
  - 2009 chinooks
2009 sockeyes

- Relative to 5-year averages we predict average Alaska-wide harvests for:
  - 2007 chinooks
  - 2007 sockeyes
  - 2008 cohos
  - 2008 sockeyes

- Relative to 5-year averages we predict below average Alaska-wide harvests for:
  - 2007 chums
  - 2008 chums
3. INTRODUCTION

3.1. Species description

3.1.1. Chinook

Scientific name: Oncorhynchus tsawytscha
Common names: Chinook salmon, king salmon, spring salmon, tyee
Maximum length: 150cm
Maximum weight: 61kg
Maximum age: 9 years
Typical spawning age: 4-6 years
Distribution: North Pacific: Honshu, Japan to Bering Sea, south from Alaska to Ventura River, CA

3.1.2. Chum

Scientific name: Oncorhynchus keta
Common names: Chum salmon, dog salmon, keta salmon
Maximum length: 100cm
Maximum weight: 16kg
Maximum age: 6 years
Typical spawning age: 3-5 years
Distribution: North Pacific: Japan/Korea to Bering Strait and Aleutian Islands, south from Alaska to San Diego, CA

3.1.3. Coho

Scientific name: Oncorhynchus kisutch
Common names: Coho salmon, silver salmon
Maximum length: 108cm
Maximum weight: 15kg
Maximum age: 5 years
Typical spawning age: 3-4 years
Distribution: North Pacific: Russia south to Hokkaido, Japan, south from Alaska to Baja California, Mexico
3.1.4. Pink

Scientific name: Oncorhynchus gorbuscha
Common names: Pink salmon, humpback salmon
Maximum length: 76cm
Maximum weight: 6.8kg
Maximum age: 3 years
Typical spawning age: 2 years
Distribution: North Pacific and Arctic: Japan/Korea to Northwest Territories, Canada, south from Northwest Territories to southern California

3.1.5. Sockeye

Scientific name: Oncorhynchus nerka
Common names: Sockeye salmon, red salmon, kokanee
Maximum length: 84cm
Maximum weight: 7.7kg
Maximum age: 7 years
Typical spawning age: 4-6 years
Distribution: North Pacific: Northern Japan to Bering Strait and Aleutian Islands, south from Alaska to Los Angeles, CA

3.2. Global harvests

- As at 2001, four countries harvested Pacific salmon species:
  - Canada
  - Japan
  - Russia
  - USA
- In 2001 US harvesters held the largest share of global salmon harvest at 36% of the global harvest in 2001.
- For sockeye salmon, the world's most valuable salmon harvest, the USA accounted for a dominant 71% of the total.
- Russia and Japan were also large harvesters, but their harvests depend on lower value species: chum (Japan) and pink (Russia).
### WORLD SALMON HARVESTS, 2001

*all figures in metric tonnes (MT)*

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<tr>
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<th>Canada Harvest</th>
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<th>Japan Harvest</th>
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- Since the USA is the world’s largest salmon producer and in particular due to its dominance in the sockeye market, this report will focus on exclusively on the US fishery.
4. MANAGEMENT

4.1. Organisations

- In the USA, state governments have jurisdiction over fisheries that occur within three miles of shore.

- Alaska’s Department of Fisheries and Game (ADF&G) acts as both governing body and fisheries manager for Alaska’s state fisheries, including those for all salmon species.

- ADF&G’s management duties include, among other things: managing the licencing of fishing vessels, monitoring vessel activity and landings, monitoring total landings against quota, and announcing fishery openings and closures.

- In addition to its management duties ADF&G conducts the scientific fisheries research that underpins its policy decisions.

4.2. Process

- Every year ADF&G prepares forecasts for major salmon runs in the state.

- The agency selects runs based on economic importance, feasibility of research, management needs, compatibility with current programs, etc.

- ADF&G uses a number of factors to estimate future runs, including:
  - Escapement levels of parental stocks
  - Spawning stock distribution
  - Smolt outmigration levels
  - Returns to date of sibling age classes
  - Environmental conditions

- Generally the escapement levels of parental stocks are the primary factor.

- Alaska boosts its salmon runs with hatchery salmon. ADF&G tracks these salmon as well.

- Different salmon species return to their spawning streams at different ages. In Alaska, ADF&G observes that sockeye salmon are of 4-6 years of age when they return to spawn (and therefore when fishermen harvest them).

- This compares to pink salmon, which return at the age of two.
AGE OF RETURNING SALMON, ALASKA

<table>
<thead>
<tr>
<th>Species</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinook</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Chum</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Coho</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Pink</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Sockeye</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

- For most fisheries ADF&G’s forecast represents a “potential” harvest based on quantitative formulae.
- But for some fisheries forecasts simply reflect historical harvests and may not accurately reflect potential harvests.

4.3. Key stock assessment data

- ADF&G subtracts the required escapement from the predicted run. From the difference it sets a target catch for commercial and recreational users.
- The stock assessments lay out an upper and lower projection of biomass for the year, with the average being the quoted “estimate.”
- ADF&G says that its harvest estimates fall within the upper and lower projections less than half of the time.

4.4. Harvest areas

- ADF&G divides Alaska’s state fisheries into four regions:
  - Region 1 – Southeast (from Dixon Entrance north to Yakutat)
  - Region 2 – Central (from Copper River west to Cook Inlet)
  - Region 3 – Arctic / Yukon / Kuskokwim (from Anchorage north to the Arctic Ocean)
  - Region 4 – Westward (from Kodiak west to the Aleutian Islands)
The Southeast and Central regions host the primary salmon fisheries such as:

- Southeast pinks (Southeast)
- Bristol Bay sockeye (Central)
- Prince William Sound pinks (Central)

The Westward region host second tier salmon fisheries such as Kodiak pinks.

Scattered small salmon fisheries comprise the huge Arctic / Yukon / Kuskokwim region that covers the majority of Alaska, from Anchorage north to the Arctic Ocean.

4.5. Profiled fisheries

- ADF&G provides harvest estimates for the following major salmon fisheries.

- For other fisheries, ADF&G either relies on average historical harvests or on third party estimates (e.g. for hatchery fish).
<table>
<thead>
<tr>
<th>ADF&amp;G MONITORED SALMON FISHERIES</th>
<th>Chinook</th>
<th>Chum</th>
<th>Coho</th>
<th>Pink</th>
<th>Sockeye</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southeast</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prince William Sound</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Copper River</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Upper Cook Inlet</td>
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<td></td>
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<tr>
<td>Lower Cook Inlet</td>
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<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Kodiak</td>
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<td>Upper Station</td>
<td></td>
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<tr>
<td>Frazer Lake</td>
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<td>Ayakulik River</td>
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<td>Spiridon Lake</td>
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<td>Karluk Lake</td>
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<td>Chignik</td>
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<tr>
<td>Bristol Bay</td>
<td></td>
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<td>Yes</td>
<td></td>
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<tr>
<td>Alaska Peninsula, Bear Lake</td>
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<td>Alaska Peninsula, Nelson River</td>
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5. HISTORICAL

5.1. Harvests¹²,¹³

<table>
<thead>
<tr>
<th>Year</th>
<th>Chinook</th>
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<th>Coho</th>
<th>Pink</th>
<th>Sockeye</th>
<th>Total</th>
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<tr>
<td>1994</td>
<td>640</td>
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<td>9,551</td>
<td>116,720</td>
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<tr>
<td>1995</td>
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<td>18,796</td>
<td>6,471</td>
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<td>63,532</td>
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<td>97,900</td>
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<td>1997</td>
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<td>3,190</td>
<td>71,960</td>
<td>31,090</td>
<td>123,140</td>
</tr>
<tr>
<td>1998</td>
<td>580</td>
<td>19,070</td>
<td>4,680</td>
<td>104,770</td>
<td>22,720</td>
<td>151,820</td>
</tr>
<tr>
<td>1999</td>
<td>430</td>
<td>20,480</td>
<td>4,590</td>
<td>145,990</td>
<td>45,120</td>
<td>216,610</td>
</tr>
<tr>
<td>2000</td>
<td>353</td>
<td>24,376</td>
<td>4,202</td>
<td>75,173</td>
<td>33,470</td>
<td>137,574</td>
</tr>
<tr>
<td>2001</td>
<td>377</td>
<td>15,466</td>
<td>4,952</td>
<td>127,852</td>
<td>26,524</td>
<td>175,171</td>
</tr>
<tr>
<td>2002</td>
<td>557</td>
<td>16,217</td>
<td>5,060</td>
<td>87,310</td>
<td>23,210</td>
<td>132,354</td>
</tr>
<tr>
<td>2003</td>
<td>615</td>
<td>17,993</td>
<td>4,208</td>
<td>124,250</td>
<td>30,912</td>
<td>177,978</td>
</tr>
<tr>
<td>2004</td>
<td>804</td>
<td>16,532</td>
<td>5,464</td>
<td>99,934</td>
<td>44,846</td>
<td>167,580</td>
</tr>
<tr>
<td>2005</td>
<td>662</td>
<td>10,853</td>
<td>4,662</td>
<td>146,931</td>
<td>43,007</td>
<td>206,115</td>
</tr>
<tr>
<td>Average 1994-2005</td>
<td>570</td>
<td>17,783</td>
<td>5,242</td>
<td>110,594</td>
<td>38,926</td>
<td>173,114</td>
</tr>
<tr>
<td>Average 2000-2005</td>
<td>561</td>
<td>16,906</td>
<td>4,758</td>
<td>110,242</td>
<td>33,662</td>
<td>166,129</td>
</tr>
</tbody>
</table>

- Pink and sockeye salmon dominate Alaska’s total salmon harvests.
- 2005 in particular was a bumper year for pink harvests, with 147 million fish.
- Sockeye harvests were also healthy in 2004 and 2005.
- Strong harvests for both pink and sockeye salmon in 2004 and 2005 have yielded above average total harvests.
- Alaska’s 2005 salmon harvest of 206 million fish was the highest total since 1999.
- It is also well above the 2000-2005 average harvest of 166 million fish.
- Average harvests from 2000-2005 have been lower than in earlier years.

5.2. Quotas¹²,¹⁴,¹⁶,¹⁷,¹⁸

- Before analysing ADF&G’s 2006 stock projections, we must review how closely previous stock assessments indicated eventual actual landings.
5.2.1. All species

<table>
<thead>
<tr>
<th>Year</th>
<th>Forecast</th>
<th>Actual</th>
<th>Diff (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>127,936</td>
<td>131,374</td>
<td>2.6%</td>
</tr>
<tr>
<td>2003</td>
<td>150,903</td>
<td>177,998</td>
<td>15.2%</td>
</tr>
<tr>
<td>2004</td>
<td>196,393</td>
<td>167,582</td>
<td>(17.2%)</td>
</tr>
<tr>
<td>2005</td>
<td>180,671</td>
<td>206,115</td>
<td>12.3%</td>
</tr>
<tr>
<td>Average 2002-2005</td>
<td>163,976</td>
<td>170,767</td>
<td>3.2%</td>
</tr>
</tbody>
</table>

- For the 2002-2005 period ADF&G’s forecasts for total salmon harvests have been within 3% of the eventual actual harvest.
- Within the period the accuracy of individual year forecasts have varied approximately 15% above or below the mean variance.
- We can therefore be relatively confident that ADF&G’s 2006 all species forecasts will fall within 15% of the eventual harvest.

5.2.2. Chinook

<table>
<thead>
<tr>
<th>Year</th>
<th>Forecast</th>
<th>Actual</th>
<th>Diff (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>416</td>
<td>584</td>
<td>28.8%</td>
</tr>
<tr>
<td>2003</td>
<td>457</td>
<td>634</td>
<td>27.9%</td>
</tr>
<tr>
<td>2004</td>
<td>518</td>
<td>816</td>
<td>36.5%</td>
</tr>
<tr>
<td>2005</td>
<td>765</td>
<td>662</td>
<td>(15.6%)</td>
</tr>
<tr>
<td>Average 2002-2005</td>
<td>539</td>
<td>674</td>
<td>19.4%</td>
</tr>
</tbody>
</table>

- Chinook is one of Alaska’s low volume salmon harvests.
- Therefore to save effort ADF&G predicts future harvests using an average of recent years’ harvests.
- Since 2002 this has meant wild variations between preseason predictions and actual harvests, from (16%) to 37%, a peak-to-peak swing of 53%.
- Since the three most recent years show a consistent overestimation of the harvest by an average of 20%, we will adjust ADF&G’s 2006 projection by this figure.
5.2.3. Chum

<table>
<thead>
<tr>
<th>Year</th>
<th>Forecast</th>
<th>Actual</th>
<th>Diff (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>13,300</td>
<td>16,210</td>
<td>18.0%</td>
</tr>
<tr>
<td>2003</td>
<td>23,039</td>
<td>17,993</td>
<td>(28.0%)</td>
</tr>
<tr>
<td>2004</td>
<td>21,268</td>
<td>16,531</td>
<td>(28.7%)</td>
</tr>
<tr>
<td>2005</td>
<td>17,623</td>
<td>10,853</td>
<td>(62.4%)</td>
</tr>
<tr>
<td>Average 2002-2005</td>
<td>18,808</td>
<td>15,397</td>
<td>(25.3%)</td>
</tr>
</tbody>
</table>

- Chum is one of Alaska’s low volume salmon harvests.
- Therefore to save effort ADF&G predicts future harvests using an average of recent years’ harvests.
- Since 2002 this has meant wild variations between preseason predictions and actual harvests, from (62%) to 18%, a peak-to-peak swing of 80%.
- Since the three most recent years show a consistent overestimation of the harvest by an average of 25%, we will adjust ADF&G’s 2006 projection down by this figure.

5.2.4. Coho

<table>
<thead>
<tr>
<th>Year</th>
<th>Forecast</th>
<th>Actual</th>
<th>Diff (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>4,820</td>
<td>5,059</td>
<td>4.7%</td>
</tr>
<tr>
<td>2003</td>
<td>5,003</td>
<td>4,208</td>
<td>(18.9%)</td>
</tr>
<tr>
<td>2004</td>
<td>5,136</td>
<td>5,463</td>
<td>6.0%</td>
</tr>
<tr>
<td>2005</td>
<td>5,092</td>
<td>4,662</td>
<td>(9.2%)</td>
</tr>
<tr>
<td>Average 2002-2005</td>
<td>5,013</td>
<td>4,848</td>
<td>(4.4%)</td>
</tr>
</tbody>
</table>

- Coho is one of Alaska’s low volume salmon harvests.
- Therefore to save effort ADF&G predicts future harvests using an average of recent years’ harvests.
- Since 2002 these projections have been relatively accurate, ranging from (19%) to 6%, a peak-to-peak swing of 25%.
- Since the average variance in recent years is less than 10% in either direction, and since there is no clear trend, we will use ADF&G’s coho projections at par.
### 5.2.5. Pink

<table>
<thead>
<tr>
<th>Year</th>
<th>Forecast</th>
<th>Actual</th>
<th>Diff (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>87,300</td>
<td>87,310</td>
<td>0.0%</td>
</tr>
<tr>
<td>2003</td>
<td>92,034</td>
<td>124,251</td>
<td>25.9%</td>
</tr>
<tr>
<td>2004</td>
<td>119,257</td>
<td>99,933</td>
<td>(19.3%)</td>
</tr>
<tr>
<td>2005</td>
<td>114,386</td>
<td>146,931</td>
<td>22.1%</td>
</tr>
<tr>
<td>Average 2002-2005</td>
<td>103,244</td>
<td>114,606</td>
<td>7.2%</td>
</tr>
</tbody>
</table>

- Pink is Alaska's highest volume salmon harvest.
- A large proportion of the pink salmon broodstock is from hatcheries, so estimates are more exact.
- Only for a few two small pink salmon fisheries does ADF&G use average historical harvests to estimate future harvests, again improving the accuracy of overall estimates.
- Since 2002 these projections have been relatively inaccurate, ranging from (19%) to 26%, a peak-to-peak swing of 45%.
- Pink salmon return to spawn reliably at two years of age (i.e. the majority of a given year class will return at two years of age).
- This lead to year-to-year variations in run strength depending on the abundance of specific year classes. This typically demonstrates itself as an odd/even year variation.
- Since pink salmon demonstrate large variations in biomass between odd and even year classes, and since 2005 was a bumper year, we will assume that 2006 projections will overestimate the actual harvest by 20%.

### 5.2.6. Sockeye

<table>
<thead>
<tr>
<th>Year</th>
<th>Forecast</th>
<th>Actual</th>
<th>Diff (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>22,100</td>
<td>22,211</td>
<td>0.5%</td>
</tr>
<tr>
<td>2003</td>
<td>30,370</td>
<td>30,912</td>
<td>1.8%</td>
</tr>
<tr>
<td>2004</td>
<td>50,214</td>
<td>44,839</td>
<td>(12.0%)</td>
</tr>
<tr>
<td>2005</td>
<td>42,805</td>
<td>43,007</td>
<td>0.5%</td>
</tr>
<tr>
<td>Average 2002-2005</td>
<td>36,372</td>
<td>35,242</td>
<td>(2.3%)</td>
</tr>
</tbody>
</table>

- Sockeye is Alaska's second highest volume salmon harvest, and by far its most valuable.
• Bristol Bay’s sockeye fishery accounts for the majority of Alaska’s sockeye harvest and its runs have been remarkably consistent in recent years, leading to more accurate ADF&G projections of total sockeye harvests for the state.

• Since 2002 these projections have been relatively accurate, ranging from (12%) to 2%, a peak-to-peak swing of only 14%.

• Since the year-to-year differences between ADF&G harvest projections and actual harvests have been small, and since the average difference is only (2%), we will use ADF&G’s sockeye harvest projections at par.
6. 2006 SEASON\textsuperscript{18}

- ADF&G announced a 2006 forecast of 167 million fish for Alaska’s salmon fisheries.
- This is a (7.5\%) drop from its 2005 forecasts and a much larger drop from actual 2005 harvests.
- The agency expects lower harvests for pink and sockeye salmon, Alaska’s two large volume salmon species.

### ALASKA SALMON PROJECTIONS

<table>
<thead>
<tr>
<th>Area</th>
<th>2006 Catch/Forecast factor</th>
<th>2005 Forecast</th>
<th>Actual catch</th>
<th>2006 (proj.) Forecast</th>
<th>Proj. catch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinook</td>
<td>1.20</td>
<td>765</td>
<td>662</td>
<td>780</td>
<td>936</td>
</tr>
<tr>
<td>Chum</td>
<td>0.75</td>
<td>17,623</td>
<td>10,853</td>
<td>17,552</td>
<td>13,164</td>
</tr>
<tr>
<td>Coho</td>
<td>1.00</td>
<td>5,092</td>
<td>4,662</td>
<td>4,959</td>
<td>4,959</td>
</tr>
<tr>
<td>Pink</td>
<td>0.80</td>
<td>114,386</td>
<td>146,931</td>
<td>108,005</td>
<td>86,404</td>
</tr>
<tr>
<td>Sockeye</td>
<td>1.00</td>
<td>42,805</td>
<td>43,007</td>
<td>35,636</td>
<td>35,636</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>180,671</td>
<td>206,115</td>
<td>166,932</td>
<td>141,099</td>
</tr>
</tbody>
</table>

- Using the adjustment factors determined in the last section, we project a 2006 salmon harvest of 141 million fish.
- This harvest would be a major drop (~30\%) drop from the actual 2005 harvest of 206 million fish.
- Our estimate is approximately (15\%) lower than ADF&G’s estimate of 167 million fish.
- This difference is within the range of 2002-2005 variances between ADF&G projections and eventual actual harvests (the range was -15\% to +15\%).
- In addition to being well below 2005 harvests, our estimate of 141 million fish is also below the 2002-2005 average harvest of 171 million fish.
- We anticipate a medium drop (20\%) in sockeye harvests to 36 million fish.
- For pink salmon we anticipate the largest drop (41\%) to 86 million fish. This drop represents nearly the entire difference between 2005 harvests and our 2006 projections.
7. FUTURE SEASONS (2007-2009)

7.1. Model

- Using ADF&G’s year end salmon fishery reviews, we can roughly rate the annual scale of escapement for the major Alaskan salmon runs as a multiplier.
- For example an average escapement is rated 1.00, double the average escapement is rated 2.00, and half the average escapement is rated 0.50.
- Individual year classes of all salmon species save pinks spawn over a range of ages.
- For example chum salmon spawn from ages 3-5.
- For runs that comprise several year classes, we average the above multipliers for those composite year classes.
- Pink salmon return only at two years of age, so a run comprises only one year class.
- We then multiply historic average harvests by the multiplier to achieve a “gross forecast”.
- Again using ADF&G’s year end reviews we identify the fisheries in which effort is somehow reduced from its full capacity.
- Reduced effort may result from poor market conditions (low demand, low price), limited processor capacity or effort restrictions.
- For example in Prince William Sound pink salmon runs are often abundant enough to allow for a greater catch, but fishermen devote their fishing time to the more valuable sockeye species, allowing large pink salmon escapements year after year.
- Another example is in the Upper Cook Inlet chum fishery, where officials have restricted fishing times, lowering annual catches below capacity and allowing large escapements year after year.
- For these reduced effort fisheries, we apply a multiplier (e.g. 0.50) to our “gross forecast” to achieve our final forecast for major fishery.
- We have produced forecasts for a species only in years for which the parent year spawning run is known.
- For example chum salmon spawn between 3-5 years of age, and 2005 is the last known parent year class, so the furthest we can predict is the 2008 run (comprised of 2003-2005 year classes).
7.2. Forecasts

<table>
<thead>
<tr>
<th>Species</th>
<th>2000-2005</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avg</td>
<td>Low</td>
<td>High</td>
<td>Mid</td>
</tr>
<tr>
<td>Chinook</td>
<td>561</td>
<td>502</td>
<td>679</td>
<td>590</td>
</tr>
<tr>
<td>Chum</td>
<td>16,906</td>
<td>11,637</td>
<td>15,744</td>
<td>13,690</td>
</tr>
<tr>
<td>Coho</td>
<td>4,758</td>
<td>4,905</td>
<td>6,637</td>
<td>5,771</td>
</tr>
<tr>
<td>Pink</td>
<td>110,242</td>
<td>131,299</td>
<td>177,640</td>
<td>154,470</td>
</tr>
<tr>
<td>Sockeye</td>
<td>33,662</td>
<td>28,664</td>
<td>38,781</td>
<td>33,722</td>
</tr>
</tbody>
</table>

- ADF&G’s forecasts generally fall within 15% of the eventual harvest, so we have shown a “low” and “high” forecast of +/- 15% of our “mid” forecast.

- Relative to 5-year averages we predict **above average** Alaska-wide harvests for:
  - 2007 cohos
  - 2007 pinks
  - 2008 chinooks
  - 2009 chinooks
  - 2009 sockeyes

- Relative to 5-year averages we predict **average** Alaska-wide harvests for:
  - 2007 chinooks
  - 2007 sockeyes
  - 2008 cohos
  - 2008 sockeyes

- Relative to 5-year averages we predict **below average** Alaska-wide harvests for:
  - 2007 chums
  - 2008 chums
8. APPENDIX

8.1. Acronyms

ADF&G  Alaska Department of Fisheries and Game
Supply Market Study – Pacific Salmon Prospects

1. http://fishbase.org/Summary/SpeciesSummary.php?id=244