Genetic Stock Composition of the Commercial Harvest of Sockeye Salmon in Kodiak Management Area, 2014–2016

Kyle Shedd
M. Birch Foster
Chris Habichct

A Report to the Alaska Board of Fisheries

January 2017
Division of Commercial Fisheries

Oral Report: RC 3; Tab 5
Written Report: RC 3; Tab 9
Topics to be covered:

1. Background
2. Sampling Methods
3. Sampling Results
4. Genetic Baseline
   - Reporting Groups
   - Genetic Diversity
5. Analysis Methods
6. Genetic Mixed Stock Analysis Results
   - Stock Composition
   - Stock-Specific Harvest
7. Interpretation
Background

- Late 70s, BOF mgmt plans (e.g. Westside, Alitak, Igvak)
- Maintain traditional fishing opportunities and allocations
- Mixed stock fisheries (local and non local)
Background

- Temporal and spatial presence of sockeye is of regional importance
- Tagging studies and scale pattern analysis form basis of knowledge
- Genetic mixed stock analysis (MSA) used successfully for sockeye
- MSA never conducted in the KMA
Background

• 61 sockeye spawning streams
• Directed sockeye fisheries (escapement-based management)
• Pink, chum, coho directed fisheries
• Large overlap in run timing exists
Sampling Methods

• Sample at 3 ports in the Kodiak Area: Kodiak, Larsen Bay, Alitak
• Analyze a representative 380 samples per spatio-temporal stratum (6 areas, 3 temporal strata)
• Collect 3-5x the analysis goal and post-season subsampling
• Temporal strata
  – Early: June (early-run sockeye)
  – Middle: July (sockeye, pink, chum)
  – Late: Aug (late-run sockeye, pink, chum)
Sampling Methods

• Collect genetic tissue (axillary process)
Sampling Areas
Sampling Results

- 45,165 fin clip samples
- 18,558 genotyped for analysis

Gillnetting in Central Section of the KMA
Uganik-Kupreanof sampling area

<table>
<thead>
<tr>
<th>Dates-Strata</th>
<th>Harvest</th>
<th>Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/1–6/27 Early</td>
<td>79,494</td>
<td>1,400</td>
</tr>
<tr>
<td>6/28–7/25 Middle</td>
<td>128,836</td>
<td>1,400</td>
</tr>
<tr>
<td>7/26–8/29 Late</td>
<td>163,843</td>
<td>1,220</td>
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<table>
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<td>79,494</td>
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<td>31,607</td>
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<tr>
<td>128,836</td>
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<tr>
<td>163,843</td>
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<td>143,567</td>
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Uyak sampling area

<table>
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<tr>
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<th>Samples</th>
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<tbody>
<tr>
<td>6/1–6/27 Early</td>
<td>102,346</td>
<td>1,400</td>
</tr>
<tr>
<td>6/28–7/25 Middle</td>
<td>126,840</td>
<td>1,400</td>
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<tr>
<td>7/26–8/29 Late</td>
<td>155,658</td>
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<tr>
<td>2016</td>
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### Karluk-Sturgeon sampling area

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<td>Harvest</td>
<td>Samples</td>
<td>Harvest</td>
</tr>
<tr>
<td>6/1–6/27 Early</td>
<td>56,018</td>
<td>1,092</td>
<td>35,183</td>
<td>800</td>
<td>13,856</td>
<td>600</td>
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<tr>
<td>6/28–7/25 Middle</td>
<td>68,438</td>
<td>960</td>
<td>29,915</td>
<td>509</td>
<td>10,700</td>
<td>900</td>
</tr>
<tr>
<td>7/26–8/29 Late</td>
<td>124,879</td>
<td>2,000</td>
<td>63,532</td>
<td>800</td>
<td>113,445</td>
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## Ayakulik-Halibut Bay sampling area

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<th>Samples</th>
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<th>Samples</th>
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</thead>
<tbody>
<tr>
<td>6/1–6/27 Early</td>
<td>162,984</td>
<td>1,276</td>
<td>203,170</td>
<td>1,200</td>
<td>3,937</td>
<td>220</td>
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<tr>
<td>6/28–7/25 Middle</td>
<td>175,205</td>
<td>600</td>
<td>384,390</td>
<td>800</td>
<td>120,068</td>
<td>1,000</td>
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<tr>
<td>7/26–8/29 Late</td>
<td>57,066</td>
<td>1,050</td>
<td>20,619</td>
<td>400</td>
<td>33,721</td>
<td>800</td>
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- **Lake Caville**
- **Becharof Lake**
- **Shelikof Strait**
## Alitak sampling area

### Harvest Samples

<table>
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<tr>
<th>Dates-Strata</th>
<th>Harvest</th>
<th>Samples</th>
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<tbody>
<tr>
<td>6/1–6/27 Early</td>
<td>Closed</td>
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<tr>
<td>6/28–7/25 Middle</td>
<td>115,998</td>
<td>1,100</td>
</tr>
<tr>
<td>7/26–8/29 Late</td>
<td>5,437</td>
<td>742</td>
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### 2014

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<tr>
<td>6/1–6/27 Early</td>
<td>28,723</td>
<td>600</td>
</tr>
<tr>
<td>6/28–7/25 Middle</td>
<td>165,894</td>
<td>800</td>
</tr>
<tr>
<td>7/26–8/29 Late</td>
<td>31,294</td>
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### 2015

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<td>6/1–6/27 Early</td>
<td>11,118</td>
<td>400</td>
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<tr>
<td>6/28–7/25 Middle</td>
<td>61,930</td>
<td>885</td>
</tr>
<tr>
<td>7/26–8/29 Late</td>
<td>21,243</td>
<td>1,309</td>
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### 2016

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<th>Dates-Strata</th>
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<tbody>
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<td>6/1–6/27 Early</td>
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<td>-</td>
</tr>
<tr>
<td>6/28–7/25 Middle</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7/26–8/29 Late</td>
<td>-</td>
<td>-</td>
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<td>Dates-Strata</td>
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<tr>
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<td>Samples</td>
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<tr>
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<td>-</td>
<td>Closed</td>
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<tr>
<td>Closed</td>
<td>-</td>
<td>6,595</td>
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Igvak sampling area
Genetic Baseline

• Sampled populations
  – All potential stocks represented

• Populations genetically characterized

• Reporting groups tested
  – Groups of populations that can be genetically distinguished

• Mixed-stock analysis
  – Used to estimate stock contributions
Genetic Baseline

473 Populations
6 Regional Reporting Groups
14 Total Reporting Groups

Black Lake
Chignik Lake

Regional Reporting Groups:
- West of Chignik
- Chignik
- Kodiak
- Cook Inlet
- Prince William Sound
- South of Cape Suckling

Upper Station / Akalura
Ayakulik / Frazer
Karluk
Uganik
Northwest Kodiak
Afognak
Eastside Kodiak
Saltery

Map showing genetic baseline with various population clusters and regional reporting groups.
Harvest Sample Analysis

- Selected harvest samples
- Analyzed genetic samples
Uyak Stock Composition

Percentage of Catch

2014
- June 1-27
- June 28-July 25
- July 26-August 29

2015
- June 1-July 3
- July 4-August 1
- August 2-29

2016
- June 1-27
- June 28-July 25
- July 26-August 29

Regional Reporting Group
- West of Chignik
- Chignik
- Kodiak
- Cook Inlet
- PWS
- South of Cape Suckling

Subregional Reporting Group
- Black Lake
- Chignik Lake
- U. Station
- Ayakulik
- Karluk
- Uganik
- Northwest Afognak
- Eastside
- Sallery
- Kodiak
Uyak Stock-Specific Harvest

2014
- June 1-27
- June 28-July 25
- July 26-August 29

2015
- June 1-July 3
- July 4-August 1
- August 2-29

2016
- June 1-27
- June 28-July 25
- July 26-August 29

Regional Reporting Group
- West of Chignik
- Cordemec
- Cook Inlet
- PWS South of Cape Suckling
- Black Lake
- Chignik U. Station
- Ayakulik Karluk
- Uganik
- Northwest Afognak
- Eastside Sallery
- Kodiak

Subregional Reporting Group
- U. Station
- Afognak
- Eastside
- Sallery
- Kodiak

Map: Location of Uyak within the region.
Ayakulik-Halibut Bay Stock Composition

2014
- June 1-27
- June 28-July 25
- July 26-August 29

2015
- June 1-July 3
- July 4-August 1
- August 2-29

2016
- June 1-27
- June 28-July 25
- July 26-August 29

Regional Reporting Group
- West of Chignik
- Chignik
- Kodiak
- Cook Inlet
- PWS
- South of Cape Suckling

Subregional Reporting Group
- Black Lake
- Chignik Lake
- U. Station
- Ayakulik
- Karluk
- Uganik
- Northwest Afognak
- Eastside
- Sallery
- Kodiak
- Eastside
- Saltery
- Kodiak
- Eastside
- Sallery
- Kodiak

Ayakulik-Halibut Bay

Lake Corille
Chelikof Strait
Becharof Lake

Map of Ayakulik-Halibut Bay
Alitak Stock Composition

2014
- June 28-July 25
- July 26-August 29

2015
- June 1-July 3
- July 4-August 1
- August 2-29

2016
- June 1-27
- June 28-July 25
- July 26-August 29

Regional Reporting Group
- West of Chignik
- Chignik
- Kodiak
- Cook Inlet
- PWS
- South of Cape Suckling

Subregional Reporting Group
- Black Lake
- Chignik U. Station
- Ayakulik
- Karluk
- Uganik
- Northwest Afognak
- Eastside
- Saltery
- Kodiak
- Alitak
- Chignik Kodiak Cook Inlet
- Inlet
- Peninsula
- South of Cape Suckling
- West of Chignik
Alitak Stock-Specific Harvest

2014
- June 28-July 25
- July 26-August 29

2015
- June 1-July 3
- July 4-August 1
- August 2-29

2016
- June 1-27
- June 28-July 25
- July 26-August 29

Regional Reporting Group
- West of Chignik
- Chignik
- Kodiak
- Cook Inlet
- PWS
- South of Cape Suckling

Subregional Reporting Group
- Black Lake
- Chignik U. Station
- Ayakulik
- Karluk
- Uganik
- Northwest Afognak
- Eastside
- Sallery
- Kodiak
- Afognak Eastside
- Kodiak Saltery
Igvak Stock Composition

No estimates available for 2014

2015
- July 4-August 1

2016
- June 1-27
- June 28-July 25

Regional Reporting Group
- West of Chignik
- Chignik
- Kodiak
- Cook Inlet
- PWS
- South of Cape Suckling

Subregional Reporting Group
- Black Lake
- Chignik Lake
- U. Station
- Ayakulik
- Karluk
- Ugak
- Northwest
- Afognak
- Eastside
- Saltery
- Kodiak

90%
### KMA Stock Composition

**June 1-August 29**
- **2014**: 46.7%
- **2015**: 55.2%
- **2016**: 62.4%

**Regional Reporting Group**
- West of Chignik
- Chignik
- Kodiak
- Cook Inlet
- PWS
- South of Cape Suckling

**Subregional Reporting Group**
- Black Lake
- Chignik Lake
- U. Station
- Ayakulik
- Karluk
- Uganik
- Northwest Afognak
- Kodiak
- Eastside
- Saltery

---
KMA Stock-Specific Harvest

June 1-August 29
- 2014: 46.7%
- 2015: 55.2%
- 2016: 62.4%

Number of Fish Harvested (Thousands)

Regional Reporting Group
- South of Cape Suckling
- Chignik
- Chignik Inlet
- Kodiak

Subregional Reporting Group
- Karluk
- Uganik
- Afognak
- Northwest
- Eastside
- Saltery
- Black Lake
- U. Station
- Ayakulik
- Karhuk
- Frazer
- Kodiak

Kodiak Management Area
2014 Stock-Specific Harvest

# Sampling Area
- Uganik
- Kupreanof
- Uuyak
- Karluk
- Sturgeon
- Ayakulik
- Halibut Bay
- Alitak
- Igvak

# Reporting Group
- West of Chignik
- Black Lake
- Chignik Lake
- U. Station
- Akahura
- Ayakulik
- Frazier
- Karluk
- Uganik
- Northwest Kodiak
- Afognak
- Eastside Kodiak
- Saltery
- Cook Inlet
- PWS
- South of Cape Suckling

# Harvest (Thousands)

<table>
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<th>Harvest (Thousands)</th>
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<tbody>
<tr>
<td>1</td>
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<tr>
<td>5</td>
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<tr>
<td>10</td>
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<td>20</td>
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<td>50</td>
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<tr>
<td>100</td>
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<tr>
<td>150</td>
</tr>
<tr>
<td>200</td>
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<tr>
<td>250</td>
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</tbody>
</table>

- Stock-Specific Harvest
- Sampling Area
- Reporting Group
- Harvest (Thousands)
Interpreting Results

• First information of genetic stock composition of the harvest

• Inferences outside the study years, areas, or temporal periods
  – Production regime
  – Ocean conditions
  – Prosecution of fisheries
    • Pink salmon

• Harvest ≠ Presence
  – Fishing vulnerability may vary by stock
  – Fishing distribution is not random
Acknowledgements

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Questions?