

# Evaluation of merits and costs of different marker types

Genetics workgroup

# Pacific Salmon Commission Expert Panel

- **David G. Hankin**, Chair Fisheries Biology, Humboldt State University
- **Gary S. Morishima**, CEO, MORI-ko, LLC
- **John H. Clark**, Chief Scientist, Alaska Dept. of Fish and Game
- **Richard B. Deriso**, Chief Scientist, Tuna-Billfish Program, Scripps
- **Carlos Garza**, Supervisory Geneticist, NOAA Fisheries SW Center
- **Brian E. Riddell**, Research Scientist, Pacific Biological Station
- **Carl Schwarz**, Prof., Statistics and Actuarial Science, Simon Fraser
- **James B. Scott**, Chief Scientist, Wash. Dept. of Fish and Wildlife

***Recommendation 12.*** We recommend that the Pacific Salmon Commission support an immediate evaluation of a coordinated transition for all salmon species from genetic stock identification (GSI) based on the use of microsatellite markers to GSI based on single nucleotide polymorphism (SNPs) markers. It is important to develop standard sets of species-specific SNPs and related protocols now, so that coast-wide implementation of SNP-based GSI will be cost-effective and efficient.

# Talk overview

- Types of genetic markers
- STRs vs. SNPs
  - Number of alleles and resolution
  - Analysis time and costs
  - In-season applications
  - Standardization
  - Marker and baseline availability
- Genetics Workgroup recommendations

# Talk overview

- Types of genetic markers
- STRs vs. SNPs
  - Number of alleles and resolution
  - Analysis time and costs
  - In-season applications
  - Standardization
  - Marker and baseline availability
- Genetics Workgroup recommendations



Clip fin

Extract  
DNA

PCR

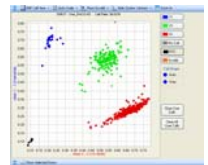
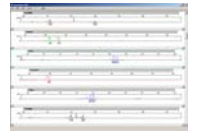
Analyze  
PCR  
products

Interpret  
raw data

STR analysis:



SNP analysis:



# Talk overview

- Types of genetic markers
- **STRs vs. SNPs**
  - Number of alleles and resolution
  - Analysis time and costs
  - In-season applications
  - Standardization
  - Marker and baseline availability
- Genetics Workgroup recommendations



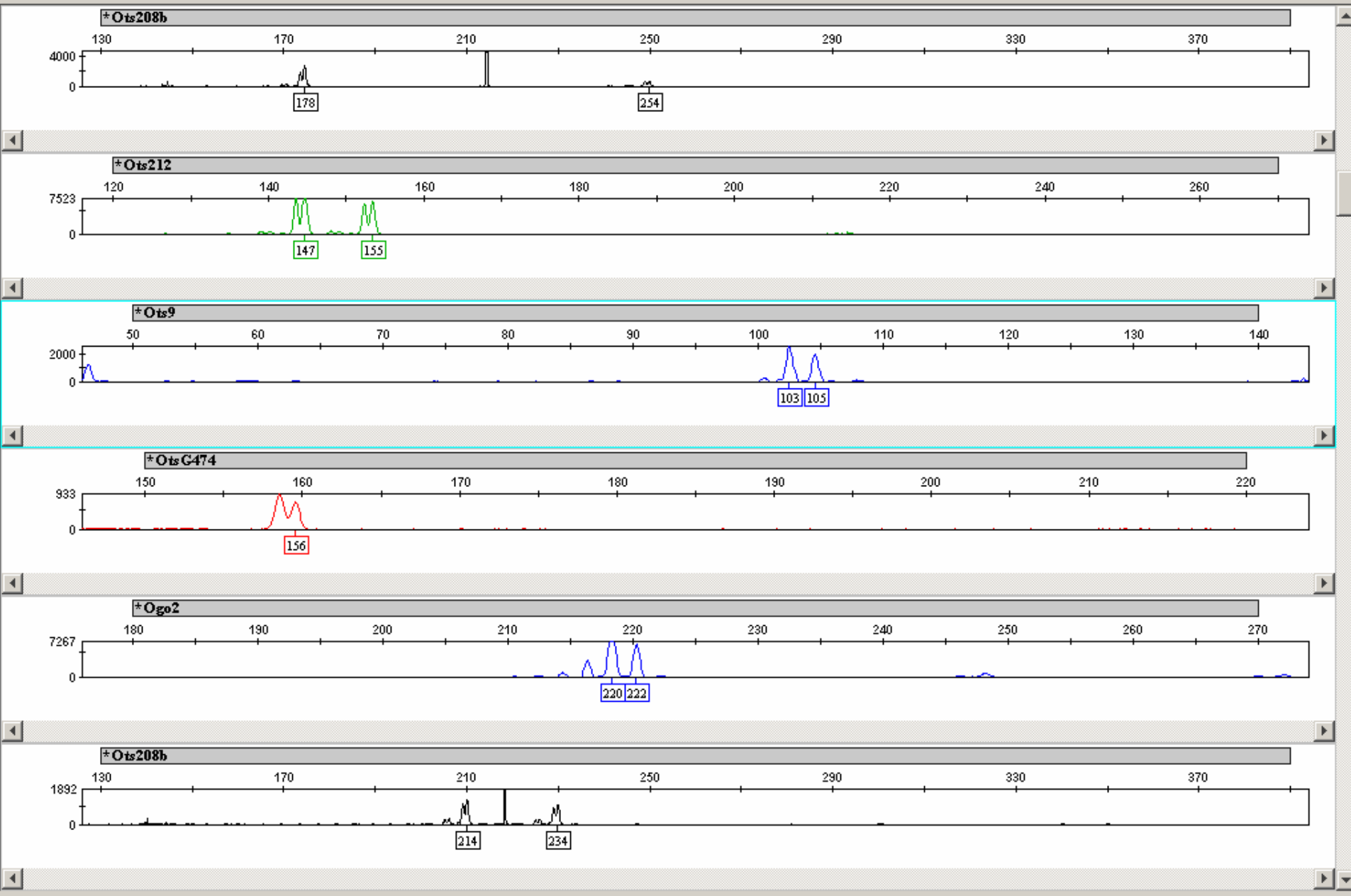
# Marker information content

(number of markers used to achieve ~ equal performance)

Application	STRs	SNPs
Western AK chum salmon	15	61
Bristol Bay sockeye salmon	12	48
Copper River Chinook salmon	12	50

# Talk overview

- Types of genetic markers
- **STRs vs. SNPs**
  - Number of alleles and resolution
  - **Analysis time and costs**
  - In-season applications
  - Standardization
  - Marker and baseline availability
- Genetics Workgroup recommendations



Clip fin

Extract  
DNA

PCR

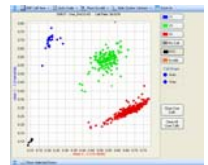
Analyze  
PCR  
products

Interpret  
raw data

STR analysis:



SNP analysis:

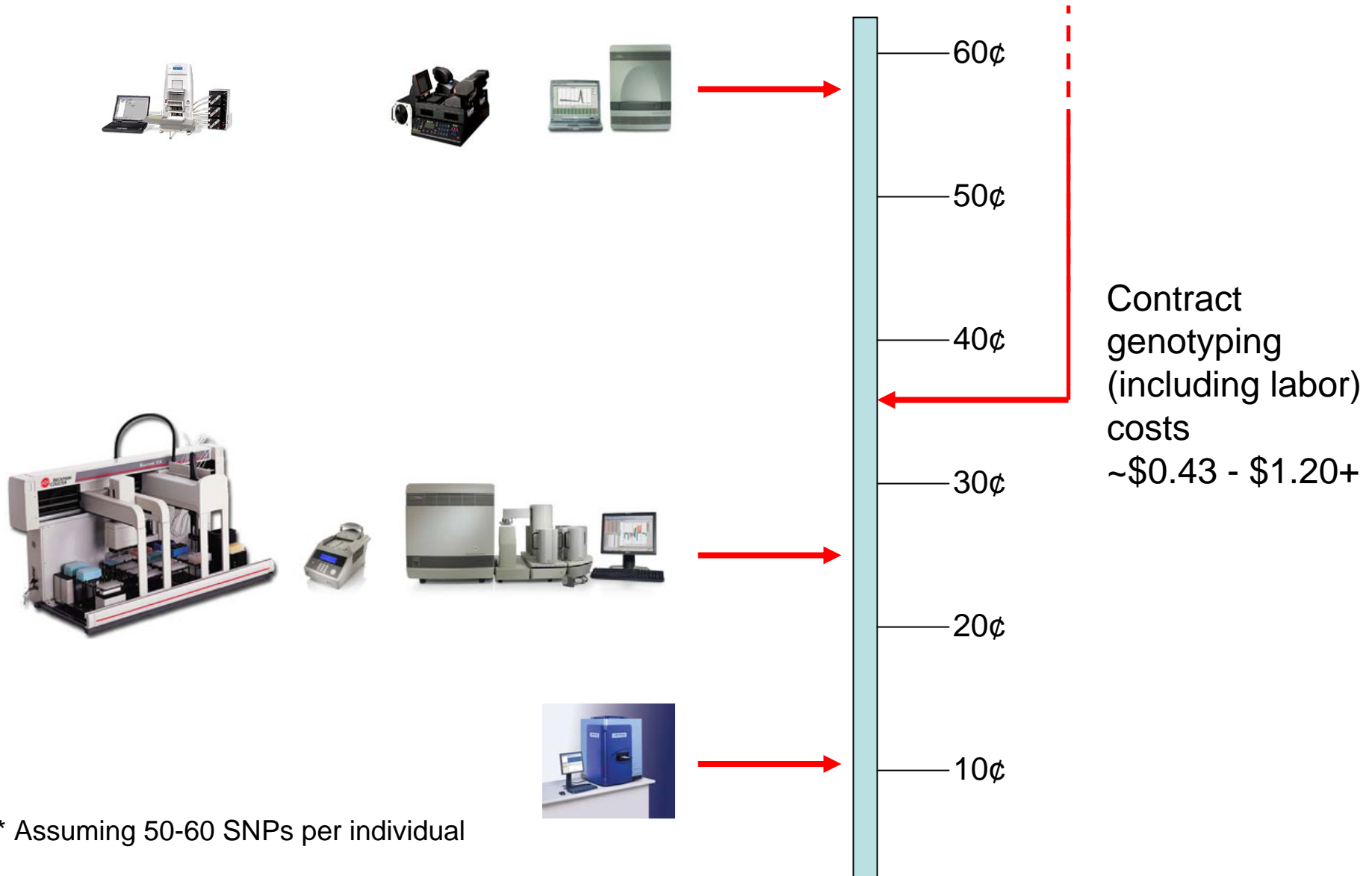


# Talk overview

- Types of genetic markers
- **STRs vs. SNPs**
  - Number of alleles and resolution
  - **Analysis time and costs**
  - In-season applications
  - Standardization
  - Marker and baseline availability
- Genetics Workgroup recommendations

# SNP Genotyping Costs

How close are we to prediction of pennies per genotype?\*



\* Assuming 50-60 SNPs per individual

# Genotyping Costs

How many SNPs can I analyze for the same cost as STRs?



18 SNPS



42 SNPS



87 SNPS

# Marker information content

(number of markers used to achieve ~ equal performance)

Application	STRs	SNPs
Western AK chum salmon	15	61
Bristol Bay sockeye salmon	12	48
Copper River Chinook salmon	12	50



# Talk overview

- Types of genetic markers
- **STRs vs. SNPs**
  - Number of alleles and resolution
  - **Analysis time and costs**
  - In-season applications
  - Standardization
  - Marker and baseline availability
- Genetics Workgroup recommendations

# Talk overview

- Types of genetic markers
- **STRs vs. SNPs**
  - Number of alleles and resolution
  - Analysis time and costs
  - **In-season applications**
  - Standardization
  - Marker and baseline availability
- Genetics Workgroup recommendations

# STRs in-season: 24 hr turnaround of 800 Fraser River sockeye



# SNPs in-season: 16 hr turnaround of 400 Bristol Bay sockeye



Clip fin

Extract  
DNA

PCR

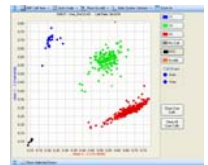
Analyze  
PCR  
products

Interpret  
raw data

STR analysis:



SNP analysis:



# Talk overview

- Types of genetic markers
- **STRs vs. SNPs**
  - Number of alleles and resolution
  - Analysis time and costs
  - In-season applications
  - **Standardization**
  - Marker and baseline availability
- Genetics Workgroup recommendations

# Talk overview

- Types of genetic markers
- **STRs vs. SNPs**
  - Number of alleles and resolution
  - Analysis time and costs
  - In-season applications
  - Standardization
  - **Marker and baseline availability**
- Genetics Workgroup recommendations

# Talk overview

- Types of genetic markers
- STRs vs. SNPs
  - Number of alleles and resolution
  - Analysis time and costs
  - In-season applications
  - Standardization
  - Marker and baseline availability
- **Genetics Workgroup recommendations**



# Genetics Workgroup Recommendations:

- Broad-scale empirical comparisons of resolution provided by SNPs and STRs
- Maintain and improve existing genetic baselines
- use GAPS approach for future marker standardization

