What is the American Fisheries Society?

The American Fisheries Society (AFS), founded in 1870, is the oldest and largest professional society representing fisheries scientists. AFS promotes scientific research and enlightened management of resources for optimum use and enjoyment by the public. It also encourages a comprehensive education for fisheries scientists and continuing on-the-job training.

The AFS publishes some of the world's leading fisheries research journals: the *Transactions of the American Fisheries Society; North American Journal of Fisheries Management; North American Journal of Aquaculture, Journal of Aquatic Animal Health,* and *Fisheries.*

The AFS organizes scientific meetings where new results are reported and discussed. In addition to these primary functions, the Society has many other programs in areas such as professional certification, international affairs, public affairs, and public information.

AFS Mission Statement

The mission of the American Fisheries Society is to improve the conservation and sustainability of fishery resources and aquatic ecosystems by advancing fisheries and aquatic science and promoting the development of fisheries professionals.

The Alaska Chapter of AFS

The Alaska Chapter is the local organization in Alaska for the American Fisheries Society. Major activities include our annual meeting, which consists of technical paper presentations, special guest lecturers, and continuing education courses for fisheries professionals. Through resolutions and letters to policy makers, the AK Chapter has supported continued conservation and stewardship of Alaska's fisheries.

Visit the Alaska Chapter AFS Website at *http://www.fisheries.org/afs-ak/*

Cover Assembled by: Sharice Walker, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences

Cover Art: *Pair of Kings* by Jerelyn Miyashiro

Artist Bio: Jerelyn Miyashiro is a multimedia artist who creates works in gyotaku printmaking, watercolors, sculpture and jewelry. Originally from Hawaii, she has lived in Anchorage since 1980. Jerelyn states "*The gyotaku print captures the beautiful shape and lines of the fish and reveals fine textural details in the scales and fins. I use watercolors to redefine the eyes, add color to enhance the dimension and put in sweeping line work to instill energy and movement to the print."* She is the owner of JtMiyash Art (www.jtmiyash-art.com) and can be contacted at 907-310-3964 and jtmiyash@ak.net.

A special thanks to those individuals who shared their knowledge, time, and expertise in planning and organizing the 2011 Chapter Meeting together

Alaska Chapter of the American Fisheries Society

Alaska Chapter Executive Committee

Lisa Stuby, Past President
Audra Brase, President
Trent Sutton, President Elect
Mark Wipfli, Vice President
Julie Bednarski, Secretary
Lee Ann Gardner, Treasurer
Emily Lescak, Student Unit President

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Communications and Publicity

Allen Bingham, Alaska Department of Fish and Game

Audio/Visual Support

AK-AFS Student Subunits (UAS, UAF, UAS)

Plenary Speakers

James Balsiger
National Oceanic and Atmospheric Administration
Alaska Fisheries Region

Michael Daigneault
Alaska Department of Fish and Game
Habitat Division

John O. Mark
Coastal Villages Region Fund

Session Chairs

Milo Adkison, University of Alaska Fairbanks
Thomas Farrugia, University of Alaska Fairbanks
Palma Ingles, U.S. Fish and Wildlife Service
Phil Loring, University of Alaska Fairbanks
Franz Mueter, University of Alaska Fairbanks
Julie Nielsen, University of Alaska Fairbanks
Ted Otis, Alaska Department of Fish and Game
Valli Peterson, ASRC Energy Service Alaska, Inc.
Amanda Rosenberger, University of Alaska Fairbanks
Tim Sands, Alaska Department of Fish and Game
Jim Seeb, University of Alaska Fairbanks
Andy Seitz, University of Alaska Fairbanks
Elizabeth Siddon, University of Alaska Fairbanks
Jason Stolarski, University of Alaska Fairbanks
Joel Webb, Alaska Department of Fish and Game
Chris Zimmerman, U.S. Geological Survey

Continuing Education Class Coordination

Tammy Hoem Neher, University of Alaska Fairbanks

Continuing Education Instructors

Using Sonar Technology in Fisheries
Sound Metrics Inc.

Microanalyses of Fish Otoliths
Chris Zimmerman, U.S. Geological Survey

Analyzing Ecological Data
Franz Mueter, University of Alaska Fairbanks

Banquet Entertainment

Hobo Jim

Meeting Donars

Alaska Department of Fish and Game, Division of Commercial Fisheries
Alaska Department of Fish and Game, Division of Sport Fish
British Petroleum Exploration Alaska, Inc.
Kenai River Sportfishing Association
University of Alaska Fairbanks, School of Fisheries and Ocean Sciences

A Special THANKS to Institutions, Organizations, and Individuals that Donated Live and Silent Auction Items and Made Other Financial Contributions to the Meeting

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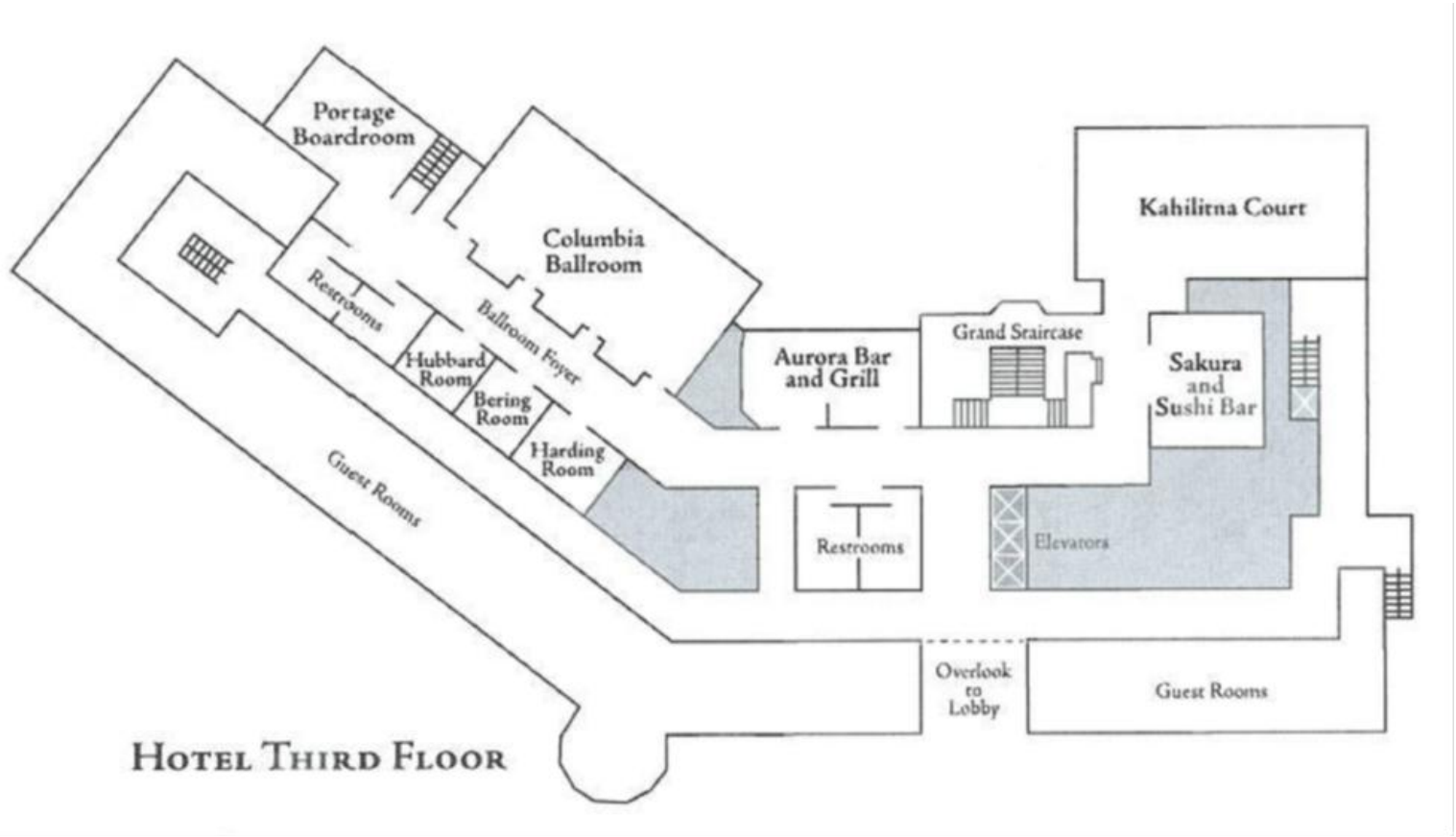
Schedule at a Glance for 2011 AK Chapter AFS Annual Meeting

Day/Date	Time Period	Columbia A	Columbia B	Columbia C	Kahiltna Court	Columbia Foyer
Monday November 14	Morning	Using Sonar In Fisheries	Otolith Chemistry			
	Afternoon	Using Sonar In Fisheries				
Tuesday November 15	Morning	Using Sonar In Fisheries		Ecological Data Analysis		
	Afternoon	Using Sonar In Fisheries		Ecological Data Analysis		Registration
	Evening				**Welcome Social (6:00 – 8:30 p.m.)**	

Day/Date	Time Period	Columbia B/C	Kahiltna Court	Columbia Foyer
Wednesday November 16	Early Morning	**Plenary Session (Columbia Ballroom)**		Registration
	Late Morning	Spatial Dynamics	Partners Program	
	Lunch	**Boxed Lunch (Columbia Foyer); Student-Mentor Luncheon (Columbia A); Past Presidents Meeting/Luncheon (Portage Board Room and Salon)**		
	Early Afternoon	Genetics	Utilization and Governance	
	Late Afternoon	Genetics	Stock Assessment	
	Evening	**Poster Social (Main Lobby; 6:00 – 8:00 p.m.)**		
Thursday November 17	Early Morning	Freshwater Ecology	Stock Assessment	Registration
	Late Morning	Freshwater Ecology	Pacific Herring	
	Lunch	**Boxed Lunch (Columbia Foyer)**		
	Early Afternoon	Freshwater Ecology	Pacific Herring	
	Late Afternoon	Education and Outreach	Marine Ecology	
	Early Evening	**Alaska Chapter AFS Business Meeting (Kahiltna Court; 5:00 – 6:30 p.m.)**		
	Evening	**Banquet, Live Auction, and Live Music by Hobo Jim (Columbia Ballroom; 6:30 – 9:30 p.m.)**		
Friday November 18	Early Morning	Habitat	Marine Invertebrates	Registration
	Late Morning	**Awards and Adjournment (Kahiltna Court; 11:00 – 11:30 a.m.)**		

Alyeska Resort Map



Banquet Program

Banquet Entertainment
Hobo Jim

Live Auction
Auctioneer: Andy Seitz

Awards

Congratulations to the following Alaska Chapter of the American Fisheries Society members who have been members of the Society at the national level for at least 25 years. Upon reaching this achievement, members are awarded with a commemorative pin. These members will be recognized at the Chapter Banquet on Thursday evening.

Name	City	Join Date
Christopher Estes	Anchorage, AK	1976
Stanley Moberly	Tumwater, WA	1964
Robert Ellis	Sitka, AK	1950
John Thedinga	Juneau, AK	1977
Seven Zemke	Anchorage, AK	1979
Denny Lassuy	Anchorage, AK	1980
Timothy Joyce	Cordova, AK	1981
Tom Kron	Anchorage, AK	1981
Richard Matson	Juneau, AK	1982
David Fluharty	Seattle, WA	1984

2011 Alaska Chapter AFS Conference Schedule

MONDAY, NOVEMBER 14 - CONTINUING EDUCATION

9:00 a.m. – 5:00 p.m.
Columbia A – Using Sonar Technology in Fisheries (Day 1 of 2)
Sound Metrics, Inc., Instructor

9:00 a.m. – 12:30 p.m.
Columbia B – Microanalysis of Fish Otoliths: Uses and Limitations
***Christian Zimmerman,* Instructor**

TUESDAY, NOVEMBER 15 - CONTINUING EDUCATION

9:00 a.m. – 4:40 p.m.
Columbia A – Using Sonar Technology in Fisheries (Day 2 of 2)
Sound Metrics, Inc., Instructor

9:00 a.m. – 4:30 p.m.
Columbia C – Beyond the Linear Model: Analyzing Ecological Data Using Generalized Mixed-Effects Models
Franz Mueter, Instructor

3:30 – 5:30 PM
Conference Registration Starts – Columbia Foyer

6:00 - 8:00 p.m.
Welcome Reception – Kahiltna Court
To get drink tickets, you MUST first pick up your registration packet

WEDNESDAY, NOVEMBER 16

7:45 a.m. – 6:00 p.m.
Conference Registration Continues – Columbia Foyer

Plenary Session – Columbia Ballroom
8:20 – 8:30 a.m.
Welcome – *Audra Brase*
Opening Remarks and Introduction of Plenary Speakers – *Trent Sutton*

8:30 – 9:00 a.m.
Fisheries in Today's Alaska: Integrating Fish, Habitat, and People - A Federal Perspective
James Balsiger

9:00 – 9:30 a.m.
Fish Habitat in Alaska: At a Confluence or up the Creek?
Michael Daigneault

9:30 – 10:00 a.m.
Fishing the Kuskokwim Bay and It's Tributaries
John O. Mark

10:00 – 10:20 a.m. – Break

Columbia B/C – Concurrent Session #1
Spatial Dynamics and Analyses in Fisheries
***Julie Nielsen and Andrew Seitz,* Chairs**

10:20 – 10:40 a.m.
Characterizing the Juvenile Fish Community in Large Glacial Rivers in Alaska
Parker Bradley, Mark Evans, Aaron Dupuis and Andy Seitz

10:40 – 11:00 a.m.
Movements of Rainbow Trout Radio-Tagged in Upper Talarik Creek
Betsy McGregor, MaryLouise Keefe, Dudley Reiser, Paul McLarnon, and Scott Prevatte

11:00 – 11:20 a.m.
Spawning Distribution and Migratory Timing of Kuskokwim River Sheefish using Radiotelemetry
Lisa Stuby

11:20 – 11:40 a.m.
A Radio Telemetry Investigation of the Spawning Origins of Yukon Drainage Inconnu
Randy Brown and John Burr

11:40 – Noon
Winter Movement Patterns and Habitat Use of Kotzebue Region Inconnu
Nicholas Smith, Trent Sutton, Christian Zimmerman, Raymond Hander, Christine Moran, and Alex Whiting

Noon – 12:20 p.m.
Beyond Light: Geolocation of Demersal Fishes in Alaska Using Geomagnetic Archival Tags
Julie Nielsen and Andrew Seitz

Kahiltna Court – Concurrent Session #2
Working With Subsistence Communities: The Partners for Fisheries Monitoring Program
***Palma Ingles,* Chair**

10:20 – 10:40 a.m.
Counting Fish and Building Trust with Subsistence Communities in Alaska
Palma Ingles

10:40 – 11:00 a.m.
Kuskokwim Native Association: Co-Management through Shared Cooperation on the Middle Kuskokwim
Michael Thalhauser

11:00 – 11:20 a.m.
Kuskokwim Native Association: A Comprehensive Approach to Fisheries Education in Rural Alaska
LaDonn Robbins and Scott Fritz

11:20 – 11:40 a.m.
The Native Village of Eyak's Partnership for Fisheries Monitoring
Keith van den Broek

11:40 – Noon
The Tanana Chiefs Conference's Fisheries Program: How Can it Best Serve Its People and Protect Fisheries Resources?
Aaron Dupuis

Noon – 12:20 p.m.
The Role of the Bristol Bay Native Association in the Co-Management of Subsistence Fisheries
Courtenay Gomez

12:20 – 1:20 p.m.
Boxed Lunch – Columbia Foyer
Student-Mentor Luncheon – Columbia A
Past Presidents Meeting/Luncheon Portage Board Room and Salon

Columbia B/C – Concurrent Session #1
Genetics, Genomics, and the Sustainability of Alaska's Fish Resources
***Jim Seeb,* Chair**

1:20 – 1:40 p.m.
Identification of Ancient Clades in Threespine Stickleback Populations from Prince William Sound and the Gulf of Alaska
Emily A. Lescak, William A. Cresko, Frank A. von Hippel

1:40 – 2:00 p.m.
Phylogeography of Least Cisco (*Coregonus sardinella*) in Northern Alaska: Preliminary Results
Veronica Padula, Andres Lopez, and Douglas Causey

2:00 – 2:20 p.m.
When Chum Salmon Meet: Examining a Zone of Secondary Contact in Alaska Using Single Nucleotide Polymorphisms
Eleni L. Petrou, Bill Templin, and Lisa Seeb

2:20 – 2:40 p.m.
Population Structure and Ecology of Bering Cisco (*Coregonus laurettae*) from Northwest Alaska
Ora L. Schlei, John K. Wenburg, Randy J. Brown, Douglas Causey, and Jeffrey B. Olsen

2:40 – 3:00 p.m. – Break

3:00 – 3:20 p.m.
The Sockeye Salmon Baseline for WASSIP: One Baseline to Rule Them All
Tyler H. Dann, Christopher Habicht, Jim R. Jasper, Elisabeth C. Fox, Heather L. Hildebrand, Eric S. Lardizabal, Judy M. Berger, Paul A. Kuriscak, Zac D. Grauvogel, and William D. Templin

3:20 – 3:40 p.m.
Genetics on the Large-Scale: A Study of Pacific Salmon Running the Gauntlet
Chris Habicht, Jim Jasper, Tyler Dann, Nick Decovich, Andrew Barclay, Judy Berger, Lisa Fox, Serena Rogers, Heather Hildebrand, Zac Grauvogel, Paul Kuriscak, Tara Harrington, and William Templin

3:40 – 4:00 p.m.
Just Because You Can Does Not Mean You Should: Responsibly Defining Reporting Groups for Mixed-Stock Analysis.
Christopher Habicht, Jim R. Jasper, Tyler H. Dann, Andrew Barclay, Sara Gilk-Baumer, Nickolas Decovich, and William D. Templin

4:00 – 4:20 p.m.
Next-Generation Sequencing (NGS) in Wildlife Research: Opportunities and Challenges
Matthew A. Campbell and J. Andres Lopez

4:20 – 4:40 p.m.
Natal Origins, Distributions and Migration Patterns of Chinook Salmon in the Bering Sea and North Pacific Ocean
Wesley Larson, Fred Utter, William Templin, Kate Myers, Jim Seeb, and Lisa Seeb

4:40 – 5:00 p.m.
Heritability of Traits in Wild Chinook Salmon
Jeffrey B. Olsen, Jeffrey J. Hard, Ken Harper, Steve J. Miller, Ora L. Schlei, and John K. Wenburg

Kahiltna Court – Concurrent Session #2
Sustainable Fisheries: Utilization, Economics, and Governance
***Philip Loring,* Chair**

1:20 – 1:40 p.m.
Transitional States in Arctic Fisheries: Challenges, Risks, and Opportunities
Philip A. Loring

1:40 – 2:00 p.m.
Responsible Fishery Management and Sustainable Seafood-A New Assessment/Certification Model
Randy L. Rice

2:00 – 2:20 p.m.
Adaptation and Maladaptation—Factors that Influence the Fragility of Fisheries
Keith R. Criddle

2:20 – 2:40 p.m.
Meeting Indigenous Subsistence Needs: Prey Switching in Rural Alaska
Winslow D. Hansen, Todd J. Brinkman, F. Stuart Chapin, III, and Caroline Brown

2:40 – 3:00 p.m. – Break

3:00 – 3:20 p.m.
"That's What Opening Day is For:" Social and Cultural Dimensions of Commercial Salmon Fishing in Cook Inlet
Philip A Loring, Hannah L. Harrison, and S. Craig Gerlach

3:20 – 3:40 p.m.
Adopting a Precautionary Approach to Fisheries Management in the Central Arctic Ocean
Jeremy Davies

Kahiltna Court – Concurrent Session #2
Fisheries Stock Assessment
***Milo Adkison,* Chair**

3:40 – 4:00 p.m.
Development of an Inseason Assessment Tool for Managing Kuskokwim River Chinook Salmon Fisheries
Ken Harper and Kevin Schaberg

4:00 – 4:20 p.m.
Simulation of AYK Salmon Runs
William R. Bechtol and Keith Criddle

4:20 – 4:40 p.m.
Salmon Assessment Using DIDSON in Kenai River, with Species Apportionment by Mixture Model
Jiaqi Huang, Steve Fleischman, and Deborah Burwen

4:40 – 5:00 p.m.
When the Best-Fit Model is Not the Best: Selecting a Model From a Biological Point of View
Xinxian Zhang

6:00 - 8:00 p.m.
Poster Social – Main Lobby

THURSDAY, NOVEMBER 17

Columbia B/C – Concurrent Session #1
Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems
***Christian Zimmerman,* Chair**

8:00 – 8:20 a.m.
A Description of Biological Characteristics of Bering Cisco Coregonus laurettae in the Coastal Yukon River Delta
David M. Runfola and Trent M. Sutton

8:20 – 8:40 a.m.
Arctic and Alaskan Brook Lampreys: Different Species or Life-History Variants?
Trent M. Sutton, J. Andres, Lopez, and Matthew Evenson

8:40 – 9:00 a.m.
Cogs, Wheels, ... and Wrenches: The Role of Invasive Species in Alaska's Freshwater Ecosystems
Denny Lassuy and Tammy Davis

9:00 – 9:20 a.m.
Uptake and Trophic Transfer of Perchlorate in a Simulated Northern Pike and Threespine Stickleback Food Web
Christoff G. Furin, Frank A. von Hippel, B. Hagedorn, and Todd M. O'Hara

9:20 – 9:40 a.m.
The Importance of Drifting Debris for Drift-Feeding Juvenile Chinook Salmon
Jason R. Neuswanger, Nicholas F. Hughes, Mark S. Wipfli, and Amanda E. Rosenberger

9:40 – 10:00 a.m.
Determining Whether Freshwater Growth Affects Recruitment of Yukon and Kuskokwim Chinook Salmon by Use of Retrospective Growth Analysis
Justin Leon and Megan McPhee
10:00 – 10:20 a.m. – Break

10:20 – 10:40 a.m.
Spatiotemporal Distribution of Migrating Pacific Salmon (*Oncorhynchus* spp.), Relative to Tide, Temperature, and Time of Day.
Samantha Simpson, Gregory Buck, Suzanne Maxwell, and Brad Harris

10:40 – 11:00 a.m.
Age, Sex, and Length Trends of Yukon Salmon Species
Toshihide "Hamachan" Hamazaki

11:00 – 11:20 a.m.
Chinook Salmon Subsistence Harvest on the Yukon River
Lisa Kangas

11:20 – 11:40 a.m.
Juvenile Coho Salmon Migration and Habitat Use in Meadow Creek, Alaska
Jonathon Gerken

11:40 a.m. – Noon
Fisheries Application of Side Scan Sonar Within the Yukon River, Alaska
Heather A. Leba and Carl T. Pfisterer

Noon – 12:20 p.m.
Eighteen Years of Chignik Smolt Investigations: Utility, Application, and Accuracy
Adam St. Saviour and Dawn Hunt

12:20 – 1:20 p.m.
Boxed Lunch – Columbia Foyer

Kahiltna Court – Concurrent Session #2
Fisheries Stock Assessment
***Milo Adkison,* Chair**

8:00 – 8:20 a.m.
Low Intensity, Low Cost Management of Salmon Fisheries
Milo Adkison

8:20 – 8:40 a.m.
Run Reconstructions in Bristol Bay, Alaska
Justin Carney and Milo Adkison

8:40 – 9:20 a.m.
Statistical Consulting in a State Resource Agency: Experiences Gleaned from a 30+ year Career
Allen E. Bingham

Kahiltna Court – Concurrent Session #2
Herring Research and Management
***Ted Otis and Tim Sands,* Chairs**

9:20 – 9:40 a.m.
Investigation of Pacific Herring (*Clupea pallasii*) Stock Structure in Alaska Using Otolith Microchemistry and Heart Tissue Fatty Acid Composition
Ted Otis

9:40 – 10:00 a.m.
A Fisherman's View and Historical Perspective of Alaska's Herring Fisheries, 1969-Present
Beaver Nelson

10:00 – 10:20 a.m. – Break

10:20 – 10:40 a.m.
Market Trends for Alaska Herring Roe
Gunnar Knapp

10:40 – 11:00 a.m.
Stock Assessment of Pacific Herring in Southeast Alaska
Kyle Hebert

11:00 – 11:20 a.m.
Managing the Sitka Sound Sac Roe Herring Harvest
Dave Gordon

11:20 – 11:40 a.m.
Prince William Sound Pacific Herring History and Current Stock Status
Steve Moffitt

11:40 a.m. – Noon
Considering Predation by Humpback Whales in the Mystery of the Failed Recovery of Pacific Herring in Prince William Sound, Alaska
Suzanne F. Teerlink and Terrance J. Quinn II

Noon – 12:20 p.m.
Estimating Overwinter Mortality of Age-0 Pacific Herring Based on Loss of Energy and Implications for Recruitment
Tom Kline

12:20 – 1:20 p.m.
Boxed Lunch – Columbia Foyer

Columbia B/C – Concurrent Session #1
Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems
***Christian Zimmerman,* Chair**

1:20 – 1:40 p.m.
Freshwater Ecology of a Glacially Dominated Stream Under Consideration Hydropower Production
James Brady, Robin Beebee, Patrick Blair, Adinda Demski, Isaac Watkins, and Heidi Wegner

1:40 – 2:00 p.m.
Influence of Turbidity and Hydrocarbons on Little Susitna River Juvenile Salmon Habitat
Jeffrey C. Davis, and Gay A. Davis, and Laura Eldred

2:00 – 2:20 p.m.
Stream Water Temperatures in the Matanuska-Susitna Basin
Leslie R. Jensen, Jeffrey C. Davis, and Gay A. Davis

2:20 – 2:40 p.m.
A Comparative Assessment of Pre- and Post-Spawning Gravel Quality in the North and South Fork Koktuli rivers, and Upper Talarik Creek.
Dudley Reiser, Paul DeVries, and MaryLouise Keefe

2:40 – 3:00 p.m. – Break

Columbia B/C – Concurrent Session #1
Fisheries Education and Outreach: Reaching out to Youth in Alaska and Reeling in Fish Biologists of the Future
***Valli Peterson,* Chair**

3:00 – 3:20 p.m.
Aquatic Education Strategies of the Alaska Department of Fish and Game, Division of Sport Fish
Jay Baumer

3:20 – 3:40 p.m.
Connecting the Connected (A Fish in Water Doesn't Understand Water)
Dan Pascucci

3:40 – 4:00 p.m.
Walk in the Wader Boots of an AFS Hutton Jr. Fisheries Student and Mentor Team
Christine Gleason and Suzanne Hayes

4:00 – 4:20 p.m.
The Alaska Marine Science and Fisheries Career Coalition – Networking to Enhance Opportunity
Asia Beder and Paula Cullenberg

4:20 – 4:40 p.m.
Educating and Recruiting the Next Generation of Fisheries Professionals
Andrew C. Seitz, Katie Straub, and Trent M. Sutton

4:40 – 5:00 p.m.
Experiential Learning in Fisheries – A "Win-Win" for Students and Industry
Katie M. Straub, Amanda E. Rosenberger, and Trent M. Sutton

Kahiltna Court – Concurrent Session #2
Herring Research and Management
***Ted Otis and Tim Sands,* Chairs**

1:20 – 1:40 p.m.
Kodiak Herring: A Brief History
Matt Birch Foster

1:40 – 2:00 p.m.
A Brief History the Togiak Herring Fishery
Tim Sands

2:00 – 2:20 p.m.
GIS Aerial Survey Data Improves Understanding of Togiak Herring Biomass and Ecology
Matt Jones

2:20 – 2:40 p.m.
Togiak Herring: Stock Assessment and Forecasting
Greg Buck, Tim Baker, and Fred West

2:40 – 3:00 p.m. – Break

Kahiltna Court – Concurrent Session #2
Marine Fisheries Ecology
***Franz Mueter and Elizabeth Siddon,* Chairs**

3:00 – 3:20 p.m.
Effects of Climate Variability on the Abundance and Distribution of Demersal Fishes in the California Current Ecosystem
Anne Beaudreau and Philip S. Levin

3:20 – 3:40 p.m.
The Gulf of Alaska Integrated Ecosystem Research Program: Preliminary Findings from the First Field Season
Jamal Moss, Kalei Shotwell, Olav Ormseth, and Mark Zimmerman

3:40 – 4:00 p.m.
Connecting Climate Variability to Recruitment Success of Walleye Pollock (*Theragra chalcogramma*) through Bioenergetics
Elizabeth C. Siddon, Ron Heintz, Franz J. Mueter

4:00 – 4:20 p.m.
Nutritional Ecology of Juvenile Pacific Herring (*Clupea pallasii*): Nucleic Acid Ratios as an Index of Growth and Starvation Threshold
Ashwin Sreenivasan, Ronald A. Heintz, Johanna J. Vollenweider, Stanley D. Rice, Paul K. Hershberger, and Jacob L. Gregg

4:20 – 4:40 p.m.
Otolith Chemistry of Arctic Cod, Arctic Staghorn Sculpin, and Bering Flounder in the Chukchi Sea
Christine Gleason and Brenda Norcross

4:40 – 5:00 p.m.
An Overview of ShoreZone Imagery and Habitat Mapping in Alaska
Cindy Hartman Moore, Sue Saupe, Mandy Lindeberg, Scott Johnson, Steve Lewis, John Harper, and Mary Morris

5:00 - 6:30 p.m.
Alaska Chapter of the American Fisheries Society Business Meeting – Kahiltna Courtroom

6:30 - 9:30 p.m.
Banquet, Live Auction, and Live Music

FRIDAY, NOVEMBER 18

Columbia B/C – Concurrent Session #1
Marine Invertebrates in Alaska
***Joel Webb,* Chair**

8:40 – 9:00 a.m.
Induction of Broadcast Spawning in Hatchery Held California Sea Cucumbers (*Parastichopus californicus*): Potential Implications for Current Alaskan Commercial Fisheries
Charlotte Regula-Whitefield and Sarah M. Hardy

9:00 – 9:20 a.m.
Marine Macroinvertebrates of Alaska: Annotated Checklist
David T. Drumm and James W. Orr

9:20 – 9:40 a.m.
Pribilof Domain King Crab Habitat Mapping Pilot Project: Demonstrating Efficacy of Multibeam Sonar Technology for Multiuse Seabed Mapping
Michelle Ridgway, Christopher Popham, and Christopher Merculief

9:40 – 10:00 a.m.
Phylogeography of Red King Crabs in Alaskan Waters
W. Stewart Grant and Wei Cheng

10:00 – 10:20 a.m.
Molt Timing and Soft Shell Handling Levels for Male Dungeness Crabs in Southeast Alaska
Gretchen H. Bishop

10:20 – 10:40 a.m.
Hybrid *Chionoecetes* in the Bering Sea: What We Know and What We Don't Know
Dan Urban

10:40 – 11:00 a.m. – Break

Kahiltna Court – Concurrent Session #2
The Whole Picture: Tying Habitat to Ecosystem Processes and Fisheries Health
***Amanda Rosenberger,* Chair**

8:40 – 9:00 a.m.
Application of a GIS-based Model to Predict Population Response of Chinook and Coho Salmon to Habitat Restoration and Climate Change in Southcentral Alaska
Jeffry L. Anderson, Frank K. Ligon, Jody B. Lando, and Peter F. Baker

9:00 – 9:20 a.m.
Freshwater Baseline Inventory and Monitoring in Nushagak and Kvichak Headwater Streams
Carol Ann Woody, Sarah O'Neal, and Dan Bogan

9:20 – 9:40 a.m.
Flexible Methods for Rapid Mapping of Marine and Estuarine Habitats and Fish Presence Using Towed Underwater Video
Leyla Arsan, Chris Moller, Ryan French, and Melissa Katz-Moye

9:40 – 10:00 a.m.
Physical Habitat Correlates of Juvenile Pacific Salmon Density in the Kulukak River, Alaska
Jesse M. Coleman and Trent M. Sutton

10:00 – 10:20 a.m.
A Framework for Assessment of Ecological Risk to Wild Salmon Associated with Large-Scale Mining in the Nushagak and Kvichak Headwaters of Bristol Bay
David Trim

10:20 – 10:40 a.m.
Distribution and Habitats of Juvenile Coho Salmon in Tributaries of the Little Susitna River, Alaska
Kevin M. Foley and Amanda Rosenberger

10:40 – 11:00 a.m. – Break

11:00 – 11:30 a.m.
Awards and Adjournment – Kahiltna Court

Session – Plenary

Fisheries in Today's Alaska: Integrating Fish, Habitat, and People - A Federal Perspective

James Balsiger

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This presentation provides an overview of what is considered to be the world's best managed wild fisheries—the Alaska fisheries. After a brief look at the history of the Alaska fisheries and how it has been the lifeblood of Alaskan peoples for thousands of years, Dr. Balsiger delves into the modern, progressive management of the fisheries, thanks to the landmark legislation that governs American fishing policy based on science—the Magnuson-Stevens Act. The MSA set up the Exclusive Economic Zone from 3-200 nautical miles off shore, made American fishing grounds off-limits to foreign fishing fleets, and has just this year resulted in the end of overfishing in the U.S. through the implementation of annual catch levels and accountability measures. Dr. Balsiger explores the human dimension of the Alaska fisheries, from economics to the value of traditional and local knowledge to the need to maintain sustainable fisheries despite pressures from an increasing world population hungry for more protein. A look at the future of Alaska fisheries investigates various scenarios, including impacts of climate change and the changing health of the world's oceans, improving habitat to make the most of wild stocks, and using value-added methods to make the most of the fisheries resource. Finally, Dr. Balsiger makes the case for venturing into aquaculture not only to produce more high-quality, low-footprint protein, but as a means for economic renewal through good-paying jobs that cannot be transferred abroad.

Session – Plenary

Fish Habitat in Alaska: At a Confluence or up the Creek?

Michael Daigneault

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Fish, habitat, and people are inherently linked. People have a varied history of living with and utilizing fish and their habitat. In some cases, people have had a long-standing respect for fish and their habitat, while in other cases, people have substantially altered habitat and the only thing that remains is a mere fraction of the fish resources that once existed. Alaska is currently blessed with abundant fish resources and diverse fish habitat. Alaska is also an aggressive development State. Lessons learned elsewhere should give us ample knowledge to make informed decisions about responsible development and appropriate habitat protection. The Alaska Department of Fish and Game's mission is to protect, maintain, and improve the fish, game, and aquatic plant resources of the state, and manage their use and development in the best interest of the economy and the well-being of the people of the state, consistent with the sustained yield principle. Within the context of that mission, the Division of Habitat has the responsibility to protect Alaska's valuable fish and wildlife resources and their habitats as Alaska's population and economy continue to expand. The Division carries out this responsibility through its statutory authority to review development projects and protect fish habitat through the issuance, monitoring, and enforcement of fish habitat permits. This authority has a range of strengths and limitations. The Division, the Department, fishery professionals, local and tribal governments, non-governmental organizations, and the Alaska legislature all play a role in developing policy and making important choices regarding the protection of fish habitat and continued development within Alaska. The greater question is: whose choice is it anyway?

Session – Plenary

Fishing the Kuskokwim Bay and It's Tributaries

John O. Mark

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Issues related to fisheries management in the Kuskokwim Bay area will be discussed in this presentation from the context of subsistence, recreational, and commercial fishing. Subsistence fishing activities will be discussed within the context of how a subsistence user exercises his efforts to manage the fish (e.g., length of fishing time, efforts not to disturb spawning grounds, staying on the main channel of the river, etc.). The tidal effects of this region, the necessary equipment and supplies for processing the fish (e.g., boat, net and other accessories, fish dry rack, smoke house, camp site, etc.), will also be described, as well as the need to catch only what is needed based on family size. An overview of subsistence fishing regulations will also be provided. In addition, guided and unguided sport fishing and float trips down the Kanetok River have become increasingly popular. The impact on the environment and the habitat of fish through recreational fishing (e.g., the disturbance of spawning grounds, potential spread of invasive species through equipment such as felt sole waders, erosion caused by outboard motor wakes, etc.) has significant implications and also effects human behavior during the sport fishing season. Finally, a brief history of commercial fishing activities in the Kuskokwim region will be discussed. An overview of Kuskokwim working salmon group efforts to manage commercial fishing openers will be provided as well as how quality control over salmon have evolved in commercial fishing over the years.

Session - Spatial Dynamics and Analyses in Fisheries

Characterizing the Juvenile Fish Community in Large Glacial Rivers in Alaska

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Migration and distribution patterns of juvenile fishes in large glacial rivers in Alaska are poorly understood. To characterize the juvenile fish communities in these rivers as part of a study assessing the potential impacts of hydrokinetic turbines, we sampled juvenile fishes in the Yukon River at Eagle, AK from June to September 2010 and the Tanana River at Nenana, AK from May to September 2011. River margin sampling was accomplished at both locations using modified fyke nets, while an incline plane trap was used in the Tanana River to sample fishes in the middle of the river channel. All captured fish were identified to the lowest taxonomic level, measured for fork length and released alive. River margin catches in both rivers consisted mostly of longnose suckers (*Catostomus catostomus*), Arctic grayling (*Thymallus arcticus*), whitefishes (*Prosopium* spp. *and Coregonus* spp.) and chum salmon (*Oncorhynchus keta*), all of which showed distinct peaks in catches. Chinook salmon (*O. tshawytscha*), coho salmon (*O. kisutch*), inconnu (*Stenodus leucichthys*), lake chub (*Couesius plumbeus*), burbot (*Lota lota*), lamprey (*Lamptera* spp.) and slimy sculpin (*Cottus cognatus*) were infrequently captured in river margins and did not display any temporal trends in catches. Mid-channel catches in the Tanana River consisted mainly of chum salmon, age-1 Chinook salmon and age-1 coho salmon. Species-specific variation in catches among sampling locations suggests that juvenile fishes exhibit preference for distinct habitats within the river channel during their downstream migrations. This knowledge advances our baseline understanding of migration and distribution patterns of juvenile fishes in large glacial Alaskan rivers, which will contribute to assessing potential impacts of human development, such as hydrokinetic turbines.

Student

Session - Spatial Dynamics and Analyses in Fisheries

Movements of Rainbow Trout Radio-Tagged in Upper Talarik Creek

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In 2007, a radio-telemetry study was initiated to: 1) document if large rainbow trout foraging and spawning in Upper Talarik Creek (UT) were part of a distinct UT population or members of a larger, more-complex Kvichak River basin population and 2) describe life history strategies used by these fish specifically addressing: adfluvial migration, inter-stream movement, and site fidelity to UT for foraging and/or spawning. Ninety-seven rainbow trout (>40 cm) captured in UT were surgically implanted with radio transmitters during late summer 2007 and spring 2008. The late summer (N=38) and spring (N=59) tag groups represented, respectively, trout that had foraged and spawned in UT. Twenty-seven of the tagged fish were eliminated from analysis due to too few detections and/or detection days. The movements and distribution of the remaining 70 fish were summarized during foraging, spawning, and overwinter periods.

Two major patterns emerged from the telemetry data: 1) fish left UT after tagging and returned for foraging and/or spawning and 2) fish left and never returned to UT. Most fish that returned to UT did so during the spawning period with a few fish returning during foraging. Outside UT, tagged fish moved into and out of Iliamna Lake and associated tributaries. Trout overwintered outside UT in four streams: Lower Talarik Creek, Pete Andrews Creek, Kvichak River, New Halen River. During this study, radio-tagged trout exhibited directed adfluvial and inter-stream movements into habitats that supported different biological functions as well as some degree of site fidelity to UT for spawning and foraging.

Session - Spatial Dynamics and Analyses in Fisheries

Spawning Distribution and Migratory Timing of Kuskokwim River Sheefish using Radiotelemetry

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A multiple-year radiotelemetry study was initiated in 2007 to expand our understanding of sheefish, or inconnu, *Stenodus leucichthys* in the Kuskokwim River drainage. Management of the sheefish population for long-term sustainability requires a greater understanding of their life history and radiotelemetry techniques have allowed for precise documentation of sheefish locations, movements, and migration timing. The primary purpose of this study has been to identify locations of spawning aggregations. The study has also provided information on feeding and overwintering areas and migration timing into and out of these areas. Information gathered from this study can be used to design future studies to investigate the population dynamics of specific spawning stocks and stock abundance.

During 2007 and 2008, 119 sheefish were captured and surgically implanted with radio transmitters throughout the Kuskokwim River drainage. Radio-tagged sheefish were tracked from fall 2007 through fall 2011using 8 stationary tracking stations and a series of aerial tracking flights. So far, three probable spawning areas have been identified in the upper reaches of the Kuskokwim River drainage: a 20km section of Big River, and ≈2km sections of Middle and East Forks of the Kuskokwim River. Sheefish arrived at their spawning areas during late July through mid-September and spawned during late September through early October. Post-spawning outmigration occurred during a 1 to 1.5 week period in mid-October. The majority of sheefish, spawners and non-spawners, migrated downstream to the Lower Kuskokwim River to overwinter. A much smaller proportion of sheefish overwintered in the middle to upper portions of the drainage.

Session - Spatial Dynamics and Analyses in Fisheries

A Radio Telemetry Investigation of the Spawning Origins of Yukon Drainage Inconnu

Randy J. Brown[1] **and John Burr**[2]

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Five inconnu *Stenodus leucichthys* spawning areas have been located in the Alaska portion of the Yukon River drainage. Evidence for the existence of additional spawning populations has been absent despite widespread sampling activities. We used radio telemetry techniques to test the hypothesis that all inconnu in the lower Yukon River belong to one of these five populations. Multi-year radio transmitters were implanted during 2007, 2008, and 2009 in 115 mature-size inconnu captured in the lower Innoko River, a large, low-gradient drainage in the lower Yukon River. Spawning origins were assigned based on migration destinations determined with a series of remote radio receiving stations and aerial telemetry flights during the late fall spawning season. Some individuals have not been located following tagging, some have been harvested and reported, and some known to be alive have not engaged in spawning migrations. The spawning origins of 66 inconnu are known at this time. Most (45) migrated to the upper Yukon Flats to spawn, smaller numbers migrated to the Alatna (15) and Sulukna (2) rivers, and none so far have migrated into the two Tanana River spawning areas. Two inconnu migrated to both the Yukon Flats and the Alatna River on different years. Six radio tagged inconnu have migrated into a gravel substrate reach of the upper Innoko River and we suspect that these are members of a previously unknown spawning population. In this paper we present details of these spawning origin data, along with information on annual migration patterns within the drainage, spawning frequency, and migration speed.

Session - Spatial Dynamics and Analyses in Fisheries

Winter Movement Patterns and Habitat Use of Kotzebue Region Inconnu

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Inconnu *Stenodus leucichthys* is a large, long-lived piscivorous whitefish found in the Arctic and subarctic waters of Alaska. In the Kotzebue region, two spawning populations have been documented, one located in the Selawik River and the other in the Kobuk River. Inconnu are one of the most important fishes harvested in the region for subsistence purposes. Key life-history attributes, including trends in spawning abundance, biological characteristics, and spawning biology, have been documented for both stocks. To date, winter habitat use and fish movements have not been defined due to sampling constraints. The specific objectives of this study are to: (1) identify the late fall and winter distribution of inconnu in the Selawik and Kobuk river drainages; and (2) assess the importance of water depth, temperature, and salinity as determinates of winter habitat use of inconnu in the Selawik and Kobuk river drainages. Methods consisted of surgically implanting acoustic telemetry tags in 80 fish from each river and deploying a fixed array of 20 Vemco VR2W acoustic receiving stations affixed with archival tags throughout Selawik Lake and Hotham Inlet. Passive tracking occurred from October 1, 2010 through April 31, 2011. After ice out 18 of the 20 receiving stations were recaptured. 28,681 tag detections were recorded from 46 and 42 Selawik and Kobuk fish, respectively. Individual fish detections ranged from 1 to 1368. Study results will allow managers to determine the appropriateness of stock specific harvest guidelines in the region and what future impacts, if any, predicted climate change will have on these stocks.

Student

Session - Spatial Dynamics and Analyses in Fisheries

Beyond Light: Geolocation of Demersal Fishes in Alaska Using Geomagnetic Archival Tags

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The ability to track marine fishes during large-scale movements such as seasonal or ontogenetic migrations is needed for spatially explicit fisheries management. However, current tracking methods, including acoustic telemetry and light-based geolocation, are very limited for Alaska's deep water, demersal fish species. We are developing a new method for obtaining information on the meso- to large-scale movements of demersal fishes using archival tags that record information on the earth's magnetic field. Because the earth's magnetic field varies over space, geolocation can be performed by matching magnetic field values recorded by archival tags on fish to modeled values within the study area. The precision of this method is expected to vary based on the tag measurement resolution, the orientation of the magnetic fields in the study area, and the movement trajectory of the tagged animal relative to the orientation of magnetic fields. To illustrate the concepts and estimated precision of this new method, we will provide results from simulated movements of fish in different regions of Alaska. We will also describe current and future efforts to develop and test this method for use on Pacific halibut, sablefish, and Pacific cod.

Student

Session - Working With Subsistence Communities: The Partners for Fisheries Monitoring Program

Counting Fish and Building Trust with Subsistence Communities in Alaska

Palma Ingles

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In Alaska, many communities depend on subsistence fishing, harvesting fish during the summer, with salmon being one of the preferred fish. For the salmon runs to be sustainable, several fish-monitoring projects count the numbers of fish returning to the rivers each year to spawn. Researchers work with local community members to keep them informed of research results, and to involve them in the decision making process if restrictions on catches are necessary. This paper reports on a program under the US Fish and Wildlife Service where researchers work with community members to monitor salmon runs and who are also building trust with the communities they are involved with.

Session - Working With Subsistence Communities: The Partners for Fisheries Monitoring Program

Kuskokwim Native Association: Co-Management through Shared Cooperation on the Middle Kuskokwim

Michael Thalhauser

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With the goal of "long-term sustainability of the subsistence way of life for its 12 member villages," the Kuskokwim Native Association (KNA) has fostered partnerships with state, Federal, and other Native organizations to form a suite of cooperative research, management, education, and outreach projects. Since KNA's participation in the Partners Program began in 2002, twenty-four cooperative projects have been successfully completed, thirteen of which have been directly related to the Fisheries Research Monitoring Program. KNA hires local technicians for each project and has created a successful 2-way dialogue between affected communities and our cooperators where project goals, results, and local knowledge and concerns are shared. KNA has also incorporated a high school and college intern program into these projects and has recently designed an in-school education program designed to use local and relevant fisheries projects to teach math and science to local students. It is through the Partners Program and the relationships that KNA has with its cooperators that have lead to KNA's success in creating a local fisheries workforce, a successful education/outreach program, as well as having real participation in the research and management of Kuskokwim fisheries resources that are essential to the subsistence way of life of its members.

Session - Working With Subsistence Communities: The Partners for Fisheries Monitoring Program

Kuskokwim Native Association: A Comprehensive Approach to Fisheries Education in Rural Alaska

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The Kuskokwim Native Association (KNA) started it's education program with short High-school internships at too cooperatively run fish weirs. Since then, this program has gained support and cooperators and now provides educational opportunities for students in grades K-12 in and out of the schools. Using local fisheries related concepts and projects to teach math and science and to mentor students interested in careers in fisheries, KNA hopes to create a more active and informed community for the future of Kuskokwim fisheries resources. With the addition of a fisheries college internship program, interested students have a clear path to careers in fisheries.

Session - Working With Subsistence Communities: The Partners for Fisheries Monitoring Program

The Native Village of Eyak's Partnership for Fisheries Monitoring

Keith van den Broek

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The Native Village of Eyak (NVE) has been involved with OSM's Partners Program and Fisheries Resource Monitoring Program continuously since 2000, conducting numerous different studies, including the longest running in the program, monitoring Chinook salmon escapement on the Copper River. This program has allowed NVE to become meaningfully involved in fisheries research and management that affects our livelihood. With this involvement the management and conservation of the resource has improved for our community members. The relationship of the Native Village of Eyak with the Federal Government and the State of Alaska has improved dramatically with our organizations now working much closer together to identify and solve problems with reliable data than has been the case in the past. The program has also created job opportunities and fostered countless learning experiences for our local youth. This presentation will discuss in detail several of the projects and program successes for NVE through the Partners for Fisheries Monitoring Program over the past decade.

Session - Working With Subsistence Communities: The Partners for Fisheries Monitoring Program

The Tanana Chiefs Conference's Fisheries Program: How Can it Best Serve Its People and Protect Fisheries Resources?

Aaron Dupuis

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The Tanana Chiefs Conference (TCC) is a non-profit organization which provides services for more than 10,000 Alaska Natives from 42 villages spread across approximately 235,000 square miles of Interior Alaska. The economy in these villages is mostly subsistence based with high rates of unemployment (ranging from 20 to 90%). Fish resources represent an important component of the subsistence harvest in many of these communities. Because of the importance of fish harvests, it is crucial that these subsistence users have a voice in the management of their resources. How can the TCC's fisheries program best serve these people? Should it be strictly through research, or education programs, or through partnering with state and Federal resource management agencies? The solution is a combination of all three. High quality research supplies data to guide TCC's position on fisheries issues, by educating the subsistence users they can have a stronger voice in the management of their resources, and through partnerships with state and Federal agencies the gap between resource users and managers can be bridged. This approach can result in subsistence fishers who are more active, more informed, and more involved with the management of the fisheries resources that they depend on.

Session - Working With Subsistence Communities: The Partners for Fisheries Monitoring Program

The Role of the Bristol Bay Native Association in the Co-Management of Subsistence Fisheries

Courtenay Gomez

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The Bristol Bay Native Association's (BBNA) Natural Resource Department hosts a variety of programs designed to assist member tribes manage natural resources and monitor subsistence harvest throughout the region. The Partners for Fisheries Monitoring Program was established in 2002 to build local capacity by involving residents and local tribal governments in both management and research in federal subsistence fisheries. Communities are engaged in the management process through an internship program and involvement in numerous research projects. Through this program BBNA serves as a true agent of co-management by providing an intermediary between tribal governments, harvesters and resource managers. The BBNA internship program provides educational employment opportunities for students interested in fisheries, ecosystem science and natural resource management. This presentation will discuss the role of a regional non-profit tribal consortium in subsistence fisheries co-management through exploring the successes and challenges of community involvement, tribal capacity building, and fisheries workforce development.

Session - Genetics, Genomics, and the Sustainability of Alaska's Fish Resources

Identification of Ancient Clades in Threespine Stickleback Populations from Prince William Sound and the Gulf of Alaska

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The widespread distribution of threespine stickleback (Gasterosteus aculeatus) throughout the northern hemisphere provides the opportunity to study both phylogeography and the importance of historical geographic isolation in determining current reproductive isolation. Threespine stickleback belong to one of two mitochondrial clades that were formed 0.8-1.2 million years ago. Individuals belonging to the Japanese clade are primarily found in coastal areas of the West Pacific basin, while the Euro-North American clade is mainly found in the eastern Pacific and Atlantic basins. Stickleback belonging to both ancestral clades have been found in populations from Cook Inlet and the Kenai Peninsula of Alaska, as well as populations from British Columbia. Using PCR amplification of the cytochrome B gene of mitochondrial DNA and restriction digests, we are identifying the ancestral clades present in oceanic and freshwater stickleback populations from Middleton, Montague, and Danger Islands, located in the Gulf of Alaska and Prince William Sound, to determine whether this region represents an additional zone of admixture. These results will add to our understanding of historical patterns of gene flow in stickleback. If both clades are present, we can then explore whether extended historical isolation between the two clades has resulted in reproductive isolation through analysis of nuclear sequence and phenotype.

Student

Session - Genetics, Genomics, and the Sustainability of Alaska's Fish Resources

Phylogeography of Least Cisco (*Coregonus sardinella*) in Northern Alaska: Preliminary Results

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Populations of least cisco (*Coregonus sardinella*) are distributed across Arctic Canada, Alaska, and Siberia, encountering physical environments that are diverse and highly variable over a range of spatial and temporal scales. Generally, coregonid fishes such as least cisco are broadly distributed throughout Arctic regions and exhibit highly variable life history traits. Because whitefishes are an important component of Alaska Native subsistence and culture, concerns over the population status and potential effects of development and environmental changes on whitefishes are growing. Current warming trends are expected to alter the hydrographic network of the Alaskan arctic, consequently altering fish distributions and patterns of connectivity among populations. To accurately assess the impact of these changes on natural genetic diversity, we must collect baseline genetic information of fish populations and develop a better understanding of the relationship between genetic variability and landscape characteristics in the context of rapid landscape and climate change. This information will contribute to predictions of how future landscape changes will affect genetic variability of fish populations. In this study, the salmonid control region of mitochondrial DNA was sequenced from least cisco individuals representing populations from the Selawik River, Koyukuk River, Yukon River, and freshwater lakes from the Arctic Coastal Plain. These sequences will be analyzed to compare the phylogeographic relationships among these populations and the preliminary data will be presented as haplotype networks. A preliminary view of the data suggests that least cisco populations are genetically variable among sites.

Student

Session - Genetics, Genomics, and the Sustainability of Alaska's Fish Resources

When Chum Salmon Meet: Examining a Zone of Secondary Contact in Alaska Using Single Nucleotide Polymorphisms

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Changing climatic conditions that fragment habitats can facilitate demographic changes and provide opportunities for adaptation to occur. The climatic changes of the Last Glacial Maximum (LGM) *ca* 21kyr ago had a large impact on the distribution and evolution of species in North America. The genetic composition of various aquatic vertebrates is thought to retain the signature of the LGM upheavals, as alleles were lost in bottlenecks and founder events, and mutations which conferred selective advantages became prevalent in different populations.

Here we examine the fine-scale genetic population structure of chum salmon from the Alaska Peninsula to explore how divergent genetic lineages meet in a contact zone. To achieve this goal, we used a genome-wide approach, screening a large number of Single Nucleotide Polymorphisms (SNP) for patterns of genetic differentiation and for individual admixture analysis. First, we estimate the levels of genetic divergence among samples collected along the Alaska Peninsula, from Bristol Bay to the Aleutian Islands. Second, we estimate the most probable number of population groups in the region, and we evaluate if the observed genetic patterns are due to interbreeding between the distinct genetic lineages. Finally, we explore clines in allele frequency and introgression to understand loci driving the differences between populations.

Student

Session - Genetics, Genomics, and the Sustainability of Alaska's Fish Resources

Population Structure and Ecology of Bering Cisco (*Coregonus laurettae*) from Northwest Alaska

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Bering cisco (*Coregonus laurettae*) is an anadromous member of the family Salmonidae and has been solely documented in Alaska in the Yukon, Kuskokwim, and Susitna Rivers. Distribution data from field sampling of Bering cisco from within these drainages indicate a single spawning population in each. The goal of this study is to enhance managers' understanding of the structure and abundance of these populations. We will test the hypothesis that the Yukon, Susitna, and Kuskokwim baseline populations are genetically divergent using a suite of 14 microsatellite markers. Challenges with species identification and variations in life history have resulted in limited information on basic biology and population structure for many coregonine species including Bering cisco. Despite the lack of information for these species in Alaska, they account for a substantial amount of subsistence harvest and, more recently, have been commercially harvested in the lower Yukon River. Bering cisco is the preferred target species for this commercial fishery, which was established in 2005 and has been pressured to expand. Managers must have knowledge of the population composition of the commercial harvest before proceeding with the expansion of the commercial fishery.

Student

Session - Genetics, Genomics, and the Sustainability of Alaska's Fish Resources

The Sockeye Salmon Baseline for WASSIP: One Baseline to Rule Them All

Tyler H. Dann, Christopher Habicht, Jim R. Jasper, Elisabeth C. Fox, Heather L. Hildebrand, Eric S. Lardizabal, Judy M. Berger, Paul A. Kuriscak, Zac D. Grauvogel, and William D. Templin

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Uncertainty about the magnitude, frequency, location, and timing of the non-local harvest of sockeye and chum salmon was the impetus for the Western Alaska Salmon Stock Identification Program. The program was designed to use genetic data in mixed stock analysis to reduce this uncertainty. A baseline of allele frequencies is required for use in mixed stock analysis to estimate the stock of origin of harvested fish. Here we describe the population genetic structure among sockeye salmon populations within the study area and the baseline we will use in mixed stock analysis of sockeye salmon fisheries. Of the 41,406 individuals from 472 collections selected to be genotyped, the final baseline was composed of 38,193 individuals from 439 collections representing 290 populations. We observed patterns of genetic structure similar to past studies, where populations common to a nursery lake appeared more similar to one another than to populations from other drainages. But we also observed interesting exceptions to this pattern, with some population groupings defined more by life history and habitat usage than geography. Forty-eight of the 54 tests of the baseline met our goal of 90% correct allocation, suggesting the baseline will provide accurate and precise estimates of stock composition in mixed fisheries. This baseline should prove useful for mixed stock analysis while also providing for many other avenues of investigation to be explored.

Session - Genetics, Genomics, and the Sustainability of Alaska's Fish Resources

Genetics on the Large-Scale: A Study of Pacific Salmon Running the Gauntlet

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While the freshwater life history and ecology of both sockeye and chum salmon is well known, less is known of their oceanic migration and susceptibility to nearshore fisheries. Given their long migrations, interception of these species in fisheries distant from their natal streams is likely but unmeasured. Generally, stock composition studies are limited to relatively small geographic areas local to the fishery or stocks of interest. Large-scale, comprehensive assessment of harvests along an entire coast is necessary for a complete picture of the interactions between stock-specific migration and abundances and the human activities of fishing and fisheries management along a geographic continuum. Western Alaska is a geographically diverse region with highly productive salmon populations that possess varying amounts of genetic structure and a long history of human use. Collaborating with other laboratories, we have developed comprehensive coastwide baselines of SNPs across both species' ranges in the North Pacific. These baselines provide the foundation for genetic stock identification of three years of sockeye and chum salmon harvest in contiguous fisheries along 3,300 km of western Alaska coast. This study will provide a more complete assessment of the biocomplexity that rises from the interplay between salmon biology and human activities within this region.

Session - Genetics, Genomics, and the Sustainability of Alaska's Fish Resources

Just Because You Can Does Not Mean You Should: Responsibly Defining Reporting Groups for Mixed-Stock Analysis

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Defining reporting groups for mixed stock analysis provides the framework for reporting fishery stock composition estimates. Reporting groups refer to the groups of populations to which fishery mixtures will be allocated during mixed-stock analyses. The end-users of the information (stakeholders) provide a starting point and influence the final determination of reporting groups while biology and statistics provide the constraints for defining reporting groups. Here we present methods to 1) use stakeholder input to establish desired reporting groups, 2) test our ability to identify the desired reporting groups, and 3) arrive at a final set of reporting groups. We also propose a dynamic reporting group strategy for tabulating stock composition information that takes into account the geographic location of the fishery. We apply these methods and strategies to the Western Alaska Salmon Stock Identification Project, a large-scale stock identification program for chum and sockeye salmon.

Session - Genetics, Genomics, and the Sustainability of Alaska's Fish Resources

Next-Generation Sequencing (NGS) in Wildlife Research: Opportunities and Challenges

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Research that is based directly or indirectly on DNA sequence data is undergoing radical change thanks to the development and continued refinement of so-called next-generation sequencing (NGS) technology. For biologists, the most significant consequence of this change is the exponential increase in the volume of genetic data that can now be acquired with relatively small time and resource investments. However, capitalizing on this abundance of data requires sample handling and data management protocols that share little in common with those in use at present. The challenges posed by the new approaches are most apparent when attempting to apply NGS to long-standing and familiar biodiversity and management research questions centered on the concept of genetic differentiation. In this presentation we summarize: major characterisitics of existing NGS platforms (costs, workflows, data output) and key differences between them. We outline methods of employing NGS to more efficiently identify markers (gene regions, SNP's, microsatellites) for subsequent standard genotyping analyses and methods that take direct advantage of NGS to generate data on genetic diversification at different temporal scales.

Student

Session - Genetics, Genomics, and the Sustainability of Alaska's Fish Resources

Natal Origins, Distributions and Migration Patterns of Chinook Salmon in the Bering Sea and North Pacific Ocean

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Over the past decade populations of Chinook salmon throughout the Pacific Rim have experienced extreme fluctuations in abundance prompting increased interest in their management and conservation. In order to effectively manage Chinook populations it is important to understand stock specific patterns of spatial and temporal distribution. To examine these patterns across the Bering Sea and North Pacific, we tested over 3,500 adults collected from 2005-2010 with a species wide genetic baseline of 45 single-nucleotide polymorphisms (SNPs). Samples were divided temporally by season and spatially into 5 regions, the Gulf of Alaska, the Eastern Bering Sea, The Middle Bering Sea, and the Western Bering Sea and North Pacific. Major stocks had predictable patterns of spatial distribution that were mostly consistent within and between years. Specifically, we found the same dominant stocks in each of our sampling locations across seasons and years with few exceptions. One limitation of the 45 SNP baseline we utilized is its inability to distinguish the major drainages in the Western Alaska stock complex. We will discuss our ongoing efforts using next-generation sequencing to develop markers capable of genetically differentiating among Chinook populations in Bristol Bay, the lower Kuskokwim River, the lower Yukon River, and Norton Sound.

Student

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Heritability of Traits in Wild Chinook Salmon

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Many Chinook salmon in the Kuskokwim River are harvested using gillnets that preferentially capture older and larger fish. There is interest in determining if this selective fishery has a population-level impact on traits such as adult size and age. To evaluate this issue estimates of trait heritability are needed. In this study we used genetic markers to reconstruct a partial two-generation pedigree from a wild Chinook salmon population in the Tuluksak River. The inferred parent-offspring relationships, combined with phenotypic data on adult size (length) and age-at-maturity provide the first estimates of the heritability of these traits in western Alaska salmon. These estimates of heritability (0.240 and 0.238 for adult length and age-at-maturation, respectively) indicate both traits have detectable genetic variation in this population although the values are lower than those reported for a hatchery population of Chinook salmon in Puget Sound, Washington. While we could not conclude that these heritability estimates are significantly lower than those reported for the hatchery population, these new values do provide locally derived estimates from a wild population to use in future studies on the influence of gear selectivity. Because the reconstructed pedigree was smaller than expected, we were unable to estimate the genetic covariance among these traits or evaluate gender-specific heritability. Given the value but limited amount of information on heritability of traits in wild salmon populations, and the availability of weirs on some tributaries of the Kuskokwim River, we feel further work that builds on the results of this study should be pursued.

Session - Sustainable Fisheries: Utilization, Economics, and Governance

Transitional States in Arctic Fisheries: Challenges, Risks, and Opportunities

Philip A Loring

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Global climate change has the potential to substantially alter the production and community structure of marine fish populations and to modify the ongoing impacts of large- and small-scale fishing. Fish community composition is already changing in some tropical, temperate and polar ecosystems, where the combinations of warming trends and higher environmental variation anticipate the changes likely to occur more widely over coming decades. In this talk I will begin by reviewing these trends. Focusing on the Arctic, I will then contextualize the direct and indirect effects of climate change on production and biodiversity and, in turn, on the social and economic aspects of fisheries, both current and future. Climate warming is expected to lead to increased diversity and yield in arctic fisheries, arising from invasions of southern species and increased primary production resulting from ice-free summer conditions. Many construe these changes as creating significant new economic opportunities; however in addition to these opportunities, the impacts and ramifications of these ongoing changes, which are already being experienced in waters further south, bring also significant challenges and risks that must be considered as new fishing regimes for Northern waters are envisioned.

Session - Sustainable Fisheries: Utilization, Economics, and Governance

Responsible Fishery Management and Sustainable Seafood - A New Assessment/Certification Model

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In recent years, the seafood marketplace has called for increased documentation and proof on the issue of responsible fisheries management/sustainable seafood. As seafood operators strive to demonstrate their commitment to social and corporate responsibility (CSR) policies, the use of 3rd-party fisheries certification has increased. Presence of legal governance structure and global reputation of responsible fishery management (RFM) are no longer sufficient in some markets. As a result, there is a proliferation of eco-labels, many by NGO groups or aquaria. These communicate to retailers and buyers, that if their particular endorsement is in place, one can be assured of RFM. However, influence of seafood market access by such endorsements (or lack of) carries the risk of erosion of fishery management governance. Some programs involve costly logo licensing fees, and others have resulted in the obscuring of the origin of the product. We present a new RFM assessment model now in use in Alaska. The use of an independent 3rd-party certifier with direct assessment to the United Nations Food and Agriculture Organization (FAO) Code of Conduct for Responsible Fisheries (Code) offers a streamlined, cost effective method for evaluation of fishery management. The Alaska model follows internationally accredited International Standards Organization (ISO) 65 certification procedures. Similar efforts are underway in Iceland and other countries. The emergence of these new RFM assessment approaches demonstrates that credible cost-effective certification which is not NGO agenda-driven, preserves integrity of fishery governance, and follows a streamlined process, can be accomplished.

Session - Sustainable Fisheries: Utilization, Economics, and Governance

Adaptation and Maladaptation - Factors that Influence the Fragility of Fisheries

Keith R. Criddle

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Sustainability of fisheries is primarily dependent on the intrinsic characteristics of social, economic, and legal systems that determine who is allowed to fish and how fishing takes place. That is, fisheries sustainability is not a biological problem, it is a social problem. Social factors that contribute to or detract from sustainability are illustrated in the Alaskan halibut fishery as it has evolved over time. This fishery includes two commercial sectors and recreation and subsistence sectors. Both commercial sectors have come to be managed under durable entitlement (DE) programs: individual fishing quotas in the longline fishery and transferable licenses in the charter sector. DE programs can increase profitability and help fishermen adapt to modest adverse changes in stock abundance, exvessel prices, or input costs. However, design characteristics of some DE programs leave them vulnerable to larger perturbations. In the Alaska halibut fishery, failure to limit catches in the charter sector create spillover that adversely affects sustainability of the longline sector.

Session - Sustainable Fisheries: Utilization, Economics, and Governance

Meeting Indigenous Subsistence Needs: Prey Switching in Rural Alaska

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Understanding the extent to which subsistence hunters in Alaska use coping strategies that facilitate resilience to adverse conditions is critical for evaluating the capacity of rural communities to sustain traditional livelihoods. Since 1998 Yukon River king salmon (*Oncorhynchus tshawytscha*), an important subsistence resource for communities along the river, have been considered a yield concern by the Alaska Board of Fisheries. Generally escapement goals have been met. However, since 2009 there have been varying restrictions on subsistence use of the resource, straining the food security of several communities. Past research suggests that subsistence hunters commonly switch prey to cope with annual fluctuations in the availability of subsistence resources such as king salmon. We developed and quantitatively tested a predictive framework to evaluate past findings and assess whether 19 communities along the Yukon River regularly use this coping strategy. We found that between 1993 and 2004, analyzed communities rarely switched prey. Out of 96 potential relationships, we found only four that indicated prey switching had occurred. Results of this study help to characterize contemporary subsistence hunting systems along the Yukon River and may provide regulatory agencies with a greater understanding of the systems they manage. This could facilitate more flexible management approaches based upon coping strategies that successfully balance conservation with rural livelihoods. Results of this study also highlight the need for continued improvement in the collection of subsistence data regarding harvests, hunter effort, and socio-economic characteristics of rural Alaskan communities.

Session - Sustainable Fisheries: Utilization, Economics, and Governance

"That's What Opening Day is For:" Social and Cultural Dimensions of Commercial Salmon Fishing in Cook Inlet

Philip A Loring, Hannah L. Harrison, and S. Craig Gerlach

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Incorporation of the human dimensions of fishing in fisheries management has historically been limited to simple models of rational economic behavior. With the push toward ecosystem based fishing management (EBFM), however, the argument has been made for a corresponding paradigm shift in how management addresses the human dimension, with the goal of extending the very boundaries of the ecosystem to include the multiple roles that fishing plays in the lives and livelihoods of fishermen and in the sustainability of fishing communities. By way of example, this paper provides an ethnographic account of commercial salmon fishing in Cook Inlet on opening day of the 2011 season. Opening day provided multiple practical and social functions relevant to the fishermen's safety, to their success over the entire season, and to how they organize to address contemporary political issues. "Green" deckhands were trained, boats and gear were tested, and important social ties within fishing groups were renewed. Salmon were caught, but in many cases not enough were harvested to "break even" in financial terms.

Given concerns regarding the long-term status of Cook Inlet salmon populations, including the myriad possible impacts of climatic warming, and given the likelihood that restrictions on commercial fisheries would be among the first measures taken in order to mitigate population declines while maintaining subsistence and personal use priority, we make the case that recognizing the importance of these social dynamics is an important step toward simultaneously ensuring the conservation of fish populations as well as of fishing as a regionally valued livelihood, lifestyle, and component of community sustainability.

Session - Sustainable Fisheries: Utilization, Economics, and Governance

Adopting a Precautionary Approach to Fisheries Management in the Central Arctic Ocean

Jeremy Davies

Oceans North: Protecting Life in the Arctic, International Arctic Program, Pew Environmental Trusts

The Arctic Ocean is encircled by five coastal states, but 2.8 million square kilometers of the central Arctic Ocean lies outside the Exclusive Economic Zones (EEZs) of these Arctic rim nations. These international waters are not at present governed by specific international fisheries agreements or regulations. Until recently, the region has been covered with sea ice throughout the year, creating a physical barrier to fisheries. In recent summers, however, the loss of permanent sea ice has left open water in as much as 40% of these international waters. These waters are well within range of pelagic fishing fleets, and a commercial fishery in the central Arctic Ocean is now feasible. The U.S. government as well as Denmark/Greenland and the E.U. have called for international management before fishing starts. The Pew Environment Group advocates increased research and the adoption of a precautionary management system for central Arctic Ocean fisheries that would postpone fishing activity until the biology and ecology of the region is understood sufficiently well to allow for a scientifically sound management regime.

Fisheries Stock Assessment

Development of an Inseason Assessment Tool for Managing Kuskokwim River Chinook Salmon Fisheries

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The Kuskokwim River Chinook salmon subsistence fishery is the largest in the state of Alaska, harvesting over 50% of the state's total subsistence harvest. Recent annual harvests have ranged between 85,000 and 95,000 Chinook salmon. Commercial and sport harvest has been minimal for the past ten years averaging about 3,000 Chinook salmon combined. The Kuskokwim River Chinook salmon fisheries have generally been managed using a relative index of abundance provided inseason by the Bethel test fishery (BTF). At the end of the 2010 season, Sustainable Escapement Goals (SEG's) were not met on multiple tributaries, specifically, the Kwethluk and Tuluksak Rivers, which did not meet SEG's for the third and fourth consecutive years respectively. We used paired data from escapement projects and the Bethel test fishery (BTF) to predict if escapement goals would be met. Correlations of BTF CPUE and escapements in all rivers collectively and singularly were relatively high (R>0.9). Using 95% CI of CPUE from the BTF for years when escapements were met and years when escapements were not met, an assessment date was identified that would provide timely indication that conservative management would have to be implemented to work towards meeting the escapement goals. This tool also provides daily assessment of escapement beyond this initial date, allowing for continuous inseason management of the Kuskokwim River Chinook salmon fisheries.

Fisheries Stock Assessment

Simulation of AYK Salmon Runs

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Potential changes in human populations and changes to affordable food resources may alter salmon harvest needs in Alaska. An expert panel, assembled through the Arctic-Yukon-Kuskokwim Sustainable Salmon Initiative (AYK-SSI), developed a predictive model containing three main components: (1) salmon run simulations; (2) subsistence demand projections; and (3) commercial harvest projections. Here, we describe run simulations, conditioned by the assumption that future returns will arise from the same distribution that resulted in historical runs. Using data sets on escapements, and subsistence, commercial, and recreational harvests, our simulation examined 28 salmon stocks: Chinook (Kuskokwim, Yukon, Norton Sound), summer chum (Kuskokwim, Yukon, Norton Sound), fall chum salmon (Yukon), sockeye (Kuskokwim, Norton Sound), coho (Kuskokwim, Yukon, Norton Sound), and pink (Kuskokwim, Yukon, Norton Sound). Available data varied by time, area, and stock. As a result, run simulation required a multi-step process. First, inconsistencies in escapement data were addressed by replacing missing values with random draws from log-normal distributions of available data. Numerical distributions were then used to characterize fisheries catches and a run reconstruction calculated as the sum of escapements and harvests. Run reconstructions for each stock were iterated 5,000 times, and the means and standard deviations of the log-transformed total returns from these iterations used to parameterize the run simulations. A synthesized total return was then subjected to a fishery management simulation regime with a primary objective to meet escapement goals and a secondary objective to meet projected subsistence demand; management considerations included the gauntlet characteristic of some river systems.

Fisheries Stock Assessment

Salmon Assessment Using DIDSON in Kenai River, with Species Apportionment by Mixture Model

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Two dual frequency identification sonars (DIDSON) were deployed in the Kenai River, southeast Alaska, from May to August 2011 to enumerate migrating salmon. The hydroacoustic data collected by DIDSON provided good resolution video-like images. The number of migrating fish was estimated and the fish lengths measured manually from the images using preprogrammed DIDSON software. In order to provide information for fishery management, the species apportionment between the two main species in the Kenai River, namely Chinook (*Oncorhynchus tshawytscha*) and sockeye salmon (*O. nerka*), could be achieved by fitting a statistical mixture model to their length measurements, even though the two species overlap in size and the length measurements were subject to measurement error. A Bayesian approach, implemented by Markov Chain Monte Carlo (MCMC) method, was used to estimate the parameters in the mixture model. Length distribution and age structure information of the two species was acquired in order to fit the model.

Fisheries Stock Assessment

When the Best-Fit Model is Not the Best: Selecting a Model From a Biological Point of View

Xinxian Zhang

Alaska Department of Fish and Game

The Alaska Department of Fish and Game use sonar to monitor salmon return in the Kenai River. Due to timing of arrivals and limitation of budgets, the sonar monitoring may not start at the beginning of return, and often ends before the end of return. In order to estimate arrivals of salmon missed by the sonar at the start and end of return, I used the three probability functions to fit the sonar counts data. I applied a model selection criterion AIC, Akaike Information Criterion, to select the best model. However, the best model by AIC is the worst one to estimate the tails of daily arrivals.

Fisheries Stock Assessment

Low Intensity, Low Cost Management of Salmon Fisheries

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Intensive in-season management of salmon fisheries, where fisheries are opened and closed based on frequent test fisheries, escapement surveys and other types of monitoring, is labor-intensive and expensive. Budgets may not be sufficient for this management approach, particularly for fisheries on stocks of low value. Alternative management approaches, such as a regular schedule of fisheries openings, potentially could provide satisfactory escapements and harvests at a much lower cost. This talk investigates how best to set such a schedule of fisheries openings using a simulated fishery. A companion study will apply alternative management regimes to reconstructed historical runs for two Bristol Bay sockeye stocks.

Fisheries Stock Assessment

Run Reconstructions in Bristol Bay, Alaska

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Most salmon fisheries in Alaska are managed for a fixed escapement through the use of emergency order openings. The high cost associated with this management may not make sense for low-value fisheries. As a first step prior to evaluating alternative management strategies of sockeye salmon (*Oncorhynchus nerka*), I estimate historical daily arrival abundances to two rivers in Bristol Bay, Alaska. The arrival distributions can be examined for evidence of multiple runs of salmon through the fishery. The cumulative harvest rate on each daily arrival cohort can be examined throughout a season. I compared different harvest rate equations, based on the number of drift vessels and set permits fishing, using AIC scores and biological information. The best harvest rate equation is used in the run reconstruction and will be used in the management strategy evaluations.

Student

Fisheries Stock Assessment

Statistical Consulting in a State Resource Agency: Experiences Gleaned from a 30+ year Career

Allen E. Bingham

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The Division of Sport Fish initiated an operational planning process for all research conducted within the division starting in 1985. The presenter will discuss the experiences gleaned from the development of the process; early-middle-late years of implementing the process since that time; and adapting the process in the face of changing needs.

Contrasts will be made to the author's experiences working as a consulting biometrician both with and without the operational planning framework over his 30+ year career.

Experiences working as both a consulting biometrician and as supervisor of the biometrics unit within the operational planning framework will be contrasted.

Both the human nature aspects (working together collaboratively) and issues related to sound statistical practice will also be covered.

Tips, 'tricks', pitfalls to avoid, and other words of (hopeful) wisdom will be shared.

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

A Description of Biological Characteristics of Bering Cisco *Coregonus laurettae* in the Coastal Yukon River Delta

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Life-history and population characteristics of Bering cisco *Coregonus laurettae* in Alaska are largely unknown. The objective of this study was to collect Bering cisco in coastal habitats in the Yukon River delta, record length and weight by age class, compare gill rakers to previous studies, and analyze stomach contents. In August 2005 and 2006, 120 Bering ciscoes were collected with gill nets in the Black and Kun rivers of the Yukon River delta, Alaska. Bering ciscoes ranged in fork length (FL) from 146 to 490 mm, with a mean FL of 321 mm, and in weight from 32 to 735 g, with a mean weight of 304 g. Fish ranged in age from 0 to 6 years, with one age-11 individual observed in the sample. Lower limb gill raker counts ranged from 21 to 24, and were similar to observations published in other studies. The percent composition of the diet by weight indicated that Bering cisco fed primarily on ninespine sticklebacks *Pungitius pungitius* and threespine sticklebacks *Gasterosteus aculeatus*. Comparisons of length and weight class data with stomach contents suggest that Bering ciscoes likely undergo ontogenetic diet shifts as they increase in size. This study observed that immature and non-spawning Bering ciscoes are found in eastern Bering Sea coastal marine habitats feeding primarily on two species of sticklebacks, which are an abundant and high-lipid food resource. This study advances our understanding of Bering cisco biology, with an expectation that it will inform future ecological, life-history, and stock-assessment investigations of the species.

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

Arctic and Alaskan Brook Lampreys: Different Species or Life-History Variants?

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Lampreys share many of the same habitats as salmonids in freshwater ecosystems, yet receive comparatively little management or research attention. This paucity of information limits the development of management and conservation plans for lampreys in Alaska. The current belief is that two lamprey species reside in interior Alaska: Arctic lamprey *Lethenteron camtschatica* and Alaskan brook lamprey *L. alaskense*. For this research, we examined the morphological and meristic characteristics and characterized the mitochondrial genetic variability of lampreys in the Yukon River drainage. Sampling was conducted during the 2010 (Chatanika River) and 2011 (Chena River) using a low voltage Model ABP-2 backpack electrofishing unit that is designed for the collection of lampreys. In addition, other lamprey samples were provided from the lower Yukon River and the Tanana River. Although larval lampreys could not be differentiated by species based on pigmentation density/patterns or trunk myomere counts, adult lampreys could be distinguished based on body size and dentition development, with Arctic lampreys being both larger and having more strongly developed teeth on the oral disk. However, there was no segregation of haplotypes by either collection location or life-history strategy (i.e., parasitic versus nonparasitic), suggesting that Yukon River drainage lamprey populations share a common mitochondrial gene pool and are not isolated. Although the selection mechanism for one life-history strategy over another is not clear, our understanding of larval lampreys in interior of Alaska rivers has increased significantly, thereby allowing for the development of appropriate and science-based management and conservation decisions.

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

Cogs, Wheels, ... and Wrenches: The Role of Invasive Species in Alaska's Freshwater Ecosystems

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Even a beautiful, complex, finely tuned Lamborghini doesn't run so smoothly when the mechanic leaves a wrench in the works! Alaska's ecosystems may need some tuning and are certainly complex and beautiful …but lately somebody's been leaving their wrenches in the works! *Elodea*, a highly invasive aquatic plant, is already messing up boating, could endanger floatplane operation, and if left unchecked could restructure freshwater ecosystems across much of Alaska. Reed canarygrass, a wetland invader, has found its way to Lake Hood (the world's busiest floatplane port), and *Elodea* may not be far behind! Northern pike, where they are not native, have altered native fish assemblages and sharply impacted fisheries. Climate change and increased trade and development could bring other new ecosystem-changing invaders and spin evolutionary trajectories off into uncertain and potentially irreversible new directions. Such instability and uncertainty is difficult even to model; the most certain path, especially for Alaska, is prevention.

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

Uptake and Trophic Transfer of Perchlorate in a Simulated Northern Pike and Threespine Stickleback Food Web

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The uptake and trophic transfer of contaminants in aquatic organisms is a major concern throughout the world (e.g. mercury). Top predators, including piscivorous birds, fishes and mammals, may accumulate high concentrations of contaminants through their diet. Many of these animals are consumed by people. This study addresses the ability of the environmental contaminant perchlorate, an endocrine disruptor commonly used in rocket fuel and industrial applications, to move between aquatic trophic levels. We investigated how different routes of exposure (food and water) affect body burden by exposing threespine stickleback (*Gasterosteus aculeatus*) to perchlorate and then feeding them to northern pike (*Esox lucius*). Routes of perchlorate exposure to the pike were through contaminated water (49 day exposure at either 10 ppm or 100 ppm) and/or food (14 day exposure to stickleback prey previously held in water at either 10 ppm or 100 ppm). We found that both water and food significantly contribute to body burden as compared to controls, but that perchlorate does not biomagnify. Contaminated food contributed to body burden in the control and 10 ppm water treatments but did not in the 100 ppm water treatments. Route of exposure is important to consider when evaluating uptake and body burden of perchlorate in fish.

Student

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

The Importance of Drifting Debris for Drift-Feeding Juvenile Chinook Salmon

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Most models of drift-feeding behavior implicitly assume that all prey capture attempts are successful, leading to the ingestion of food that offsets the energetic and opportunity costs of each capture maneuver. The same assumption underlies the common use of prey capture attempts as a proxy for energy intake and fitness. This study examines the validity of that assumption for juvenile stream-type Chinook salmon in the Chena River, a clearwater river in central Alaska.

We used close-up, high-definition video to record drift-feeding behavior as the fish grew through the 30-80 mm size range. We discovered that the fish spit out most of the potential prey items they captured, and spent considerable time visually inspecting items they ultimately declined to capture. The only other similar studies we found were performed on brook trout in still water, and by comparison we found that fish spent far more foraging attempts pursuing and rejecting inedible debris. We attribute this difference to the fact that flowing rivers contain more suspended debris than still waters, and they give the fish less time to visually distinguish prey from debris. The ubiquity of these apparent mechanistic explanations suggests that our results may be more typical for small salmonids feeding in moving water.

We examined the implications of this effect for a modern foraging model by incorporating the opportunity cost of handling debris into the model. Under several realistic parameter scenarios, the time spent pursuing debris dramatically reduces the model's predictions of the fish's net energy intake. The effect is particularly strong for juvenile salmonids, whose small prey competes for attention with minute detritus that may be abundant even in clear streams.

Student

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

Determining Whether Freshwater Growth Affects Recruitment of Yukon and Kuskokwim Chinook Salmon by Use of Retrospective Growth Analysis

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Pacific salmon (*Oncorhynchus* spp.) are important fish species for commercial, sport, and subsistence uses in Alaska. Chinook salmon (*Oncorhynchus tshawytscha*) attain the largest size of all Pacific salmon and are the main focus of fisheries in certain areas. A large portion of the Chinook salmon statewide subsistence harvest is taken from both the Yukon and Kuskokwim river drainages (Y-K region) each year. These drainages have experienced poor returns since the early 2000s and have proven to be more difficult to manage in recent years. For these reasons fisheries managers and Alaskan residents are interested in better understanding what affects Chinook salmon recruitment in this region. Previous studies dealing with freshwater growth focus on minimum smolt size and habitat requirements, but the connection between freshwater growth and adult recruitment remains unclear. This study's objective is to examine archived Chinook salmon scales from the Andreafsky (Yukon) and Kogrukluk (Kuskokwim) river weirs to determine if freshwater growth is correlated with adult recruitment in the Y-K region. The correlation between growth and recruitment at the population level, inclusion of circuli width of scale samples, and examination of all age classes will be conducted to more thoroughly examine the effect freshwater growth has on adult recruitment. Results from this study will help determine future management of this region for better sustainability of Chinook salmon.

Student

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

Spatiotemporal Distribution of Migrating Pacific Salmon (*Oncorhynchus* spp.), Relative to Tide, Temperature, and Time of Day

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The Alaska Department of Fish and Game (ADF&G) uses dual-frequency identification sonar (DIDSON) to enumerate fish passage for sockeye (*Oncorhynchus nerka*), Chinook (*O. tshawytscha*), and chum (*O. keta*) salmon on the Nushagak River. Between 6 June and 18 July 2011, two DIDSON units recorded salmon passage for ten minutes of each hour, at both low and high frequencies. A long range DIDSON was placed on the north bank in order to obtain inshore (0-10 m) counts at high frequencies, and offshore (10-50 m) counts at low frequencies. On the south bank, a standard range DIDSON was used to obtain inshore (0-10 m) counts at high frequencies, and offshore (10-30 m) counts at low frequencies. The video-like images produced by DIDSON contain information beyond simple counts, such as the spatial arrangement of salmon, which are examined along with the relationship between passage rate and environmental factors. This paper will analyze DIDSON images to determine if the hourly passage rates of salmon are influenced by tidal cycles, water temperature, or time of day. The spatial aggregations of salmon at various passage rates are also examined. Understanding the details of migratory movement patterns may provide insight that helps us improve our basic enumeration operation.

Student

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

Age, Sex, and Length Trends of Yukon Salmon Species

Toshihide "Hamachan" Hamazaki

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Age, sex, and length (ASL) trends of the Yukon Chinook salmon have been analyzed. However, ASL trends of other salmon species in the Yukon River: summer chum, fall chum, and coho salmon have not been analyzed. I examined ASL trends using data obtained from the Lower Yukon test, commercial, and subsistence fisheries (1964-2009). Length trends were examined using general additive model. I discuss similarity and differences of trends among species.

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

Chinook Salmon Subsistence Harvest on the Yukon River

Lisa Kangas

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Chinook salmon stocks on the Yukon River have been decreasing in the last decade. During this same time, the subsistence harvest has been the largest and most consistent component of the Yukon River Chinook salmon harvest, averaging 45,000-60,000 fish. Sustainable salmon management relies on salmon stock information (age, sex, length, and genetics) obtained from commercial or subsistence harvests. Downward trends in commercial harvests, followed by recent years of no commercial harvests, have led to the inability to collect this crucial information. From 2009 to 2011, the Tanana Chiefs Conference (TCC) worked with local fishers to collect subsistence salmon harvest information along the Yukon River. In 2009, 1,713 samples were collected; in 2010, 2,754 samples, and ~1800 in 2011. Age, sex, length, girth, genetics, location and gear type were collected for each fish and weight was recorded for some samples.

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

Juvenile Coho Salmon Migration and Habitat Use in Meadow Creek, Alaska

Jonathon Gerken

USFWS, Anchorage Fish and Wildlife Field Office

The waterbodies of the Matanuska-Susitna (Mat-Su) region support some of North America's most viable and productive salmon fisheries. Salmon migration, spawning, rearing and ultimately production in these waterbodies are dependent on connectivity of habitat. Surveys of manmade juvenile salmon fish barriers on streams within the Mat-Su have been conducted since 1999 and are largely the result of inadequate culvert installation at road crossings. Approximately 70% of the over 400 culverts surveyed were some type of juvenile salmon barrier at certain flows. Restoration activities to improve fish passage have been ongoing for the past 15 years and have resulted in over 60 culverts replaced or removed; however, the prioritization for effectiveness can be significantly improved upon the remaining culvert barriers. The goal of this project is to provide an assessment of juvenile coho salmon migration and habitat use by cohort in the Meadow Creek drainage using passive integrated transponders (PIT) tags. In 2011, 2,300 PIT tags were implanted in juvenile coho salmon in Meadow Creek, AK. Tracking was accomplished weekly through active trapping and using four fixed PIT tag arrays. Preliminary results indicate migration distances up to 3 rKm in a week, instantaneous growth rates of 4 mm/week, and general preferences for mainstem and tributary habitats in summer months and lakes in fall. These data will be used to assess culvert utilization and migration behavior amongst habitat types in this drainage, providing biological input to an objective decision making optimization model to prioritize culvert replacement under a limited mitigation budget.

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

Fisheries Application of Side Scan Sonar Within the Yukon River, Alaska

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Side scan sonar is commonly used in search and recovery applications, yet there is a dearth of information about its utility for counting fish. Side scan sonar was deployed at Pilot Station, Alaska during the 2010 and 2011 Chinook salmon seasons to determine the efficacy in fisheries assessment within the Yukon River. The objective of this project was to augment the existing sonar types at Pilot Station, to observe fish beyond the split-beam and DIDSON sonar ranges on the left bank of the river, and to determine the success of fish detection during high water events or periods of high silt load. The sonar used was capable of operating at two frequencies (400 kHz and 900 kHz) depending on the range ensonified and the desired resolution. The side scan was deployed concurrently with normal left bank sonar operations to enable comparison of fish counts and distribution. A stationary deployment strategy was employed to enumerate salmon as they migrated upstream. Results during periods of relatively high turbidity during the summer of 2011 indicate high correlation between the split-beam and side scan estimates suggesting the side scan will be a useful diagnostic tool for assessing the performance of the split-beam sonar during poor environmental conditions. Echogram data was easy to interpret during calm river conditions but became problematic with high wind or wave activity. We attempted to address this issue utilizing various stabilization techniques.

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

Eighteen Years of Chignik Smolt Investigations: Utility, Application, and Accuracy

Adam St. Saviour[1] and Dawn Hunt[2]

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The Alaska Department of Fish and Game has conducted a sockeye salmon *Oncorhynchus nerka* smolt monitoring and enumeration project in the Chignik River in since 1994. This research was designed to estimate the smolt population size and age structure, assess body condition, assess limnology and forage in Chignik and Black Lakes, and provide data for a smolt-based adult-return forecast. Genetic samples have been collected since 2006 for stock identification. Abundance of sockeye salmon smolt is estimated using a rotary-screw trap array and mark-recapture techniques. Limnological surveys are conducted in Chignik and Black Lakes once per month from May to August to describe the physical characteristics, nutrient availability, primary production, and zooplankton forage available to rearing juvenile sockeye salmon. Competition between Chignik and Black Lake stocks and consequential shifts in outmigration timing have been suggested. Smolt emigration estimates are used in the formal forecast and in a smolt-based forecast. The smolt-based forecast accuracy varies annually with no clear pattern of under- or over-forecasting by either sibling-temperature relationships or smolt linear regression techniques. The Chignik smolt enumeration project has proven invaluable in evaluating rearing conditions, monitoring early life-history response to changes in the freshwater environment, and selecting escapement goals.

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

Freshwater Ecology of a Glacially Dominated Stream Under Consideration Hydropower Production

James Brady, Robin Beebee, Patrick Blair, Adinda Demski, Isaac Watkins, and Heidi Wegner

HDR Alaska, Inc.

The State of Alaska has set a goal of 50 percent renewable power generation by 2025, and the development of new hydropower facilities will be an important if not essential component of meeting this goal. The ecological affects of hydropower development are diverse and principally driven by changes in stream flow. To meet rigorous state and federal permitting requirements, a landscape perspective must be taken to identify locations and set operational parameters that sustain healthy aquatic resources. This presentation will focus on Battle Creek, a glacial system located at the head of Kachemak Bay that has the potential to sustainably supplement the Bradley Lake Hydroelectric Facility. This 23-square-mile watershed transitions from glaciated coastal mountains to tidewater in a 9-mile stream course, following deep bedrock dominated gorges, passing over spectacular waterfalls before transiting on to fish-friendlier habitats in its lowest 1.8 miles. Over the past two field seasons, investigators have sampled and monitored the biotic "cogs" and abiotic "wheels" in this system to better understand how dramatic flow fluctuations affect the availability of stream habitat for aquatic organisms. Biotic monitoring and sampling efforts include: resident and rearing fish distribution, adult salmon distribution and timing, and sampling of macroinvertebrate communities. Abiotic factors include stream flow, water quality, temperature, stream bed characteristics, and cross sectional geometry. By understanding these elements and modeling their key inter-relationships, investigators hope to predict how aquatic communities will respond to the diversion of a portion of Battle Creek's waters.

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

Influence of Turbidity and Hydrocarbons on Little Susitna River Juvenile Salmon Habitat

Jeffrey C. Davis[1], Gay A. Davis[1], and Laura Eldred[2]

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Water sampling has been conducted in the Lower Little Susitna River during the Chinook and coho fisheries from 2007 through 2011. Weekly water sampling was conducted at sites distributed from 1 km above to 4 km below the Public Use Facility (PUF) to compare concentrations of total aromatic hydrocarbons and turbidity with State water quality standards (WQS). Turbidity also was measured hourly using Hach MS5 probes deployed a reference site and 4 km below the PUF. Surveys of boat use by motor type were conducted at the PUF. A total of 231 water samples were analyzed for TAH and 17.3% exceeded the WQS of 10 µg/L. Turbidity in the lower river was 5 NTU above natural conditions 39% of the time, also an exceedance of WQS. Hydrocarbon concentrations and turbidity were significantly correlated with boat use. Primary productivity, macroinvertebrate drift, and juvenile salmon abundance were measured at locations above and below high use areas and were significantly lower downstream from the PUF. Intensive boat use is affecting water quality and may be resulting in the loss of rearing juvenile salmon habitat.

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

Stream Water Temperatures in the Matanuska-Susitna Basin

Leslie R. Jensen, Jeffrey C. Davis, and Gay A. Davis

Aquatic Restoration and Research Institute

The Aquatic Restoration and Research Institute has been measuring stream water temperatures at approximately 40 stream locations throughout the Susitna and Little Susitna drainages for the past several years. Stream water temperature sampling locations include large and small clear and brown-water streams, and stream-lake complexes. On larger stream systems, temperatures were recorded at multiple locations. Daily maximum, minimum, and average stream temperatures were calculated from hourly temperature measures. Monthly cumulative degree days were calculated from mean daily values. Linear regression was used to determine the relationship between daily stream statistics, and air temperatures recorded at the Talkeetna and Palmer Airports. Temperature regressions were used to identify those sites that were more responsive to changes in air temperatures. Current and projected stream water temperatures among stream types were compared with habitat requirements and tolerance values of rearing juvenile salmon and resident fish.

Freshwater Ecology: Describing the "Cogs and Wheels" of Freshwater Fish Ecosystems

A Comparative Assessment of Pre- and Post-Spawning Gravel Quality in the North and South Fork Koktuli Rivers, and Upper Talarik Creek

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The amount of fine sediment in spawning gravels has been related to salmonid embryo survival and fry emergence. Fine sediment concentrations in streams can vary temporally in response to hydrologic events and physical disturbances related to spawning. Spawning gravel characterization analysis should reflect conditions found in redds during the egg incubation period, but gravel studies are typically conducted just prior to spawning activity to avoid risk of injury/mortality to embryos. The validity of such studies can be questioned for streams subjected to gravel re-working due to spawning and bedload transport events when sediment intrusion occurs over the incubation period. This study tested the hypothesis that gravel samples collected just prior to spawning contain fine sediment concentrations similar to samples collected post-spawning and after fall rains. The study was conducted in 2008 on the North and South Fork Koktuli Rivers (NFK, SFK)(tributaries to the Nushagak River) and Upper Talarik Creek (UTC) (tributary to Lake Iliamna and Kvichak River). All three systems are subjected to fall rains after spawning. Three study sites were established in and bulk samples collected from, each of the streams; August (pre-spawning); and October (post-spawning). Results of grain size analysis indicated that concentrations of fine sediments were not significantly different (alpha = 0.05) in samples collected pre-spawning and post-spawning/fall rains. Computation of four sediment quality metrics indicated the gravels from all three systems were conducive to embryo survival.

Herring Research and Management

Investigation of Pacific Herring (*Clupea pallasii*) Stock Structure in Alaska Using Otolith Microchemistry and Heart Tissue Fatty Acid Composition

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Understanding the structure of Alaska's Pacific herring stocks is relevant to how these exploited populations should be assessed and managed. We evaluated the capability of heart tissue fatty acid profiles and otolith microchemistry to identify the stock of origin for herring sampled from fourteen spawning aggregations associated with seven putative herring stocks throughout Alaska (e.g., Sitka, Prince William Sound, Kamishak, Kodiak, Togiak, Kuskokwim Bay, and Dutch Harbor). Fatty acid profiles were determined by performing trans-esterification and fatty acid chromatography on purified lipids from whole hearts. Otolith microchemistries were measured (ppm) using laser ablation inductively coupled plasma mass spectrometry (LA-ICPMS). Across-year comparisons were made to evaluate the temporal stability of fatty acid biomarkers that successfully discriminated putative stocks at multiple spatial scales within-years. Cross-validation of discriminant functions and nMDS with ANOSIM revealed that considerable shifts in fatty acid composition occurred for most stocks across short (1 year) and long (4-5 year) time periods. Temporal shifts also made it difficult to identify stock of origin for a putative mixed-stock sample collected during winter. Otolith edge microchemistries were significantly different between some putative stocks at multiple spatial scales, but nMDS and ANOSIM suggested that this difference was infinitesimal. We used heart tissue fatty acid profiles to discriminate Alaskan herring stocks at relatively fine spatial scales when we built models from data collected within the same annual spawning period, but we were unsuccessful discriminating unknown samples (e.g., from mixed stock fisheries) collected outside the spawning period, or in other years.

Herring Research and Management

A Fisherman's View and Historical Perspective of Alaska's Herring Fisheries, 1969-Present

Beaver Nelson

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Beaver Nelson and a few other seiners pioneered the sac roe herring fisheries in Prince William Sound, Kamishak Bay, and Togiak back in the late 1960's and he continues to seine herring with his sons today. Beaver will recount some of his experiences and observations drawn from participating in most of the major herring fisheries throughout Alaska since 1969. Topics he plans to touch upon include: a fisherman's perspective on the differences in management strategies across areas, how markets, fishing strategies, and the fisheries themselves have changed, and a fisherman/biologist's observations on herring biology and ecology.

Herring Research and Management

Market Trends for Alaska Herring Roe

Gunnar Knapp

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Prices in Alaska Pacific herring fisheries have declined dramatically over the past two decades. This paper describes market trends for Alaska herring and factors affecting prices paid for Alaska herring. Most Alaska herring production is frozen round and exported to Japan for processing into traditional herring roe products. Japan also imports both Pacific and Atlantic herring and roe from several other countries, for production of both salted roe as well as a newer flavored roe product. Long-term market trends for Alaska herring roe reflect declining Japanese demand for traditional herring roe products as lifestyles and tastes change. Shorter term price trends reflect changes in the supply of herring roe to the Japanese market from Alaska and other producers, exchange rates between the Japanese yen and the dollar, carry-over inventories, and other factors.

Herring Research and Management

Stock Assessment of Pacific Herring in Southeast Alaska

Kyle Hebert

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Pacific herring (*Clupea pallasi*), is an important species in the marine ecology of southeastern Alaska and is of great cultural and economic interest in the region. With the goal of managing for sustainable populations and fisheries, the Alaska Department of Fish and Game assesses herring populations annually to ensure that adequate stock size exists prior to allowing harvest. The stock assessment is based primarily upon three types of information: egg deposition, spawning segment age composition, and fishery catch age composition. Total egg deposition is estimated each spring for each spawning area by SCUBA divers that complete transects through the spawn area. Survey location is determined by mapping milt along the shoreline as observed during aerial surveys. Age composition is estimated by reading scales of herring sampled from spawning grounds and from commercial catch. Estimates of age composition and egg deposition are the primary inputs for one of two models: age-structured or biomass accounting. These models are used to estimate the current mature herring biomass and forecast mature biomass for the ensuing year. Forecast results are compared to minimum threshold levels, established in regulation, to determine if a fishery may be conducted. Overall, herring abundance is currently at a high level in southeastern Alaska, relative to the past few decades. The Sitka Sound stock, by far the largest in southeastern Alaska has increased in recent years, producing record high commercial harvests. Other stocks are also currently at high levels, though some stocks have fluctuated and are at low levels.

Herring Research and Management

Managing the Sitka Sound Sac Roe Herring Harvest

Dave Gordon

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Herring have been harvested in Sitka Sound for the Japanese sac roe market since 1969. The development of the high value sac roe market resulted in increased participation in the Sitka fishery, mostly by seine vessels. The Sitka Sound herring fishery was placed under limited entry in 1977, with around 50 seine vessels participating in the fishery annually since that time. Smaller stock levels during the 60's and 70's kept annual harvests below 1,000 tons. A significant increase in the stock occurred in 1979 and the stock has remained at higher levels since. In more recent years the stock has further increased in size allowing for guideline harvests levels approaching 20,000 tons. High income potential and high permit values have attracted Alaska's more successful and competitive fishermen. Managing the harvest is challenging due to many factors, including highly competitive fishermen, large harvesting capacity, limited processing, a short duration of time when roe quality is acceptable for market prior to spawning, the unpredictability of herring, and subsistence considerations. Successful management the Sitka Sound herring harvest requires a combination of vessel surveys, aerial surveys, roe sampling, cooperation with industry, a good management support team, short notice opening and closure, experience and sometimes luck. Short fishing periods in confined areas are often necessary to remain within harvest targets. This creates an intensely competitive and contentious fishing environment resulting in vessel collisions, gear entanglement, and safety concerns. Many permit holders have been advocating for regulatory change for a less competitive form of management.

Herring Research and Management

Prince William Sound Pacific Herring History and Current Stock Status

Steve Moffitt

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Commercial exploitation of Prince William Sound (PWS) Pacific herring began in the early 1900s. Commercial markets in the 1920s through the 1940s were for fish oil, fertilizer, or fish meal; pickled fish, dry salted fish, or halibut bait. Significant harvests occurred in the late 1930s with development of the reduction fishery. The modern era of herring exploitation in PWS began demand for herring roe in the late 1960s. By the 1980s there were five herring fisheries including fisheries for sac roe, spawn-on-kelp, and a fall food/bait fishery. The fishery has a regulatory management plan with objectives to provide for an optimum sustained yield and provide an equitable allocation among all user groups. The Department of Fish and Game has monitored herring population trends since 1969 with aerial, dive, and hydroacoutics surveys. Age structured analysis models have been used to forecast the size of the prefishery run biomass since1993. The PWS herring biomass appeared to decline significantly in the winter of 1992/1993, although the timing of the beginning of the decline is in contention. No commercial fisheries have opened since 1999, and the population has remained below the regulatory fishery threshold through 2010. Available evidence suggests the decline can best be explained by an outbreak of viral hemorrhagic septicemia virus in a large biomass in poor condition.

Herring Research and Management

Considering Predation by Humpback Whales in the Mystery of the Failed Recovery of Pacific Herring in Prince William Sound, Alaska

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Biomass of an important forage species, Pacific herring (*Clupea pallasii*), crashed in Prince William Sound (PWS) in the early 1990s, and has since failed to recover. Here we explore the role that predation by humpback whales (*Megaptera novaeangliae*) has had in limiting this recovery. To do this, we utilized three decades of existing data to model the historic relationship between these two species. Mark-recapture estimates of abundance produced the first time series of humpback whale abundance for this area. This time series was then integrated into the age-structured assessment model used by Alaska Department of Fish and Game to manage herring biomass in PWS by adding annual estimates of humpback whale abundance as a covariate to natural mortality. The current (2009) humpback whale population estimate was 191 (SE 32) representing a rate of increase of ≈ 4.5% annually over the time series. Humpback whale abundance helped to explain as much as one-third of the variation in herring natural mortality, but only of older ages (5+), It is unknown if this indicates that humpback whales are targeting older, larger fish or if this is a result of confounding in the model in the younger age classes (ages 3-4) with other factors, such as disease. While model results indicate a substantial removal (particularly of older fish) by humpback whales, retrospective analyses of the updated model show that recruitment, and not predation on adult herring, is the most influential factor limiting the recovery of Pacific herring in PWS.

Student

Herring Research and Management

Estimating Overwinter Mortality of Age-0 Pacific Herring Based on Loss of Energy and Implications for Recruitment

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An overwinter mortality model based on empirical mortality and energy density levels following forced fasting was applied to age-0 Pacific herring (*Clupea pallasii*) of Prince William Sound, Alaska. The frequency distribution of energy density measured during November 2007-2010 was used as model initial conditions. The model was validated by comparing observed energy distributions in March 2008-2011 to model predictions. Modeled mortality from November to March, April, and May resulted in survival rates of, respectively, 22, 5, and 1.2%. Mortality from starvation from November through May thus explains the two orders of magnitude range observed for herring recruitment in Prince William Sound if there is no starvation mortality for cohorts leading to peak recruitment levels (~ 1 billion age-3 herring). Observations of November and March energy density for cohorts recruiting at 1 billion are needed to resolve whether low energy conditions at the beginning of winter or starvation during winter drives recruitment. Low energy levels in November may be due to lack of sufficient high-energy forage as well from energy losses such as those caused by external parasites. For example, recent in-situ observations of multiple sea lice, actually parasitic copepods, on age-0 herring during their first months following metamorphosis suggest this as a possible energy sink.

Herring Research and Management

Kodiak Herring: A Brief History

Matt Birch Foster

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Pacific herring stocks have been exploited commercially for many years on the Kodiak Archipelago. The earliest recorded commercial Pacific herring harvest in the Kodiak area occurred in 1912 when the herring were harvested primarily as food, bait, fishmeal, or oil. During the peak years of the reduction fisheries (1934-1950) the average annual harvest was 31,600 tons, which vastly surpasses the current harvests (2001-2010) annual average of 3,600 tons, primarily in a sac roe fishery. Spawning is temporally and geographically varied, extending between April and May at locations spread out over the entire Archipelago. To protect discrete spawning populations roughly 50 individual section guideline harvest levels (GHLs) ranging from 10 to 2,000 tons are typically managed in an individual years. Despite the apparent precision in management, complications abound as herring aggregate outside of their typical spawning area, adverse weather affecting a large geographical area, variable spawning time, limited management coverage, and limited biomass estimation. Since the 1980s sporadic herring research has been conducted in the Kodiak Management Area including scale pattern analysis, hydroacoustics, pathology, age-structured analysis, and predator-prey studies.

Herring Research and Management

A Brief History the Togiak Herring Fishery

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The Bristol Bay Togiak sac roe herring fishery has been prosecuted since 1967. It started as a very small scale fishery with mostly gillnet vessels participating. The participation and production stayed at low levels until 1977, when interest and harvest increased dramatically. By the early 1980's, the fishery was a significant fishery in the state with an exvessel value exceeding $10 million in some years. Management became very intense with multiple field camps and short openings in small areas defined on short notice. The catching power of the fleet was demonstrated in 1992 when over 20,000 tons of herring was harvested in one 20-minute opening. The fishery peaked in 1995, when the value exceeded $16 million and the gillnet participation was 461 vessels. Since the peak, there has been a sharp decline in value and participation. Management is now much less intense and the value hovers in the $2-3 million range. Participation is 2-3 dozen gillnet vessels and a score of purse seine vessels.

Herring Research and Management

GIS Aerial Survey Data Improves Understanding of Togiak Herring Biomass and Ecology

Matt Jones

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The Alaska Department of Fish and Game relies heavily on aerial surveys to estimate Pacific Herring (*Clupea pallasii*) comprising the Togiak Herring population of western Bristol Bay. Dramatic improvements in GIS and computer technologies have allowed for great progress in the way natural and biological resources, such as herring populations, are monitored. A tablet PC using ArcPad GIS software to document herring biomass and spawn has improved measurement accuracy, reduced math error and data entry time, and increased the utility of the data through GIS software applications. Analyses of GIS survey data shows great promise in improving poorly understood western Bristol Bay Pacific herring movement, spawning, and schooling behavior.

Herring Research and Management

Togiak Herring: Stock Assessment and Forecasting

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The Alaska Department of Fish and Game began stock assessment studies on the Togiak herring population in 1976 and have continued annually since 1978. The purpose of the stock assessment program is to estimate the abundance, age, sex, and size of Pacific Herring in the Togiak District. Accurate abundance measurements, age, sex and size statistics in the Togiak District are essential to the management of the herring fishery. These data are used to 1) monitor harvest levels, 2) determine run timing, entry patterns and distribution of herring arriving on the spawning grounds, 3) monitor sexual maturity and age composition, 4) forecast herring abundance, 5) determine optimal spawning goals and, 6) gain a better understanding of the biology of this stock. We use an age-structured analysis (ASA) model to forecast the Togiak herring population that incorporates catch and age composition data as well as total run biomass estimates. The ASA integrates purse seine age composition data, total run age composition data, and aerial survey biomass estimates. We plan to present and discuss our stock assessment and forecast methods for the Togiak herring population.

Fisheries Education and Outreach: Reaching out to Youth in Alaska and Reeling in Fish Biologists of the Future

Aquatic Education Strategies of the Alaska Department of Fish and Game, Division of Sport Fish

Jay Baumer

Sport Fish Division, Alaska Department of Fish and Game, Anchorage, AK

The Aquatic Education Program of the Alaska Department of Fish and Game, Division of Sport Fish offers a diverse combination of field and classroom activities that focus on promotion of ethical angling and natural resource stewardship for youth in Alaska. Students that participate in the program get hands-on experience exploring fisheries science and learning about local aquatic resources. The program caters to the different knowledge and skill levels associated with grades K-12. Activities include spawning salmon in the field and rearing the eggs in classroom aquariums, learning about salmonid external and internal anatomy with classroom dissections, learning proper fishing techniques including spin and fly casting and how to ethically handle their catch, and much more. In this presentation I introduce selected activities of the Aquatic Education Program and discuss how each activity strives to establish and foster a life-long enjoyment of angling and fisheries science in the youth of Alaska.

Fisheries Education and Outreach: Reaching out to Youth in Alaska and Reeling in Fish Biologists of the Future

Connecting the Connected (A Fish in Water Doesn't Understand Water)

Dan Pascucci

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The Kenai Peninsula has been given the title "Alaska's Playground" due to its wealth of natural beauty and natural resources. Each year, people flock from around the world and other parts of Alaska to experience the world-class salmon runs on the Kenai River. The Kenai Peninsula is truly a spectacular place to experience, but what about the people who have lived on the Kenai Peninsula their whole life? The Kenai Watershed Forum (KWF) has been working to develop and implement educational programming for students in Peninsula schools that connects them to their environment in exciting and engaging ways. The crown jewel of the KWF's educational programs is Adopt-A-Stream, started by US Fish and Wildlife Service personnel in the early 90s and taken over by The KWF in 2005. Since that time, Adopt-A-Stream has spread into many more classrooms and has connected students with their watersheds and fisheries. Utilizing technology in the classroom and the field, students are given hands-on scientific experience testing water and sampling fish and invertebrate populations. By continuing these studies throughout an entire year, students become more engaged in the process and more aware of seasonal changes in their adopted streams and connected to the scientific processes that are used. Over the years that Adopt-A-Stream has been running, new techniques and teaching methods are constantly developed, honed, and perfected. By combining science with art and music, lessons are able to bring a new awareness to students who would otherwise take their incredible surroundings for granted.

Fisheries Education and Outreach: Reaching out to Youth in Alaska and Reeling in Fish Biologists of the Future

A Walk in the Wader Boots of an AFS Hutton Jr. Fisheries Student and Mentor Team

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Remember your first live fish ASL sampling wrestling attempt? Learn how you can teach a high school student the ropes of being in a fisheries profession. The Hutton Junior Fisheries Biology Program is a competitive summer mentoring internship sponsored by AFS that introduces eager high school students to careers in fisheries nationwide. Upon acceptance into the program, Hutton students are mentored by a fishery professional for 8 weeks during the summer and students are rewarded with a $3,000 scholarship. Take a walk with a Hutton student and mentor team to revisit their experience in the program, get suggestions for projects and fieldwork to involve Hutton students, and learn how to become a mentor in your management area. Christine Gleason was mentored by Suzanne Hayes, Fisheries Biologist II, at the Palmer ADF&G Sport Fish Division office in summer 2004. Hayes exposed Gleason to the daily life of a fishery biologist including conducting sport fish creel surveys, wrestling live salmon for scales and ASL samples, daily duties on salmon weirs, hatchery egg-takes, radio telemetry tracking, report writing, and many more hands-on fisheries experiences. Gleason continued in fisheries by working as a fisheries technician for ADF&G, earning a bachelor's degree in fisheries, and is near completion of a master's in fisheries oceanography at UAF. The Hutton program has proven to be an effective and encouraging internship to engage Alaskan students in life-long fisheries career goals. By mentoring high school students in the AFS Hutton Program, we are investing in our future Alaskan fisheries biologists.

Student

Fisheries Education and Outreach: Reaching out to Youth in Alaska and Reeling in Fish Biologists of the Future

The Alaska Marine Science and Fisheries Career Coalition – Networking to Enhance Opportunity

Asia Beder[1] and Paula Cullenberg[2]

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Despite a strong traditional understanding of and geographic proximity to marine and coastal resources, Alaska Natives and rural Alaskans are poorly represented in professional fisheries and marine management positions in our state. The Alaska Marine Science and Fisheries Career Coalition (AMSFCC) is a statewide network of representatives from educators, employers and both community and fishing groups working together to increase the number of rural Alaskans and Alaska Natives in careers in fisheries and marine sciences. Collectively, the Coalition shares information and advocates for opportunities for students, including summer youth science camps, on-campus programs for high school students, college scholarship incentives, internships, and employment opportunities. The Coalition sponsors the Future Alaskans in Fisheries and Marine Sciences website and a variety of social networking communication methods. The Future Alaskans website (www.sfos.uaf.edu/future) offers career information and links to a job board, internships, camps, and other youth activities in Alaska. In October 2010, the Coalition contracted with NMFS to provide a statewide workshop to prioritize education and training projects to support more rural and Alaska Natives in fisheries. One outcome of this workshop has been the development of a new fisheries, seafood and maritime career and workforce initiative at the University level.

In the summer of 2011, Coalition funds were used to sponsor interns in Kodiak, Sitka, and Juneau. The Coalition has used surveys and interviews to begin tracking the youth who participated in several of the summer opportunities in terms of their future involvement in fisheries and marine science careers.

Fisheries Education and Outreach: Reaching out to Youth in Alaska and Reeling in Fish Biologists of the Future

Educating and Recruiting the Next Generation of Fisheries Professionals

Andrew C. Seitz, Katie Straub, and Trent M. Sutton

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Fisheries resources provide an important source of employment, high quality protein, cultural identity and recreational opportunities throughout the country and world. As a result, understanding and managing these resources is critically important. To accomplish these goals, it is necessary to educate future fisheries professionals in a wide variety of scientific and humanist specializations. To attract these future fisheries professionals, it is imperative to recruit our country's youth to college and university fisheries programs. Historically, higher learning recruitment efforts involved mail and telephone communications with junior- and senior-level high school students. Recently, successful recruitment efforts have changed dramatically and involve outreach and educating youths in all grades K-12. In this presentation, we provide a case study that describes the recruitment efforts started in 2005 that were used to increase student enrollment and rebuild the undergraduate Fisheries Program at the University of Alaska Fairbanks. These efforts, conducted by a dedicated Recruitment and Outreach Coordinator with the help of Fisheries faculty members, are aimed at K-12 students and include a variety of programs including on-campus educational activities, visits to schools throughout the state, college fairs, volunteer and internship opportunities, summer science camps, academic competitions and social media. As a result of these efforts over the past five years, undergraduate student enrollment in the UAF Fisheries program has nearly tripled. Therefore, we believe that outreach and recruitment activities are an invaluable tool for increasing enrollment of undergraduate university students who will become the next generation of fisheries professionals.

Fisheries Education and Outreach: Reaching out to Youth in Alaska and Reeling in Fish Biologists of the Future

Experiential Learning in Fisheries – A "Win-Win" for Students and Industry

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As part of the recent reinvigoration of the undergraduate fisheries program at the University of Alaska Fairbanks (UAF), an Experiential Learning component was added to both improve student experience and help with student retention, as well as to prepare students for work in the fisheries field. Experiential or "hands-on" learning is a way to combine traditional classroom learning with direct learning, where students can apply classroom knowledge to real-world applications. As part of the Experiential Learning program, students in the B.A. in Fisheries and B.S. in Fisheries Science degree programs are required to complete either an internship or senior thesis. Most commonly, students complete the internship requirement (FISH 490), which is geared toward juniors and seniors and can be fulfilled with a variety of work experiences, such as: undergraduate research at UAF, a fisheries job with an agency or organization, participation in a science camp or program, work in the seafood industry, and more. The internship program is designed to be broad and flexible to incorporate a range of potential interests and specializations in fisheries. Students in the undergraduate fisheries program at UAF have given positive feedback about the program, often stating it was one of their best learning experiences at UAF. Examples of student internships will be given and future direction of the program will be discussed.

Marine Fisheries Ecology

Effects of Climate Variability on the Abundance and Distribution of Demersal Fishes in the California Current Ecosystem

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Climate variability and long-term climate change can affect the distribution and abundance of marine species, with potential consequences for food web structure and function. We examined the biological responses of 24 groundfish species to environmental conditions to better understand how they might respond to future climate variability in the California Current system (CCS). Seasonal variation in ocean circulation, upwelling, and freshwater inputs dictate changes in marine water properties nearshore and translate to patterns of biological productivity in the CCS. Additionally, interannual climate variability and decadal-scale regime shifts have led to large changes in system productivity. We used generalized linear mixed effects models to evaluate the relative importance of local environmental variables and longer-periodicity climate processes in dictating variation in groundfish abundance and distribution. We hypothesized that biological responses to climate-ocean conditions would be related to species' life history and behavioral characteristics. Local environmental variables (e.g., sea surface temperature, SST; chlorophyll concentration, chl-*a*) were important predictors of occurrence for all species. Species showing positive relationships with SST and chl-*a* had significantly shallower distributions, smaller maximum size, and were more sedentary than those whose occurrence varied inversely with temperature and chlorophyll. The importance of interannual climate variability was related to age, with earlier maturing and shorter-lived species showing more sensitivity to upwelling and El Nino Southern Oscillation anomalies. Resolving the mechanistic linkages between climate-ocean conditions and distribution of adult fishes remains a major challenge, however, this study provides insight into the potential vulnerability of different life history types to future climate change.

Marine Fisheries Ecology

The Gulf of Alaska Integrated Ecosystem Research Program: Preliminary Findings from the First Field Season

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The Gulf of Alaska Integrated Ecosystem Research Program is a newly initiated study focused on both identifying and quantifying the key process that regulate the recruitment of five commercially and ecologically important groundfish species in the Gulf of Alaska (GOA). This study is designed to indentify regional differences in the processes occurring in the southeast and central GOA during spring, summer, and fall. A combination of modeling, field and lab work initiated in 2011 in order to characterize the biophysical conditions encountered in the GOA, the amount and quality of habitat available to these species, and health and fitness during the first year of life. Preliminary findings from this year showed a decrease in the abundance of target marine fish, an increase in salmon, and distinct pelagic communities of forage species and predators.

Marine Fisheries Ecology

Connecting Climate Variability to Recruitment Success of Walleye Pollock (*Theragra chalcogramma*) Through Bioenergetics

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Walleye pollock (*Theragra chalcogramma*) support the largest commercial fishery in the United States and are an ecologically important component of the eastern Bering Sea ecosystem. Alternating climate states influence the recruitment success of walleye pollock through bottom-up control of zooplankton communities. Recent (2007-2010) cold summer conditions have resulted in high quality (i.e., lipid-rich) prey availability, allowing walleye pollock to acquire sufficient energy reserves for increased overwinter survival relative to warmer years (2003-2005). Relating the seasonal progression of energy content and allocation to the distribution and abundance of walleye pollock allows for detection of spatial and temporal trends in fish condition and provides critical information for the prediction of overwinter survival and recruitment to age-1. Energy densities remain relatively low during the larval phase in early summer, indicating energy allocation to growth and development. Lipid acquisition rates increase rapidly after transformation to the juvenile form, with energy allocation to lipid storage leading to higher energy densities in fall. We propose this physiologically and ecologically important shift represents a short critical period for determining fall condition and overwinter survival in walleye pollock.

Student

Marine Fisheries Ecology

Nutritional Ecology of Juvenile Pacific Herring (*Clupea pallasii*): Nucleic Acid Ratios as an Index of Growth and Starvation Threshold

Ashwin Sreenivasan[1], Ronald A. Heintz, Johanna J. Vollenweider, Stanley D. Rice, Paul K. Hershberger, and Jacob L. Gregg

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Pacific herring (*Clupea pallasii*) are an important prey species in the north Pacific. Populations, and annual recruitment, can vary significantly between populations and years, making population predictions through modeling difficult. Juvenile young-of-the-year herring face critical energetic challenges during their first winter due to competing needs for energy to support both growth and energy storage. This energetic challenge is exacerbated with a short summer growing season. These energetic challenges affect population recruitment and year class success. Providing energetic assessments for herring can help in better population prediction models for Prince William Sound herring, which have not recovered after a crash in 1993. The nucleic acid (RNA/DNA) ratio from white muscle of young-of-the-year herring was applied as a measure of regular and compensatory growth in fed, fasted/fed, and terminally fasted fish cultured at 3 temperatures. Growth corresponded to changes in RNA/DNA. Relative to fed controls, fasted/fed fish showed similar RNA/DNA ratios and soluble protein concentration, but reduced mass. Nucleic acid ratios in fasted/fed and terminally fasted fish indicated incipient terminal starvation. A seasonal variation of RNA/DNA, protein concentrations and total body lipid concentrations was seen in fed fish, reflecting changes in resource allocation; growth rates, RNA/DNA, temperature and mass covaried seasonally. Compensatory growth is an effective survival mechanism in Pacific herring. Energy allocation strategies are seasonally influenced, and suggest a minimum storage lipid level required before somatic growth occurs.

Student

Marine Fisheries Ecology

Otolith Chemistry of Arctic Cod, Arctic Staghorn Sculpin, and Bering Flounder in the Chukchi Sea

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Arctic cod (*Boreogadus saida*), Arctic staghorn sculpin (*Gymnocanthus tricuspis*), and Bering flounder (*Hippoglossoides robustus*) are key arctic and subarctic fishes that exhibit unique life histories and distributions within the Chukchi Sea, a marginal sea to the Arctic Ocean. We assessed otolith chemistry and the physical environment of fish capture locations for the three fish species. A component lacking in marine otolith chemistry studies is the interdisciplinary approach to validate the interpretation of the otolith signatures in fish. Fish, sediment interstitial water, bottom seawater, and CTD data were collected near the seafloor in the Chukchi Sea aboard the Russian American Long-term Census of the Arctic (RUSALCA) and Chukchi Sea Offshore Monitoring in Drilling Area (COMIDA) interdisciplinary research cruises. Otoliths were prepared from frozen fish and measured for calcium (Ca), magnesium (Mg), strontium (Sr), and barium (Ba) concentrations on the recent growth edge by an inductively coupled plasma mass spectrometer (ICP-MS) at UAF. Bottom and interstitial seawater were measured for Ba by the ICP-MS whereas Ca, Mg, and Sr were calculated based on salinity. Partition coefficients were determined from otolith: water chemistry ratios and revealed species, age, and water mass to have the most influence on otolith signatures in all three fish species.

Student

Marine Fisheries Ecology

An Overview of ShoreZone Imagery and Habitat Mapping in Alaska

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An overview of ShoreZone methods, applications, and products will be provided in this presentation. ShoreZone is a mapping and classification system that specializes in the collection and interpretation of low-altitude aerial imagery of the coastal environment. Its objective is to produce an integrated, searchable inventory of geomorphic and biological features of the intertidal and nearshore zones which can be used as a tool for science, education, management, and environmental hazard planning. Many agencies from Washington, British Columbia, and Alaska have used ShoreZone for their regions. Currently ShoreZone imagery is available for 51,745 km of Alaska's shoreline (approximately 69%) and mapping is completed or in progress for 44,660 km (approximately 59%). ShoreZone work was funded by a partnership of many organizations. The goal is to image and map the entire shoreline of Alaska. Recent ShoreZone products from Alaska will be highlighted in this overview including the ShoreZone website, the ShoreStation and Fish Atlas data, and ShoreZone applications including habitat capability modeling.

Marine Invertebrates in Alaska

Induction of Broadcast Spawning in Hatchery Held California Sea Cucumbers (*Parastichopus californicus*): Potential Implications for Current Alaskan Commercial Fisheries

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With rising demand for sea cucumber products, commercial fisheries of California sea cucumber (*Parastichopus californicus*) were established throughout the Eastern North Pacific. Nevertheless, fishermen have concerns about the sustainability of stocks. While sea cucumber aquaculture has flourished in the South Pacific, hatchery production of California sea cucumbers has previously not been conducted due in part to the past difficulty in inducing spawning. In light of this, the goal of my study was to create a reliable method to induce California sea cucumbers to spawn in captivity. Broodstock were collected on 3/11/2011 and 4/6/2011 from Southeastern Alaska and transported to the Alutiiq Pride Shellfish Hatchery in Seward, Alaska. Broodstock were acclimated for 9-12 weeks while being fed mixtures of co

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- C sea water and live microalgae at ~5,000 cells/ml. Five spawning trails were conducted, with between 1-23 broodstock spawning during each trail. No broodstock eviscerated as a result of spawning treatments. Spawned eggs had 100% germinal vesicle breakdown and a mean fertilization of 91.3±0.4% (±SE). Mean fecundity/female was 449,588.8±76.0 (±SE). Although this study has advanced California sea cucumber aquaculture potential, there is still much research to be conducted before aquaculture of California sea cucumbers is an economical solution to population shortages.

Student

Marine Invertebrates in Alaska

Marine Macroinvertebrates of Alaska: Annotated Checklist

David T. Drumm[1] and James W. Orr[2]

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A comprehensive species list of marine invertebrates of Alaska is currently lacking. The checklist of Austin (1985) treated the marine invertebrates of Southeast Alaska to California and since then many new species have been described, many range extensions have been discovered, and considerable changes in higher-level systematics have been made. We are compiling a checklist that will include the currently accepted scientific name and its significant synonyms, common names, type localities, geographic and depth distributions, a general statement of abundance (e.g., rare, uncommon, common, abundant), significance for fish habitat, and general remarks. This checklist will serve as a foundation for future species-specific research. Another goal of this project is to evaluate the Alaska Fisheries Science Center's bottom-trawl survey database for levels of confidence in invertebrate identifications over the duration of the survey time series. To monitor and predict future changes to marine life, the distribution and abundance of marine species need to be better understood, and this can only be achieved with reliable identifications based on a sound taxonomy.

Marine Invertebrates in Alaska

Pribilof Domain King Crab Habitat Mapping Pilot Project: Demonstrating Efficacy of Multibeam Sonar Technology for Multiuse Seabed Mapping

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Pribilof blue king crab (*Paralithodes platypus* Brandt, 1850) benthic habitat extends from the shores of Pribilof Archipelago to over 2,000 meters in Pribilof Canyon. Essential fish habitat for juvenile Pribilof blue king crab (PIBKC) is less than 70 meters deep, comprised of broken seashell, called "shellhash". This stock was declared "overfished" in 2002, and habitat integrity is being examined as a potential bottleneck limiting stock rebuilding. We surveyed 78 square kilometers of benthic habitat off of St. George and St. Paul Island aboard the R/V Mt. Mitchell, using the Kongsberg EM 710 Multibeam Echosounder (70-100 Hz). National Ocean Survey protocols were fully implemented. Sites were selected based upon previous *in-situ* mapping of shellhash habitat in the mid-1980s and recent ADFG pot surveys that confirmed PIBKC still used those habitats. A Seabotix Remotely Operated Vehicle was used to visually examine habitats around St. George Island. Multibeam sonar backscatter data was processed through CARIS HDCS Hydrographic Data Processing Software and then analyzed using Fledermaus and ArcGIS 9.3. These methods successfully discriminated shellhash juvenile king crab habitat from surrounding seafloor substrata. The distribution of shellhash at St. George Island had changed little since the mid-1980s study; data for St. Paul was less conclusive. This pilot project demonstrated multibeam sonar bathymetry and backscatter can be acquired within data specifications simultaneously for NOAA NOS nautical charting and for seabed typing needed for essential fish benthic habitat assessment. It provides critical information regarding swath coverages and costs for planning future surveys of PIBKC habitat.

Marine Invertebrates in Alaska

Phylogeography of Red King Crabs in Alaskan Waters

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Red king crab populations support substantial subsistence and commercial harvests in Alaskan waters. However, population declines in several areas have led to temporary and permanent fishery closures in some areas and have prompted research into possible population enhancement. The genetic population structure is of considerable importance in both fisheries management and enhancement. Here, the analysis of mitochondrial (mt) DNA and nuclear SNP variability is used to infer the degree of connectivity between populations and to provide insights into the evolutionary history of red king crab. A strong gradient in mtDNA diversity occurs across the North Pacific with greatly diminished diversities in SE Alaska. Both mtDNA and SNPs (together with allozymes and microsatellites) define three major evolutionary lineages: 1) western North Pacific-northern Bering Sea-Aleutian group, 2) southeastern Bering Sea-western Gulf of Alaska, and 3) SE Alaska. Bayesian skyline plots of observed and simulated mtDNA sequences show population growth in response to post-glacial warming in the Holocene. The distribution of genetic diversity and differences in mtDNA coalescence among groups indicate a complex phylogeographic history. High levels of diversity in Asian populations indicate an Asian ancestry of populations in the NE Pacific. However, the pattern of genetic differentiation and shallow gene genealogies in NE Pacific populations indicate that present day populations were likely seeded by crabs from the Kodiak Island and Queen Charlotte Island refugia after the last glacial maximum.

Marine Invertebrates in Alaska

Molt Timing and Soft Shell Handling Levels for Male Dungeness Crabs in Southeast Alaska

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Commercial harvest of Dungeness crabs, *Cancer magister,* in Southeast Alaska began in the 1930s. For the 2009/10 season, they were by far the most valuable shellfish fishery in Southeast Alaska, producing a harvest of 3.57 million lbs, with an exvessel value of approximately 5.97 million $US. Despite the undisputed value of the fishery, the resilient life history of the species has permitted exploitation by a 3-S (size, sex, and season) harvest strategy. However, in Southeast Alaska the season provides only partial protection during sensitive life history periods, as the summer season overlaps the male molt, identified to occur February through July. Managers have had difficulty dealing with this problem due to uncertainty around the spatial and interannual variability in the timing of the male molt and the level of handling in the fishery. To gather more information, several field sampling programs were initiated. Extensive on the grounds sampling was conducted in 1999, a survey was conducted from 2000 through 2004, and the annual dockside sampling program was ramped up with the establishment of spatial and monthly sampling goals in 2001. We report here on the results of these efforts pertaining to male molt timing, and soft shell handling levels in the commercial fishery. We also discuss the ecological, evolutionary, and anthropogenic factors leading to variable life history timing, and the implications of handling soft shell crabs.

Marine Invertebrates in Alaska

Hybrid *Chionoecetes* in the Bering Sea: What We Know and What We Don't Know

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The hybridization of species has figured prominently in evolutionary biology for more than a century. The topic takes on increased interest when commercial species hybridize. This is the situation in Alaska where snow crab (*Chionecetes opilo*) and Tanner crab (*C. bairdi*) interbreed in the Bering Sea. *Chionecetes* hybrids have been recognized for 40 years, first through morphological characters intermediate between the two species and later confirmed with genetic methods. Morphometrics and genetic techniques were combined in a pioneering study by Donaldson. Despite an understanding of the basic science underlying this hybridization, it has proved difficult in the field to identify hybrids. This has proved problematic for biologists, law enforcement officers, and fishery managers. I will review the biology and history of this topic as well as the latest technological advances needed for the field identification of these hybrids.

The Whole Picture: Tying Habitat to Ecosystem Processes and Fisheries Health

Application of a GIS-based Model to Predict Population Response of Chinook and Coho Salmon to Habitat Restoration and Climate Change in Southcentral Alaska

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Existing habitat inventory data and assessments throughout Alaska are incomplete. This limits the capacity of resource managers to understand, anticipate, and prepare appropriate responses to changes in watershed processes that can result from anthropogenic and climate change. To address this need, the U.S. Fish & Wildlife Service is implementing a habitat assessment project on the Anchor River watershed in Southcentral Alaska. The goals of the project are to assess current habitat conditions for Chinook and coho salmon in the Anchor River watershed, to increase our understanding of the relationships of key life stages of salmon to these habitats throughout the watershed, and to model the potential responses of Chinook and coho salmon populations to restoration efforts and potential shifts resulting from climate change. We are using remotely sensed data, field data, refined hypothesis testing, and GIS tools to identify salmon habitats in the Anchor River watershed and applying a predictive model called RIPPLE to characterize locations critical to protect population productivity, and make predictions on how changes to existing habitats might translate into changes in productivity. Once the model is refined on the Anchor River, we will apply it to similar watersheds on the Kenai Peninsula. We plan to use the model as a prioritization tool for projects funded under our Fish Passage, Partners for Fish Wildlife, and National Fish Habitat Action Plan programs.

The Whole Picture: Tying Habitat to Ecosystem Processes and Fisheries Health

Freshwater Baseline Inventory and Monitoring in Nushagak and Kvichak Headwater Streams

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Bristol Bay is home to one of the largest, most valuable salmon fisheries in the U.S. owing largely to its pristine nature. In Alaska, fish must be explicitly documented in a water body for fish conservation statutes and regulations to apply, though less than half of the state's streams have been surveyed. Consequently, presence/absence surveys were conducted in headwater streams of the Nushugak and Kvichak Rivers including the Koktuli River, Talarik Rivers, Chulitna Creek, Sixmile Lake, and the Newhalen River. Non-salmon species important to subsistence and sportfishing stakeholders, including Dolly Varden and rainbow trout, were found in 96% of streams surveyed, and salmon were documented in 3 of every 4 streams surveyed excluding those in the Chulitna drainage. Salmon were documented directly on top of the proposed Pebble deposit. Freshwater macroinvertebrate, diatom, and physical habitat monitoring was conducted concurrently to produce baseline data within and adjacent to mining claims in the region. This study underscores both the importance of headwater streams as essential salmon rearing habitat and the lack of data for two of the world's most productive salmon ecosystems. The work provides some legal protection to 149 kilometers (92.5 miles) of newly documented salmon streams.

The Whole Picture: Tying Habitat to Ecosystem Processes and Fisheries Health

Flexible Methods for Rapid Mapping of Marine and Estuarine Habitats and Fish Presence Using Towed Underwater Video

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Faced with the need to efficiently and safely map nearshore benthic habitat for baseline studies in support of an environmental impact statement in SE Alaska, we developed a method using GIS interpolation of coded data from subsampled towed underwater video transects. Supplemented by remote sensing techniques and standard intertidal quadrat transects, this method resulted in detailed maps of several habitat variables. Different interpolation methods were combined to form separate component surfaces (bedrock, gravel, sand, mud, shell, kelp and algae), which were mapped individually and then merged into maps of dominant substrates and biological components using conditional statements.

In contrast to SCUBA transect methods, the use of continuous geolocated digital video allowed for increases in subsample size and independent error assessment without further field effort. This allowed us to stratify our sample sizes according to project needs: we selected evenly-spaced samples in areas needing general characterization and increased sample density in areas where direct project impacts were expected and higher resolution/larger scale maps were needed.

The flexibility of this method allows it to be used at a variety of scales and depths. Habitat coding methods can accommodate diverse classification schemes such as NOAA's Coastal and Marine Ecological Classification Standard (CMECS). Spatially concurrent trawling and incidental faunal sightings also indicate that species/habitat associations could be integrated with increased field effort.

The Whole Picture: Tying Habitat to Ecosystem Processes and Fisheries Health

Physical Habitat Correlates of Juvenile Pacific Salmon Density in the Kulukak River, Alaska.

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Quantifying the influences of freshwater habitat on Pacific salmon dynamics is critical to adopting an ecosystem-based approach to salmon management. In Bristol Bay, this is especially true in the face of a changing climate and the development of a large-scale mine in the headwaters of its salmon-producing rivers. Currently, much of the freshwater habitat in Bristol Bay is inaccessible by plane or boat, and for this reason, data on those habitats and the freshwater-rearing juvenile salmon populations therein are non-existent. This project was developed to address the challenges in conducting ground-based habitat assessments and enumeration of juvenile salmon during freshwater life stages, and to explore the relationships between physical habitat and juvenile salmon densities in the Kulukak River, Alaska. Our specific objectives were to (1) use freshwater habitat area derived from classified aerial imagery and estimates of density (fish/m^2) to estimate the abundance of juvenile Chinook, coho and sockeye salmon, and to (2) model juvenile salmon density as a function of several physical habitat variables in two tributaries of the Kulukak River. The evidence was strong for greatest juvenile salmon densities in habitats with slow water velocities and fine sediments. Understanding the implications of these habitat correlates — as well as the potential impacts upon them by natural and anthropogenic processes — will allow for more effective management of Pacific salmon and their freshwater ecosystems.

Student

The Whole Picture: Tying Habitat to Ecosystem Processes and Fisheries Health

A Framework for Assessment of Ecological Risk to Wild Salmon Associated with Large-Scale Mining in the Nushagak and Kvichak Headwaters of Bristol Bay

David Trim[1] and David Albert[2]

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Ecological risk assessment (ERA) has become an essential tool for evaluating impacts to biological receptors associated with wide range of human activities. We applied ERA methodology to develop a framework for analyzing potential risks to salmon that may result from large-scale mining and associated activities in the Nushagak and Kvichak headwaters. This framework considers key ecological functions that support all freshwater life-stages of salmon, including in-migration, spawning, incubation, rearing and out-migration. Potential risk factors included loss or alteration of habitat associated with water withdrawals, road construction, sedimentation, metals toxicity, accidental spills, acid mine drainage, and large-scale pollution events. While it is not possible to predict future conditions with certainty, this conceptual framework provides a systematic approach to evaluate the potential scope and severity of a range of risk factors, as well as potential effects on ecological systems that support salmon, to inform decision-making and risk management.

The Whole Picture: Tying Habitat to Ecosystem Processes and Fisheries Health

Distribution and Habitats of Juvenile Coho Salmon in Tributaries of the Little Susitna River, Alaska

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The upper Little Susitna drainage is a relatively intact system and provides habitat for multiple Pacific salmon (*Oncorhynchus spp.)* runs. However, because this area is currently seeing increased development, urbanization and fishing pressure, there is concern regarding the conservation status of Little Susitna salmon stocks. Data on these stocks are limited. We lack a full understanding of juvenile rearing habitat and what habitat factors limit the distribution and production of Pacific salmon in the region, specifically, areas located within the headwaters of drainages with high gradient and fast moving water. We will use a habitat modeling approach to determine the range of habitats used by juvenile coho salmon (*O. kisutch*) including habitats that are most limiting or productive at selected spatial scales. We sampled headwater tributaries of the Little Susitna drainage using a continuous sampling technique to investigate spatial patterns in fish distribution, in conjunction with a streamwide assessment of habitat. We used backpack electrofishers to sample fish throughout 200 m stream reaches. During 2010 and 2011, habitat characteristics were measured on 83 stream reaches and 77 reaches were sampled for fish. We performed mark-recapture on 27 reaches for validation of abundance estimates and for developing models of our sampling efficiency. These data will allow us to model habitat use and identify areas of the Little Susitna region that are important for juvenile coho salmon. This will allow for more strategic and informed management of these populations with implications towards conservation and restoration practices occurring in the Matanuska-Susitna regions.

Student

Poster Session

Estimation of Abundance and Run Timing of Kenai River Chinook Salmon Stocks Using SSART Mark-Recapture Model Based on Genetic Stock Identification and Weir Escapement Data

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Estimation of abundance of Kenai River Chinook salmon stocks and their run timing is highly important for managing this valuable resource. In this study we estimated abundance of five major Kenai River Chinook salmon stock groups and their run timing in 2010 using SSART mark-recapture model with genetic marks and radio transmitters complemented with weir escapement data. The Stock Specific Abundance and Run Timing model (SSART) was developed by the USFWS (Bromaghin et al. 2010) and later modified by ADF&G to adopt a Bayesian framework, the use of genetic marks, and the inclusion of harvest. The model creates a space-time matrix of relative abundance where the genetically identifiable stock groups represent the space component and 2-week strata represent the time component. This space component is estimated by two data sources; genetic stock identification (GSI) estimates of inriver gillnetting samples from Kenai river-mile (rm) 8.5 and radio-telemetry final destinations. The time component is estimated using catch rates of an inriver gillnetting project located near rm 8.5. The matrix is converted from relative abundance to actual fish by having known escapements for one or more of the stock groups. In this study we used data collected in 2010 to estimate abundance and run timing for five genetically distinct stock groups: Funny River-Slikok Creek, Killey River-Benjamin Creek, Mainstem Kenai River, Quartz Creek-Crescent Creek, and Russian River. The weir data was available for two groups: Funny-Slikok and Russian River. Harvest was accounted for by collecting genetic samples from harvested fish for stock identification and weighting harvest estimates by time strata. For management purposes, the abundance estimates were pooled into early run and late run groups.

Poster Session

Acoustic Repertoire of Pacific Cod (*Gadus macrocephalus*): Does it Have One?

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Many fish species commonly produce knocks, grunts, and pulsed sounds. Atlantic cod (*Gadus morhua)* produce grunting sounds and knocks in captivity and in the wild; however no sound production by Pacific cod (*Gadus macrocephalus*) has been reported previously. To determine if Pacific cod produce sounds, passive acoustic recordings and behavioral observations were collected during June and July 2010 at the Alaska SeaLife Center in Seward, Alaska. The "Deep Gulf" tank, where recordings were collected, contained eight Pacific cod, a Pacific halibut (*Hippoglossus stenolepsis*), three Sablefish (*Anoplopoma fimbria),* three Great sculpins (*Myoxocephalus polacanthocephalus*), a Plain sculpin (*M. jaok*), three Yellow irish lords (*Hemilepidotus jordani*), four Longnose skates (*Raja rhina),* two Lingcod (*Ophiodon elongatus*), a Giant wrymouth (*Delolepis gigantean*), and four Flat bottom stars (*Asteria amurensis*). Passive acoustic data were collected using a HTI-96-MIN hydrophone (response up to 30 kHz) and a handheld digital recorder Edirol R-09. Video data were collected using an 8GB Flip Video Ultra HD camcorder. In over 48 hours of recordings, a total of five distinct, likely fish sounds were found. All sounds were single pulses, ranging in frequency from 154-440 Hz and lasting <190 ms. Three different Pacific cod behaviors were observed: yawning, milling, and feeding. Our findings are inconclusive on whether Pacific cod is the source of these sounds; rockfish and sculpins produce sounds in similar frequency range and duration. Further study is necessary for conclusive coupling of recorded sounds with individual species. Understanding the acoustic repertoire of these species could aid in population monitoring.

Student

Poster Session

Strontium (Sr) Isotopic ($^{87}Sr/^{86}Sr$) Variation of Alaskan Rivers: Implications on Tracking Movement Patterns and Natal Origins of Fish

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Recently, strontium (Sr) isotopic ($^{87}Sr/^{86}Sr$) variation across the Earth's surface has been used extensively to track movement patterns and natal origins of fish populations using fish otoliths. This work has been largely motivated by efforts to develop tools to help identify population structure having a strong geographic relationship, such as populations of Pacific salmon species, to aid in biodiversity conservation. A prerequisite of using strontium isotopes to track fish movement patterns and natal origins is that different environments encompassed by the migratory range of the species in question vary significantly. $^{87}Sr/^{86}Sr$ variation in freshwater ecosystems is dictated by geology. Alaska is defined by a geologically diverse landscape and is home to many migratory populations of fish, including valuable natural resources such as Pacific salmon. This poster presents strontium isotopic ($^{87}Sr/^{86}Sr$) compositions of surface waters from Alaskan Rivers ranging from the Chugach and Wrangell Mountains to the North Slope of Alaska. The values exhibit a strong latitudinal gradient. This large range of variability is systematic (geologically and geographically) and indicates that the use of strontium isotopic compositions recorded in otoliths of Alaska's migratory fish populations may serve as an informative tool for tracking movement patterns and natal origins between freshwater environments in Alaska. This poster also identifies current and future work in Alaska to characterize temporal and spatial scales of $^{87}Sr/^{86}Sr$ variability as it relates to the complex migratory behavior of Pacific salmon, and the limitations spatio-temporal variability pose to the otolith-strontium isotope method.

Student

Poster Session

Phylogeography and Population Genetics of Beringian Blackfish (*Dallia*)

Matthew A. Campbell, J. Andrés López, Rachel DeWilde, and Naoki Takebayahsi

University of Alaska Fairbanks

Populations of the freshwater fish genus *Dallia* inhabit a restricted range in areas adjacent to the former Bering land bridge in Chukotka, Russia and Alaska, USA in the biogeographic region known as Beringia. The current distribution of both blackfish and blackfish genetic variability were heavily influenced by paleoclimatic instability during the Pleistocene. Beringian paleoclimatic changes during the Pleistocene included cycles of growth and decline of glaciers and an overall decrease in temperature and increased aridity in areas not adjacent to the Bering Sea. Pleistocene glacial advances resulted in the cyclical emergence of the Bering land bridge, connecting western Alaska with eastern Chukotka. The effects of paleoclimatic instability on blackfish distribution and abundance can be inferred through the distribution of genetic variation across the Beringian landscape. The information garnered from blackfish can then be applied more generally to questions of Beringian biogeography. We address three basic questions: 1: Are geographically segregated populations of blackfish taxonomically distinct entities? We found that while there is clear genetic structuring and isolation, information remains insufficient to support strong conclusions in this regard. 2: Did blackfish survive Pleistocene glaciations within multiple Beringian refugia? The results indicate that blackfish persisted in at least four broad geographic areas. 3: How did the Bering land bridge influence intercontinental aquatic interchange? Our evidence points to close genetic relationships and potentially high exchange of blackfish across the Bering land bridge, which supports the Bering land bridge as suitable habitat for freshwater aquatic migration.

Student

Poster Session

Artificial Spawning and Early Life History of Alaska Blackfish (*Dallia pectoralis*) from Cook Inlet Basin, Alaska

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The Alaska blackfish (*Dallia pectoralis*) is a small freshwater mudminnow endemic to Beringia. Alaska blackfish occur on the Chukotka Peninsula of Eastern Russia, across Western Alaska, Central Alaska in the Yukon River drainage, and on the North Slope. First introduced to Southcentral Alaska in the 1950s, Alaska blackfish are believed to inhabit most Cook Inlet Basin waters. The species exhibits extreme hardiness from an ability to breathe atmospheric air and also legendary cold tolerance. Alaska blackfish ecology is poorly described, and reproductive behavior is not understood. 47 years ago, Nevin Aspinwall artificially spawned Alaska blackfish from Lake Aleknagik (Bristol Bay). Here we describe the first successful *in vitro* fertilization of Alaska blackfish from Rabbit Slough (Cook Inlet Basin). We detail embryo and larval development and describe techniques for culturing and rearing Alaska blackfish.

Student

Poster Session

Trophic Ecology of Non-Native Alaska Blackfish (*Dallia pectoralis*) in Cook Inlet Basin, Alaska

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The Alaska blackfish (*Dallia pectoralis*) is a small freshwater mudminnow endemic to Beringia. Alaska blackfish occur on the Chukotka Peninsula of Eastern Russia, across Western Alaska, Central Alaska in the Yukon River drainage, and on the North Slope. First introduced to Southcentral Alaska in the 1950s, Alaska blackfish are believed to inhabit most Cook Inlet Basin waters. The species exhibits extreme hardiness from an ability to breathe atmospheric air and also legendary cold-tolerance. Alaska blackfish ecology is poorly described, and fisheries managers express concern over possible predation of introduced blackfish on native salmonids as well as competition with native fishes for food. The aims of this study are to describe diet of non-native Alaska blackfish across seasons, sex, and age. Specimens are collected every month for a full year from a wetlands pond, stream, and lake. Morphometric measurements include gape width, eye diameter, and gill raker counts. Stomach contents are dissected and quantified by percent frequency of occurrence, percent abundance of food items, and percent volume for calculation of the index of relative importance (IRI). Intensity of feeding is measured by an index of fullness. Percent empty stomachs is also calculated. We expect non-native blackfish to be zoophagous opportunistic feeders whose primary diet consists of assorted invertebrates. We also expect non-native blackfish to be piscivorous on smaller conspecifics, native juvenile salmon, ninespine stickleback, and threespine stickleback.

Student

Poster Session

An Interdisciplinary Sustainability Assessment of the Skate Fishery in Prince William Sound, Alaska: Movement Patterns, Stock Assessment and Bioeconomic Modeling

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Skates are in growing demand worldwide. In 2008, the U.S. landings of skates, mainly from the Atlantic Ocean, totaled 65 million pounds, worth US$11 million. Because skates are long-lived, mature late in life and possess slow intrinsic growth rates, they are vulnerable to overfishing. As such, many Atlantic Ocean skate stocks are depleted. In contrast, Alaska has relatively healthy skate stocks and there is increasing economic pressure to develop fisheries for them. Big (*Raja binoculata*) and longnose (*R. rhina*) skates are the most commonly landed skates in Alaska and a directed fishery is being developed in Prince William Sound (PWS). To sustainably manage this marine resource more biological information is needed. Our goals are to 1) use satellite telemetry and conventional tags to understand habitat use, movement and transfer of skate biomass among management areas, 2) use this information to develop a mark-recapture-based stock assessment for PWS skates and 3) build a bioeconomic model of the proposed skate fishery. To accomplish these goals, skates were tagged with pop-up satellite and conventional tags during the Alaska Department of Fish and Game's 2011 PWS summer trawl survey. In this poster, we present preliminary results from our tagging experiments and a framework for developing a spatially explicit stock assessment and bioeconomic model for PWS skates. This information is important for managing existing and proposed future skate fisheries.

Student

Poster Session

The Influence of Estuary Habitats on the Expression of Life History Characteristics of Juvenile Coho Salmon in Southcentral Alaska

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We examined how variability in estuary habitat conditions can be translated into life history variability in juvenile coho salmon. This poster presents preliminary results from our work that focused on environmental variability and the resulting patterns of abundance, size, age, and condition in juvenile salmon that occupied channel habitats of two different estuaries. We evaluated how traits such as fish size, age structure and body condition, abundance corresponded to seasonal conditions in estuarine channel environments. Juvenile coho salmon were found using the estuary channels throughout the sampling period (early May through late September), and preliminary diet analysis suggests active feeding within these habitats. Three age classes of coho salmon were found using the estuary habitats, with larger, older fish becoming scarce by the end of June and smaller, younger fish becoming more prevalent. Two kinds of habitats with corresponding differing patterns of use were apparent: transitional refuge habitats (short term use by few age classes, little or less feeding activity) and rearing habitats (long term use by all age classes, greater feeding activity). Patterns of use most greatly correspond with variability in channel depth (covaried with temperature). These data provide support for our hypotheses that estuary channels serve important roles both as rearing and as and refuge habitats and that these roles are different across various stages of development and potential life histories in coho salmon. Future work includes determining estuary rearing time and comparisons between patterns of use, phenotypic traits, and corresponding genetic diversity in juveniles occupying glacial and spring-snowmelt fed estuary habitats.

Student

Poster Session

Changing Seasonality of Arctic Hydrology Disrupts Key Biotic Linkages in Arctic Aquatic Ecosystems

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Arctic grayling (*Thymallus arcticus*) are an important circumpolar species that provide a model system for understanding the impacts of changing seasonality on arctic ecosystem function. Grayling serve as food for other biota, including lake trout, birds and humans, and as top-down controls in stream ecosystems suggesting that changes to their populations will have effects that reverberate throughout the arctic ecosystems. Our objective is to assess how shifting seasonality of Arctic river hydrology may disrupt key biotic linkages within and between lake and stream components of watersheds on the North Slope of the Brooks Mountain Range, Alaska. In 2010, we undertook new surveys of grayling migration dynamics using Passive Integrated Transponder (PIT) tags, coupled with stream-side antenna units to monitor grayling migration timing into winter lakes. Initial results indicate day length may prime grayling migration readiness, but that flooding events may be the cue the grayling use to initiate migration. Many fish used high water in the stream as an opportunity to move into lakes. Stream and lake derived stable isotopes also indicate that lake trout rely on these seasonally transported inputs of stream nutrients for growth. Improved understanding of these processes will advance our general understanding of the role of animals in ecosystem dynamics, life-history evolution and ecosystem management.

Poster Session

Determining Population Relationships for Two Sister Species of Coregonus: Arctic and Bering Cisco (*C. autumnalis* and *C. laurettae*).

Robert Marcotte[1] and Andrés Lopéz[2]

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Like other members of the *Coregonus* genus, the degree of relatedness between Arctic Cisco and Bering Cisco (*C. autumnalis* and *C. laurettae*) remains poorly known. Understanding their relationships is complicated by the fact there are only minor morphological differences between them, and the species appear to hybridize. Ongoing gene flow and a relatively short time since divergence each contribute to shared genetic variation. By determining the relative contribution of incomplete lineage sorting and hybridization to shared genetic variation, we can evaluate different models for the mechanism of differentiation between these two putative species. Specifically, we are interested in establishing how glacial history, patterns of connectivity, and migratory behaviors shaped the history of these assemblages of lineages. To resolve these questions, we examine evidence from DNA sequences from the introns of the s7, tropomyosin, enolase, and Rag 1 genes, as well as the mitochondrial control region, from both Arctic and Bering Cisco, and from Least Cisco (*C. sardinella*) for comparison. As predicted, the two species were not found to be reciprocally monophyletic. The genetic distances of those alleles common between Arctic and Bering Cisco suggest alleles from both incomplete lineage sorting as well as hybridization. Possible implications for the understanding of the evolution of these species are addressed.

Student

Poster Session

Anadromous Lamprey and Salmon: Co-Habitation in the Mat-Su Valley

Betsy McCracken

USFWS/CPA Branch

Alaska's marine and freshwater habitats support three anadromous species and two non-anadromous species of lamprey. The three anadromous species are the Pacific, Arctic and American River lamprey. Non-anadromous species include the Alaskan Brook and the Western Brook Lamprey. Researchers are just beginning to understand the complex ecology and life history of these species. What we do know is that lamprey occupy habitats similar to salmon species and provide ecological benefits to salmon and resident fish species.

This poster identifies some known lamprey sightings in the Mat-Su Valley, basic lamprey life history information, and potential ecological benefits to salmon. It also describes general conservation concerns for the species, and current research needs.

Poster Session

Alaska Fish Mural Adventure Project

Katrina Mueller[1] and Patricia Barrere[2]

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During the summer of 2011, urban youth from Anchorage, Alaska participated in a U.S. Fish and Wildlife Service pilot program designed to: 1) connect underserved audiences to Alaska's native fishes and 2) introduce careers options in fisheries and with the Service. Phase 1 consisted of an overnight "adventure" that exposed participating youth to local fishery and aquatic resources and enabled them to shadow local biologists. Phase 2 consisted of a guided art project (mural) that incorporated concepts learned during the outdoor adventure (e.g., fish anatomy and native fish biodiversity). A pre- and post-program survey assessed changes in participant knowledge about native fish and their habitat needs.

Poster Session

Estimating Stock Composition of Yukon Delta Bering Cisco Harvest with Otolith Chemistry Data

Andrew J. Padilla[1], Randy J. Brown[2], and Matthew J. Wooller[1]

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2: *U.S. Fish and Wildlife Service, Fairbanks, AK 99701*

Bering cisco (*Coregonus laurettae)* are an anadromous whitefish species endemic to Alaska. Currently only three spawning populations are known: in the Yukon, Kuskokwim, and Susitna Rivers. Bering cisco rear in coastal estuaries and lagoons in Cook Inlet, and from Bristol Bay to Prudhoe Bay. A commercial fishery is developing in the lower Yukon River estuary where Bering cisco are the targeted species. Processor requests for a larger allocation indicate a desire for future fishery expansion. Bering cisco from both the Kuskokwim and Yukon River stocks are thought to be harvested in the fishery due to coastal currents. Relative abundance data from the Yukon River suggest a large population; however, no estimates are available for the Kuskokwim River. Subsistence harvest also occurs throughout their range. In order to monitor harvested populations appropriately, and prevent overharvest on an important subsistence resource, it is necessary to determine the population composition of the fishery. This project aims to determine Bering cisco stock composition in the lower Yukon mixed stock commercial fishery. This will be accomplished through use of otolith and water chemistry, including strontium isotope composition. Our initial validation of this approach has involved collecting cisco from their different natal streams. We have compiled a collection of 118 otoliths from the Yukon, Kuskokwim, and Susitna Rivers, to examine whether they have significantly different otolith chemistry. In addition, several hundred mixed stock otoliths have been collected. Resulting data will provide additional tools for fishery managers in developing a population monitoring program and harvest strategy.

Student

Poster Session

Subsistence Harvest Management - A Harvest Reporting Validity Assessment

Scott Prevatte1, James Brady[1], Robbin La Vine[2], and Erica McCall Valentine[3]

1: *HDR Alaska, Inc.*

2: *Division of Subsistence, Alaska Department of Fish and Game*

3: *Ecotrust*

Alaska's Copper River State and Federal subsistence fisheries allow all Alaska residents to harvest up to 500 sockeye salmon per household using a fish wheel. Fish wheel owners are ultimately responsible for fish harvested from their permitted wheel. The study uses a Traditional Knowledge based approach to document how fish wheel owners operate their wheels and how they manage the sometimes large number of friends, family, co-workers and acquaintances who use their wheel.

In 2010 HDR scientists formed a partnership with the State of Alaska Department of Fish and Game and Ecotrust's Copper River Program to address concern that subsistence harvest may be under reported and potentially contributing to inaccurate escapement estimates.

To help insure the sustainability of this unique fishery the USFWS Office of Subsistence Management is currently funding the HDR team to complete a pilot project to assess the validity of harvest reporting. Investigators are testing a variety of methods including site observation, interviews with wheel owners and resource managers, and postal survey on two road accessible user groups at Copperville and Chitina.

The study uses a Traditional Knowledge based approach to document how fish wheel owners operate their wheels and how they manage the sometimes large number of friends, family, co-workers and a Management Requirements Analysis to describe how resource managers collect and compile the harvest data; the resulting identification of potential errors will help managers provide more confidant escapement estimates for a sustainable fishery.

Poster Session

An Invasive Aquatic Plant, *Elodea,* Threatens Alaska's Fisheries and Aquatic Resources

Cecil Rich[1] and Katrina Mueller[2]

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Until recently, Alaska has been considered to be free of the invasive aquatic plants that greatly impact freshwater resources in other areas of the world where they are not native. Since the discovery of *Elodea* in Chena Slough in Fairbanks in August 2010, it has been documented in Chena Lake in Fairbanks, Sand and Delong Lakes in Anchorage, and Eyak Lake in Cordova where the taxa was first documented in 1982, but not recognized as a nonnative, invasive species. This presentation will describe the habitat requirements, identifying characteristics, and invasive traits of Elodea. We also summarize modes of invasion and documented impact on aquatic resources where it has spread outside its native range. Finally, we describe methods most likely to be effective in the control of Elodea, initial efforts that have been taken to control the species in Alaska, and the need for quick action to prevent further spread.

Poster Session

Trophic Patterns of Mercury Concentration in a Nonanadromous Aquatic Ecosystem in Southwest Alaska

Kyle Shedd[1] and Frank von Hippel[2]

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Mercury (Hg) is a pervasive environmental contaminant and neurotoxin At northern latitudes there are three primary sources of Hg in freshwater ecosystems; (1) geological sources contributing background levels of Hg, (2) atmospheric deposition of anthropogenic Hg, and (3) marine derived Hg transfer via ocean currents and migrating marine organisms. This project utilizes stable isotopes of carbon and nitrogen to interpret trophic patterns of Hg concentration in a nonanadromous freshwater lake in southwest Alaska, Jo-Jo Lake, that lacks anadromous sockeye salmon (*Oncorhynchus nerka)* as the principal regional source of marine-derived Hg. This objective will be addressed: (1) by measuring Hg concentration in lake sediment cores from Jo-Jo Lake and comparing to nearby anadromous and nonanadromous lakes; (2) by determining how the bioconcentration of Hg varies intraspecifically between two trophically polymorphic populations of nonanadromous sockeye salmon (kokanee), in Jo-Jo Lake; and (3) by quantifying Hg concentrations interspecifically in predominant species of both benthic and limnetic trophic webs within Jo-Jo Lake, and comparing with nearby anadromous systems. These results will help elucidate how Hg concentration varies trophically in an aquatic ecosystem lacking marine Hg from anadromous salmon. This will provide further insight into how Hg biomagnifies in aquatic trophic webs in Alaska and how Hg accumulates in organisms at higher trophic levels, including freshwater fish that are consumed by humans as sport-fish and important subsistence foods.

Student

Poster Session

Utilization of Attack Scars as a Proxy for Lamprey Abundance and Distribution in the Eastern Bering Sea

Kevin A. Siwicke, Trent M. Sutton and Andrew C. Seitz

University of Alaska, School of Fisheries and Ocean Sciences

Arctic and Pacific lampreys are anadromous species playing ecologically important roles in freshwater and marine environments. These species are critical predators and prey items in food webs, and they interact with several commercially important fishes, as evidenced by scars left on hosts. To date, research efforts in Alaska have focused solely on investigating freshwater aspects of these species and there is an absence of lamprey research related to their parasitic marine phase. As such, basic marine ecological information such as abundance and distribution is virtually unknown. Because lampreys are difficult to capture in the ocean, this study will examine marine lamprey abundance and distribution, using attack scars on Pacific cod as a proxy for actual lampreys. Attack scars on Pacific cod sampled in the 2011 International Pacific Halibut Commission Annual Longline Survey and the National Marine Fisheries Service Annual Eastern Bering Sea Trawl Survey were photographed, and scars will be rated for severity and measured. The results may be useful for understanding basic marine ecology of Pacific and Arctic lampreys, and understanding the biological and economic effects of lampreys on other commercially important fishes.

Student

Poster Session

Salmon as Predators and Prey in Marine Waters of Alaska

M. Sturdevant[1], E. Fergusson[1], J. Orsi[1], and R. Brenner[2]

1: *NOAA Fisheries, Alaska Fisheries Science Center, Auke Bay Laboratories*

2: *Alaska Department of Fish and Game, Division of Commercial Fisheries, Cordova*

Predation during the early critical period of rapid fish growth is thought to determine year class strength for juvenile salmon and many other species, yet surprisingly little has been published on the impact of specific marine predation. Predation impact is hard to document because it requires consistent sampling over extended periods to capture infrequent or episodic events. We examined diets of marine fish, including adult salmon, in migratory corridors from a 15-year time series (1997-2011) of surface trawl catches in Southeast Alaska and from two years (2009-2010) of purse seine test fisheries in southwestern Prince William Sound. Our objectives were to investigate four aspects of predation: a) the incidence of predation on juvenile salmon by adult/immature Chinook, coho, sockeye, chum, and pink salmon, b) piscivory on forage fish by adult salmon, c) the potential for cannibalism by odd-even year broodlines of pink salmon to depress adult returns the following year, and d) predation impact on juvenile salmon by an episodic strong year class of sablefish. We present highlights of research on these trophic interactions that could affect salmon recruitment.

Poster Session

Growth Increment Formation Using Otoliths and Scales of Juvenile Chinook Salmon

Brian Walker[1] and Trent M. Sutton[2]

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Freshwater growth of juvenile Chinook salmon Oncorhynchus tshawytscha has been found to strongly influence survival and recruitment to the adult population. Retrospective analysis using daily increments on otoliths and circuli on scales has emerged as a tool to measure salmon growth at previous ages. Fish size and growth is assumed to be accurately reflected by otolith increments and scale circuli, but this assumption is rarely validated. We will validate the relationship between body size and growth and width between otolith growth increments and scale circuli in juvenile Chinook salmon. Twenty-four 110-L aquaria will be stocked at densities of 10 or 20 fish (12 aquaria for each density) and tanks will be assigned a feeding ration of 1%, 2%, or 4% of total fish body weight to simulate low growth, maintenance, and high growth conditions, respectively, during the 122-d experiment. Growth increments on the otoliths and scales will be counted and measured to examine the periodicity of otolith increment and circuli formation and to determine the effects of density and food ration on increment and circuli deposition. This study will assist fisheries managers by testing the accuracy of the assumption that fish body size and growth is reflected by otolith and scale size and growth-increment formation. If the relationship between body size, hard structure size at age, and growth chronology can be validated, the findings of my study can be used to ascertain body size at past ages and interpret the meaning of retrospective growth.

Student

Alaska Chapter of the American Fisheries Society

The 38th Annual Business Meeting

Agenda, November 17, 2011

Girdwood, AK – Alyeska Resort

1. Call to Order – Audra Brase (President)

2. Determination of a Quorum

3. Approval of Agenda

4. Approval of minutes from the 2010 Alaska Chapter AFS Business Meeting

5. Reports

a.	Treasurer's report	Lee Ann Gardner
b.	Committee reports	
i.	Awards	Theresa Tanner
ii.	Continuing Education	Tammy Hoem Neher
iii.	Cultural Diversity	Sara Gilk-Baumer (absent)
iv.	Electronic Communication	Allen Bingham
v.	Environmental Concerns	Cecil Rich
vi.	Finance	Ray Hander
vii.	Fisheries Communication and Education	Laurel Devaney
viii.	Membership	Mark Wipfli
ix.	Molly Ahlgren Scholarship	Ray Hander
x.	Newsletter	Bill Bechtol
xi.	Past Presidents	Lisa Stuby
xii.	Program	Trent Sutton
xiii.	Resolutions and Bylaws	Hamachan Hamazaki
xiv.	Student Sub-units	Emily Lescak
xv.	Wally Noerenberg Award	Ken Gates

6. Outgoing President's Address – Audra Brase

7. Old Business

8. New Business

a. AFS Western Division report

b. Update to Vice President and Secretary elections

c. 25 yr membership pins

d. Reappointment of all committee chairs

9. Open forum

10. Adjourn

Alaska Chapter of the American Fisheries Society

The 37th Annual Business Meeting Notes

November 4, 2010

Juneau, AK - Centennial Hall

1. The meeting was called to order at 5:19 PM by President Lisa Stuby.
2. **Quorum Established:** Members of Executive Committee present were President Lisa Stuby, President Elect Audra Brase, Past President Bert Lewis, and Treasurer Lee Ann Gardner. The student sub-unit president Sara Miller in attendance. A quorum was established with 32 members present.
3. **Approval of the Agenda:** The membership approved the agenda as revised and presented at the meeting.
4. **Approval of minutes from 2009 Alaska Chapter AFS Business Meeting:** The minutes of the November 4, 2009 meeting were approved pending a few minor changes.
5. **Reports:**

   a. **Treasurer's report:** Lee Ann Gardner provided a treasurer's report. The primary treasury-related efforts in 2010 were: (1) develop a spending plan for 2010, (2) complete federal tax return filing for the Tax Year 12/1/2008 through 11/30/2009, and (3) serve on and provide support as needed to the Chapter's Finance Committee and the Molly Ahlgren Scholarship Committee. She noted that many numbers are inflated on report because we are still paying for this year's meeting. The total assets for the Alaska Chapter are listed as $225,968. The annual meeting bill is still outstanding ($2,700). The student travel fund balance is included in the Wedbush Checking account and was $1,374; this year's silent/audible auction and t-shirt sales raised $4,191 and there were $9,257 in student travel expenses for a total balance of-$3,692 that was authorized by the ExCom and the deficit then paid out of general funds. The student travel balance is now $0.00. This year's meeting showed a record attendance of 288.

   b. Committee reports:

   i. **Awards:** Theresa Tanner reported that there were 43 student presentations, 30 oral presentations and 13 posters. Fourteen participants volunteered to judge and select the best student paper and student poster at this year's annual meeting. The best student paper was awarded to Jason R. Neuswanger, and the best student poster was awarded to Jamie McKellar, both students at the University of Alaska Fairbanks. Both students received the $200 monetary award

   This year there were no nominations for the AK Chapter Meritorious Service Award. This year's AK Chapter Service Award went to Gretchen Bishop who was our long-time *Oncorhynchus* editor. The Almost Darwin Award went to the

Kwethluk River SARON camp which was completely burned in an afternoon by a massive and unfortunate fire. The Wally Noerenberg Award for Fishery Excellence was not given in 2010. This was the first year that the closing date for nominations for these awards was January 31, 2010. This date has worked well since most nominations tend to occur soon after the AK Chapter meetings.

ii. **Continuing Education:** Tammy Hoem Neher was not present, so Lisa Stuby read a pre-prepared statement.

Four workshops were planned in association with the annual meeting covering a broad range of topics in fisheries in Alaska, including scientific public speaking, technical writing for fisheries, GIS basics, and the NOAA catch share program. There was insufficient interest in the catch share program workshop and the scientific communication workshop to be able to hold them. We had 29 members attend the GIS and technical writing workshops associated with the annual meeting.

Tammy continues to ask for ideas and suggestions from the membership for workshops (and instructors) that the membership would like to have offered both associated with the annual meeting and outside of the meeting. Please contact Tammy Hoem Neher if you have ideas or suggestions you would like to share!

iii. Cultural Diversity Travel Award: Sara Gilk introduced the three recipients of this year's Cultural Diversity Travel Award. She solicited applications from around the state and received applications from seven highly qualified individuals. After scoring applications with a panel of anonymous judges, this committee was able to fund three candidates for the 2010 meeting in Juneau: Ernestine Ahgeak (Fairbanks), Elena Fernandez (Fairbanks), and Emilie Springer (Homer). Ernestine Ahgeak is currently a senior at University of Alaska Fairbanks working towards a B.S. in Fisheries, Elena Fernandez is currently a student in the final year of her Master's program in Fisheries Oceanography at University of Alaska Fairbanks, and Emilie Springer is in the third year of her PhD program in the University of Fairbanks' Anthropology Department. More detailed descriptions of the candidates biographies will be published in the Winter *Oncorhynchus.*

iv. Electronic Communication: Allen Bingham reported that during the past few years the web site has essentially just been "maintained" (i.e., no new improvements). Each newsletter that has been distributed during this past year has been made available on our web site in Adobe Acrobat (pdf) format and information about training courses and meetings of not only the Chapter but also the Parent Society and the Western Division have been posted. As has been the case for the last three years, continuing this year the newsletter was primarily distributed by a email-based system; with some hard-copies sent to some non-members, libraries, and members without email (or those requesting a hard-copy).

The Student Subunit web site (http://www.fisheries.org/units/afs-ak/student) has been maintained as a portion of our site. Comparative to past years, Allen has not

received updates of information on the Student website, and as such most of what is currently on this sub-site is out of date. The Student Subunit's web site has included postings of the officers, meetings, and special event announcements were posted for the University of Alaska Fairbanks and the University of Alaska Fairbanks-Southeast. So far, the Anchorage campus group is still inactive.

The committee continued to maintain an email distribution list for most Chapter members with email addresses in the Chapter's membership database. The distribution list was used successfully to "get the word out" for Chapter activities such as the recent announcements for the 2010 Annual Conference, chapter elections, the chapter newsletter, and other items of interest. The Parent Society hosts our Chapter's email list server, and all Chapter members with an email address (who have chosen to participate) can be members of that list. Chapter members that are subscribed can post email to the list at the following address (they need to post from the email address that they are subscribed to the list):

akchap@lists.fisheries.org

The list is moderated by Allen to reduce SPAM messages sent out and to control for mistaken "Reply-to-All" responses to posted messages that he filters out before allowing transmission to subscribed Chapter members. Membership in the list is contingent upon membership in the Chapter. Periodically, postings from non-Chapter members have been permitted to be posted for distribution to the list on a case by case basis. During this past year (November 2009-October 2010) an approximate total of 108 email messages were sent to our membership.

Allen will be stepping down as the *Membership Manager* for the Chapter --- and announced that he will need someone to step up and replace him in that role. Allen envisions being available to transition a new volunteer into this role over the next year or so.

The committee is interested in hearing what members would like to see on our web site. The web site address is: http://www.fisheries.org/units/afs-ak

and the e-mail address for sending comment about and contributions to the web site is: allen.bingham@alaska.gov

v. **Environmental Concerns:** Cecil Rich provided a rundown of responsibilities to provide views on environmental issues that represent the views of the AK Chapter. In 2010 no significant issues were brought to the committee. In addition, Bert Lewis has joined Cecil on this committee.

vi. **Financial Assets Oversight Committee:** Ray Hander the committee chair was not in attendance, so Lee Ann Gardner, who is also a committee member along with Tim Joyce, gave the report. They meet with their financial advisor, Todd Fletcher of Wedbush Morgan Securities (WMS) on a quarterly basis. In 2010, the FAOC met quarterly with the Chapter's WMS representative, Todd Fletcher, to receive portfolio status updates and conduct maintenance of accounts as needed to

conduct Chapter business. Lee Ann Gardner, Treasurer, is in frequent contact with WMS as she conducts day-to-day Chapter business and informs finance committee members with information on an as needed basis. The FAOC submitted a new committee entry for the Chapter's Procedure Manual revision that provides FAOC background and responsibilities.

The Chapter's WMS portfolio is invested using a moderately conservative strategy with an investment horizon of 7 to 10 years as determined by the Finance Committee members in consultation with the WMS investment representative. The Chapter's Wedbush Morgan Securities (WMS) investment portfolio for endowments has gained approximately $16,891 since 30 October 2009. These gains were from interest gained in the Wally Noerenberg and Molly Ahlgren Scholarship Fund endowments. The loss between 2009 and 2010 ($-1,541) shown in the Cultural Diversity Award Fund is a result of the recent withdrawal to pay for the 2010 Cultural Diversity Award. Since no Wally Noerenberg award was given in 2010, the earnings from this account were reinvested into the fund's corpus. The Molly Ahlgren Scholarship Fund has increased since 2009 from interest earned, donor contributions, and two $5,000 (one for 2009 and one for 2010) contributions from the Chapter as is consistent with the resolution approved by the Alaska Chapter in 2005. Fund A has gained $1,777 since October 2009 through interest earned and payments made from general funds such as earnings from the annual meeting, continuing education events, and membership dues. Interest earned from Fund A may be used for expenditures such as travel and scholarship awards and special projects. Unexpended annual earnings from Fund A were reinvested into the Fund A corpus. The interest bearing money market checking and petty cash accounts fluctuate annually during August through December due to annual meeting and continuing education expenses and income. The money market checking account during the remainder of the year holds approximated $7,000–$10,000 to conduct regular Chapter business. At present, we are experiencing positive investment returns in the 10% range on a total return on basis while maintaining a moderately conservative investment portfolio. Realized portfolio gains are due to the ongoing stock market improvement and the Chapter's portfolio asset allocation. Overall, our investments are in bonds (85%), stocks (10%), and fund manager held cash (5%) and is a moderately conservative means of investing that has gained ground over the past year in a difficult investing climate.

Overall, the Chapter's portfolio value continues to creep up under the current market conditions while holding to our moderate to conservative investment strategy. Diversified bond investments continue to "pay us to wait" as our bonds-based portfolio continues to build. With current market conditions we are able to take advantage of the bond market in the sense that we are getting equity-type

returns without the equity investments that have a higher risk level. Global and U.S. events of the recent few months have led to persistence in market volatility, investor uncertainty and market instability. September 2010 has been the best month out of 2010 for general market conditions.

The outlook at this time is for continued volatility until indicators such as a significant upturn in the housing market, lending, and jobs creation change for the better. Advice is that the portfolio maintains its current track with bond investments. Exposure to equity investments should only be considered when a serious change in market conditions occurs; otherwise you open the portfolio to the market volatility. Mortgage interest rates will probably continue to drop in the near future and this environment generally fares well for bond investments.

vii. **Fisheries Communication and Education:** Laurel Devaney presented the report. Cheryl Anderson, Fisheries Biologist with the Kenai Fish & Wildlife Field Office, has agreed to join this committee as a co-chair. She has already brought energy and new ideas to the committee. The Communication and Education Committee held a meeting of interested AFS members at the annual meeting. Steve Brockman of the Juneau Fish & Wildlife Field Office gave a presentation of a recent "Bio-Blitz" they held which yielded a wealth of scientific data while being an excellent outreach event. AFS members attending the Bio-Blitz also brain-stormed ideas for future activities.

viii. **Membership:** Trent Sutton reported that the AK Chapter membership has increased over the last 3 years. Membership in 2010 was 329 compared to 317 for 2009. The number of delinquent members has also decreased. Lee Ann added that more delinquent member's payed their dues here, so the number should decrease even more. Although the number of active members is down slightly from 2009, the number of AFS life, retired, student, and young professional members have all increased over the past year. It should be noted that new in 2010 is the category for Alaska Chapter life member. In addition to the above membership statistics, the number of delinquent dues members (members who have not paid their membership dues) is down from 2009.

One hundred fourteen reminder emails were sent out on August 20, 2010 and September 28, 2010 to Alaska Chapter members who owed Parent, Chapter, and State Chapter dues. It is not clear if the decline in the number of delinquent dues members is in part due to this year's effort or the effort of the previous Vice President (Audra Brase) for her snail mail reminders in fall 2009.

ix. **Molly Ahlgren Scholarship:** Hal Geiger mentioned that this year the Molly Ahlgren Scholarship Committee (MASC) made several important changes. Extensive revision of the committee's formal procedures and duties were made and the committee produced an approximately 500 word entry dealing with those duties and responsibilities for the Chapter's procedures manual. Notably, the committee has moved to a system of open application initiated by the students. The committee developed a new application form, and the committee will

annually review all timely applications from the individual students that apply. In consultation with the student subunit, the MASC will make a recommendation on a scholarship winner to the Executive Committee.

This year the committee met and selected two students that were recommended as co-winners of the 2010 award: Andrew Reichel of Alaska Pacific University and Casey McConnell of the University of Alaska Fairbanks. The Ak Chapter Executive Committee then approved this recommendation. Due to a busy schedule, Hal Geiger has resigned his chairmanship but will remain on the committee. Ray Hander has been appointed the new chair of the MASC Committee.

x. Newsletter: Gretchen Bishop did a great job in her fourth year as the *Oncorhynchus* editor. Gretchen Bishop compiled articles submitted by Chapter members and then sent the articles to Connie Taylor of Fathom Publishing who designed, laid out, and mailed the Oncorhynchus to the AK Chapter membership. The AFS style conventions described at *http://www.fisheries.org/afs/styleguides.html* are generally followed. During the past year, four electronic issues were printed, one at the beginning of each calendar quarter. After four years, though, Gretchen was ready to step down. Bill Bechtol has agreed to step up as the new editor. Newsletter submission deadlines remain the 10th of March, June, September and December.

xi. Past Presidents: Hamachan Hamazaki reported that at the annual Past Presidents luncheon participants enjoyed their lunch and discussed a diverse array of AK Chapter AFS issues including and the AK Chapter's current position of neutrality on the Western Division AFS proposal "Recommending a Formal Independent Scientific Review and Survey of Potential Environmental and Socioeconomic Consequences of Large-Scale Mineral Extraction in the Bristol Bay Watershed". Currently, we have chosen to not take action on this issue because the Pebble Partnership has not yet released a definite project plan nor have they applied for permits. Due to the current lack of information on how this mine will proceed in the future we choose to remain neutral on the WDAFS resolution. In addition, the updated AK Chapter Procedure Manual was discussed including nomination criteria for the Wally Noerenberg award, specifically whether or not to consider nominees who have worked but never lived in Alaska which was discussed and debated.

xii. Program: As President Elect, Audra Brase planned this year's meeting. She chose Juneau as the 2010 host city because the AK Chapter has not had a meeting here since 1997. Audra thought there might be more participation from members if the meeting was held in the "hub" of Southeast since the economy was/ is still a bit sketchy. Because Juneau is an expensive place to hold a meeting the Chapter applied for a Juneau Sales Tax Exception, this saved the Chapter quite a bit of money in taxes and reduced our fees as a non-profit. With the help of JCVB we were able to obtain group rates at hotels near Centennial Hall.

The 2010 AK Chapter meeting we had 15 sessions with over 100 presentations. In addition the poster session had over 30 participants. Friday had a full day of presentations, compared to recent years where Friday has been relatively "light". Thirty three students gave oral presenters and there were 13 student posters.

For the Continuing Education classes, Tammy Hoem Neher was a huge help after Jan Conitz stepped down as CE chair earlier this year. We had four classes lined up, but unfortunately we had to cancel two of them due to low enrollment (public speaking & catch-share). Audra would recommend NOT offering the public speaking class again as this is the second year we have had to cancel it. However, GIS was very popular and we might consider holding it again with perhaps a higher class fee.

Rachel Kvapil, an ADF&G publications technician, was a big help with formatting this year's program. In-retrospect Audra would NOT have extended the call for presentations since this just postponed her time getting the program put together and she would have liked more editing time. The program was printed in Juneau, so money was saved on shipping. We received good donations: UAF donated lanyards and names tags, ADF&G donated $200 for student lunch, and the Alaskan brewery donated 2 kegs of beer.

In addition, for the banquet, the first band disbanded and the ChillKats were difficult to confirm since they were in the field for most of the summer. Sara Miller was invaluable in coordinating the 48 student volunteers. The 2011 rotation will be in Southcentral and Trent Sutton will be the meeting organizer.

xiii. **Resolutions and Bylaws:** Bill Bechtol has been the sole committee chair of the Resolutions and Bylaws committee. This committee continues to provide input on revisions of the Alaska Chapter Procedure Manual to reflect actual Chapter practices. The Procedures Manual is a living document, providing guidance to Chapter officers and members and intended to be revised as needed within the bounds of the Chapter Bylaws. The Chapter Bylaws, which describe the core objectives and operating procedures for the Alaska Chapter of the American Fisheries Society, may also be revised as needed upon an approval vote of the Chapter membership. In 2010, the committee received a proposal to make three primary revisions to the Chapter Bylaws: (1) to simplify the title of "First Vice-President" to "Vice-President"; (2) to revise the term "Chairperson" to read "Chair" throughout the Chapter Bylaws; and (3) to clarify that committee chairs are to be appointed by the Chapter President no less than annually. Aspects of the proposed Bylaws changes were presented in the Fall 2010 issue of the Chapter newsletter *Oncorhynchus*. The proposed Bylaws changes will be discussed, with a potential vote for or against approval by the membership, at the annual Chapter Business Meeting in November 2010.

xiv. **Student Sub-units:** Sara Miller AFS was able to fund many students to attend this year's AK Chapter meeting. Because there were so many student presenters,

a requirement for airfare to and from Juneau was the students need to give an oral or poster presentation. There were student volunteers from Anchorage, Fairbanks, Juneau, California, Hawaii, and Sitka who received airfare, room, board, registration and/or had their banquet ticket waived. Students from UAA, UAF, and UAS were encouraged to solicit auction items to try and reimburse the AFS student travel fund. The new student representative for the 2011 meeting in central Alaska will be Emily Lescak. She is currently a UAF Ph.D. student living in Anchorage.

xv. **Wally Noerenberg Award:** Ted Otis led a discussion on why there was no Wally Noerenberg Award (WNA) given for 2010. The WNA for Fishery Excellence is the highest award bestowed by the Alaska Chapter. It honors an individual's life-long achievements in a career focused on Alaska's fisheries. The WNA is administered by a committee comprised of three Chapter past-presidents and a committee chair that cannot be a past president. Committee members serve a staggered three-year term such that only one position becomes vacant and is refilled each year. The 2010 WNA committee consisted of Bill Wilson, Scott Maclean, and Jim Reynolds, whose 3-year term ends at the 2010 Juneau Meeting. Hal Geiger was selected and has agreed to take Jim Reynolds' place on the committee.

This year, the committee received one WNA nomination prior to the new January 31, 2010 deadline. Unlike past years, the 2010 nominee had never been an Alaska resident and the WNA committee decided to table the nomination while it solicited input regarding the nominee's eligibility for the award. The procedures manual did not explicitly exclude non-Alaskans, however, every past award recipient was an Alaska resident for all or the majority of their career. Some members with lengthy associations with the Alaska Chapter and the WNA felt it was always assumed the award was intended for individuals who'd spent all or the majority of their career living in Alaska and focusing on Alaska fisheries. Hence, the WNA Committee drafted language to explicitly include an Alaska residency criterion in the procedures manual. A further clarification was added stating that only individuals, not agencies or organizations, are eligible for the award. During their October 13th meeting, the Executive Committee provided a unanimous vote of confidence to support these changes. Due to the ineligibility of this year's nominee, the WNA was not presented in 2010. And an apology letter was sent stating that the nominee was not eligible because it was Alaskan award. Hal Geiger has a serious disagreement with this policy and wants to make the award broader and for someone who lives out of state but has conducted much work in Alaska to be eligible. The WNA committee will meet in 2011 and further discuss the criteria.

11. **Outgoing President's Address**: Lisa Stuby told the meeting participants that it has been an honor to be President over the last year. She has enjoyed working with a great group of people, in particular those on the Executive Committee and other AK Chapter Committees. Planning the meeting in Fairbanks, representing the AK Chapter to the Western Division AFS, and attending the WDAFS meeting in Salt Lake City, Utah were also highlights. She encouraged members to become involved in and participate in AK Chapter committees, etc. Lisa then passed the gavel to Audra Brase

12. Old Business: None

13. New Business:

a. **AFS Western Division report:** Mary Buckman, the WDAFS secretary/treasurer from Corvallis OR discussed the National Meeting that will take place in Seattle during September 2011. In addition, she told the membership that a Mexico chapter started last year and they had their 1st meeting in 2010. The WDAFS spent a lot of time encouraging student involvement, specifically inclusion in the Western Division. She concluded by encouraging the AK Chapter to apply for the best AFS Chapter award.

b. **Vote on proposed changes to Alaska Chapter bylaws:** We further discussed changes to the AK Chapter bylaws that Bill Bechtol presented and that was published in the Fall *Oncorhynchus*. Bert Lewis motioned to accept the changes in bylaws as defined by the discussion and was seconded by Lisa Stuby. All were in favor. Hamachan did a good job on instigating these changes as well as updating the entire Procedures Manual.

c. **Reappointing of all committee chairs :** As listed per the AK Chapter bylaws, Audra Brase reappointed all of the committee chairs, with the notable changes of Ray Hander assuming chairmanship of the MASA and Bill Bechtol will be taking over for Gretchen Bishop as the new *Oncorhynchus* editor.

d. **Vice President and Treasurer Elections:** Lisa Stuby mentioned that the election will close on December 5, 2010. Right now Mark Wipfli and Lee Ann Gardner are in lead for Vice president and Treasurer respectively. For 2011 Lisa will have start the election earlier and have the closing date at the meeting so the new Vice President, etc. can be announced at next year's Business Meeting.

e. **25 yr membership pins:** Audra handed out 25 year pins at banquet.

14. Open forum: Audra Brase presented outgoing president Lisa Stuby with a plaque.

15. Adjourn: