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, consisting 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 Art: *Halibut* by Bruce Nelson

Artist Biographical Sketch: Bruce Nelson has been using his paintbrush to reflect the world around him since he was 8 years old. He spent a year studying in Europe, and in 1980 on a summer vacation while in college he came to Alaska for a commercial fishing job and never left. From deck hand to skipper Bruce fished on many different boats and different fisheries throughout the state. This work exposed him to much of remote Alaska and gave him time to observe and paint coastal landscapes and wildlife. Bruce has over 50 prints and posters to his credit. Some of Nelson's works include three local Kodiak crab festival posters, 1996 Alaska state medallion, 2001 Indiana state trout stamp, works for Ducks Unlimited, Alaska Outdoor Council and was awarded a grant for the only scientific illustrations of a complete set of Gray whale bones. His paintings have been purchased by Alaska museums, NOAA/NMFS, ADF&G, and art collectors. Nelson works out of his studio on Kodiak Island. His artwork can be seen and purchased at Northern Exposure Gallery in Kodiak and Fishermen's Eye Graphics in Sitka.

A special thanks to those individuals who offered their knowledge, time, and expertise in planning and organizing the 2012 Chapter meeting together

Alaska Chapter of the American Fisheries Society

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Trent Sutton, President
Mark Wipfli, President Elect
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Meeting Sponsors
ABR, Inc. – Environmental Research & Services
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Cover Art Donation
Bruce Nelson, Kodiak Island artist

Public Outreach, Kodiak Island
Julie Matweyou, University of Alaska Fairbanks

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

Audio/Visual Support
AK-AFS Student Subunits (UAF, UAA, UAS)

Tuesday Reception Social Hosts
Quentin Fong and staff – Food preparation, University of Alaska Fairbanks
Staff – National Oceanic and Atmospheric Administration

Webmaster
Audra Brase, Alaska Department of Fish and Game

List-Serve Manager
Hamachan Hamazaki, Alaska Department of Fish and Game

King Crab Shirt Design
Lisa Stuby, Alaska Department of Fish and Game

Plenary Speakers

Dr. Frank Asche
Department of Industrial Economics
University of Stavanger, Norway

Dr. Franz Mueter
School of Fisheries and Ocean Sciences
University of Alaska Fairbanks

Patrick Saltonstall
Alutiiq Museum, Kodiak

Session Chairs and Co-Chairs
Jeff Adams, U.S. Fish and Wildlife Service
Milo Adkison, University of Alaska Fairbanks
Anne Beaudreau, University of Alaska Fairbanks
Andrea Bersamin, University of Alaska Fairbanks
Allison Bidlack, University of Alaska Southeast
Randy Brown, U.S. Fish and Wildlife Service
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Andy Seitz, University of Alaska Fairbanks
Dan Urban, National Oceanic and Atmospheric Administration
Vanessa von Biela, U.S. Geological Survey
Matthew Whitman, Bureau of Land Management
Mark Wipfli, University of Alaska Fairbanks
Chris Zimmerman, U.S. Geological Survey

Continuing Education Coordinator
Tammy Hoem Neher, University of Alaska Fairbanks

Continuing Education Instructors
Introduction to Scientific Sampling and Scientific Writing with Statistics
Instructor Hal Geiger, St. Hubert Research Group
-
Hands-on DIDSON Sonar
Instructor Mary Beth Loewen, Alaska Department of Fish and Game
Instructor Carl Pfisterer, Alaska Department of Fish and Game
-
Aircraft Survival Training
Instructor Chief Charley Fowler (AST), U.S. Coast Guard

Poster Session Organizers
Natura Richardson, University of Alaska Fairbanks
Thomas Farrugia, University of Alaska Fairbanks

Student Presentation Judging Coordinator
Theresa Tanner, U.S. Fish and Wildlife Service

Banquet Entertainment
Jim Brashear, "*The Fisheries Influence*" presentation
White Twang, music

Banquet Auction
Michael Bach, auctioneer

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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Biographies of Plenary Speakers

FRANK ASCHE

Frank Asche was educated at the University of Bergen (BA, MA) and received his PhD from the Norwegian School of Economics and Business Administration. He has been a visiting scholar at the University of British Columbia, the University of Rhode Island, and Duke University (as a Fulbright Scholar), and a member of the science advisory board for the Worldfish Centre. He is president of the International Association of Aquaculture Economics and Management and associate editor for Marine Resource Economics. Professor Asche's research interests focus on aquaculture and seafood markets, but he has also been doing work in fisheries management and energy economics. Recent research topics include international trade with seafood and the organization of the seafood supply chain as well as the impact of productivity development on aquaculture and seafood markets. Professor Asche has published numerous articles in international journals in economics as well as leading multi-disciplinary journals like Science and PLoS One. He edited the book Primary Industries facing Global Markets in 2007, and has co-authored the book The Economics of Aquaculture with Trond Bjørndal (Blackwell, 2011). He has also written a number of popular scientific articles, undertaken a number of research projects in Norway as well as for international organizations like the FAO, OECD and WTO, and served on the expert panel on a new law of the management of marine resources in Norway.

Biographies of Plenary Speakers

FRANZ MUETER

Franz began biological studies at the Rhino-Westphalian Technical Institute in Aachen, Germany, before moving to Fairbanks in 1988 to pursue graduate degrees in biological (M.S.) and fisheries oceanography (Ph.D.), as well as biostatistics (M.S.). His research initially focused on the early life history of pollock and flatfishes in nearshore waters of the Gulf of Alaska, and gradually expanded to include adult groundfish communities throughout the Gulf of Alaska and Bering Sea. He has also modeled recruitment processes of salmon in relation to temperature variability throughout the Northeast Pacific and has worked on other anadromous species in Alaskan waters, including the Beaufort Sea. In 2008 he accepted a faculty position at the University of Alaska in Juneau, where he teaches quantitative fisheries classes, supervises a number of graduate students, and continues research on the effects of environmental variability on the distribution, growth, and survival of fishes in subarctic and arctic waters. He is particularly interested in the applied aspects of this research as they relate to the management of fisheries resources in the face of global climate changes. He is currently involved in several multi-disciplinary integrated ecosystem research programs in the Bering Sea (BEST/BSIERP), the Gulf of Alaska (GOA IERP), and the Arctic (Arctic Ecosystem Integrated Survey).

Biographies of Plenary Speakers

PATRICK SALTONSTALL

Raised in Maine, Patrick Saltonstall has been interested in archaeology since the age of 7, when he first visited an excavation. He pursued this interest by studying anthropology, receiving a Bachelor's degree from Harvard and a Master's degree from the University of Wisconsin. He is currently the Curator of the Alutiiq Museum, a Native-governed cultural center and repository in Kodiak, Alaska, where he cares for collections, leads research, oversees historic preservation projects, and shares archaeology with the public. A registered professional archaeologist, Patrick has spent the past two and a half decades exploring the prehistory of arctic and subarctic North America, working in remote settings from the Kodiak National Wildlife Refuge, Alaska to Baffin Island, Canada. On Kodiak, his research projects focus on understanding the evolution of Alutiiq societies – the development of sedentary village life and the evolution of fishing practices. An avid sportsman, Patrick can most often be found outdoors. He skis Kodiak's mountains year round, never misses opening day of deer season, and enjoys kayaking. He is also an accomplished gardener and photographer, a reader, a blogger and a dog lover. Patrick is married to Kodiak physical therapist Zoya Herensteen Saltonstall. They have two children.

At-a-Glance Schedule for the 2012 AFS Alaska Chapter Annual Meeting

Day/Date	Time Period	Katurwik Room	Pavillion Room	Stellar Room	Harbor Room (Kodiak Inn)	Convention Center Lobby
Sun Oct 21	Evening	Reception at Shelikof Lodge (complimentary drinks and appetizers)				Late registration and CE class sign up
Day/Date	**Time Period**	**Katurwik Room**	**Pavillion Room**	**Stellar Room**	**Harbor Room (Kodiak Inn)**	**Convention Center Lobby**
Monday October 22	Morning	Overflow registration, and vendor set-up	Continuing ED- Scientific Writing	Continuing ED- DIDSON		Registration and CE class sign up
	Afternoon					Pick up banquet tickets here
	Late Afternoon	Overflow reg/vendor set-up	Cont Ed Scientific Writing	Continuing ED- DIDSON		
	Evening	Gathering at the Kodiak Island Brewery 5:00-7:00 (complimentary appetizers)				
Day/Date	**Time Period**	**Katurwik Room**	**Pavillion Room**	**TUESDAY TOURS**	**Harbor Room (Kodiak Inn)**	**Convention Center Lobby**
Tuesday October 23	Morning	Overflow registration, and vendor set-up	Continuing ED- Scientific Writing	Pillar Creek Hatchery (10:00a) and Processor (10:00a)		Registration and CE class sign up
	Afternoon			Wind Turbines (1:00p) and USCG Base (1:30p)		Meet here for tour shuttles
	Late Afternoon	Overflow reg/vendor set-up	Cont Ed Scientific Writing			Pick up banquet tickets here
	Evening	Reception at NOAA and KSMSC* (food and some beverages complimentary)				Meet here for shuttles to NOAA/KSMSC reception
Day/Date	**Time Period**	**Katurwik Room**	**Pavillion Room**	**Stellar Room**	**Harbor Room (Kodiak Inn)**	**Convention Center Lobby**
Wednesday October 24	Early Morning	Vendor displays	Plenary Session			Continental Breakfast & Registration
	Morning	Vendor displays	Plenary Session			Registration/Banquet tickets
	Late Morning	Vendor displays	Marine Ecosystem Dynamics	Elasmobranchs	Hatchery Programs Old and New	
	Lunch	Student-Mentor luncheon (Stellar Room)				
		Past President's luncheon (Harbor Room)				
		Committees Luncheon Meetings				
		Others on your own				
	Afternoon	Vendor displays	Marine Ecosystem Dynamics	Salmon Marketing Sustainability	Hatchery Programs Old and New	
	Late Afternoon	Vendor displays	Advances in Marine Biology	Subsistence Partnerships	Freshwater Temperatures	
	Early Evening			Business Meeting (open to everyone)		
	Evening	Poster Social at Convention Center (Pavillion) (appetizers & some beverages complimentary)				
Day/Date	**Time Period**	**Katurwik Room**	**Pavillion Room**	**Stellar Room**	**Harbor Room (Kodiak Inn)**	**Convention Center Lobby**
Thursday October 25	Early Morning	Vendor displays	Advances in Marine Biology	Subsistence Partnerships	North Slope Fishes	Continental Breakfast & Registration
	Morning	Vendor displays	Advances in Marine Biology	Invasive Species	North Slope Fishes	Registration/Banquet tickets
	Late Morning	Vendor displays	Fish Movement	Invasive Species	Nutrients and Food Webs	
	Lunch	Box Lunch (CC lobby)		Social Media Presentation (Lunch)		
	Early Afternoon	Vendor displays	Fish Movement	Social-Natural Sciences	Nutrients and Food Webs	
	Afternoon	Vendor displays	Fish Movement	Social-Natural Sciences	Fish and Aquatic Ecology	
	Late Afternoon	Vendor displays	Crab Fisheries	Social-Natural Sciences	Fish and Aquatic Ecology	
	Evening	Banquet/Auction/Entertainment (Pavillion) (food & some drinks provided with ticket)				
Day/Date	**Time Period**	**Katurwik Room**	**Pavillion Room**	**Stellar Room**	**Harbor Room (Kodiak Inn)**	**Centennial Hall Lobby**
Friday October 26	Early Morning	Vendor displays	Bering Cisco	Fish and Food Security		Continental Breakfast & Registration
	Morning	Vendor displays	Seafood Processing/Marketing	Freshwater Habitat Modeling		Registration
	Noon		Student Awards Ceremony			
	12:30pm	Conference Adjourns				

* Kodiak Seafood and Marine Science Center (UAF)

AIR CHARTER:
1 Island Air Service - 1420 Airport Way - 487-4596
1 Harvey Flying Service - State Airport - 487-2621
6 Andrew Airways - 500 Trident Way - 487-2566
8 Sea Hawk Air - 506 Trident Way - 486-8282
50 Kingfisher Aviation - 1829 Mill Bay Rd. - 486-5155

ASSOCIATIONS:
17 Koniag - 194 Alutiiq Drive - 486-2530
19 Sun'aq Tribe of Kodiak - 312 W Marine Way - 486-4449
26 Kodiak Chamber of Commerce - 100 E Marine Sts. 200 - 486-5557

BANKING & FINANCIAL SERVICES:
18 Wells Fargo - 202 Marine Way - 486-3126

BED & BREAKFASTS:
3 An Ocean Bay B&B - 420 W Rezanof Dr. Unit B - 486-8315
31 A Downtown B&B - 208 E Rezanof Dr. - 486-2766
34 Pearson Cove Bed & Breakfast - 910 Mission Rd. - 486-5301
36 A Channel View B&B - 1010 Shelter Way - 486-2470
37 Awesome Views - 91 6 Mission Rd. - 486-5942
39 Cliff House B&B - 1223 W Kashevaro - 486-5079
42 Ismailoff B&B - 1324 Ismailov St. - 539-2623
43 Beachside B&B - 1421 Yanovsky St. - 486-4941
44 Bev's Bed and Make Your Own Darn Breakfast 1510 Mission Rd. - 486-8217
45 Cranky Crow Bed & Breakfast - 1713 17th Ave. - 654-7356
52 Lakeview Terrace - 2426 Spruce Cape Rd. - 486-5135
53 Annie's By The Sea - 2990 Spruce Cape Rd. - 486-8484
56 A Bakers Bed and Breakfast - 3226 Arctic Tern Rd. - 486-4260
58 Kodiak Hilltop B&B - 993 Hilltop - 486-4862
59 Waterfall on Mill Bay Bed & Breakfast - 3989 Woodland Dr. - 512-8998
60 Parkside Guesthouse - 1165 Abercrombie Dr. - 486-9446

BOAT CHARTERS:
2 Adventure Kodiak - Slip K26, St. Barnabas Harbor - 855-337-6332
4 Ultimate Island Adventures - Slip G1, St. Herman Harbor - 539-1367
10 Island Angler Charters - Slip A5, St Paul Harbor - 486-4260
12 Galley Gourmet - Slip B3, St. Paul Harbor - 486-5079
14 Fish-N-Chips Charters - Slip A46, St Paul Harbor - 539-6135
15 Happy Hooker Charters - Slip B11, St. Paul Harbor - 486-2524
16 Kodiak Adventures Unlimited - Corner of Marine Way & Mission Rd. - 486-8766

BUSINESS & PROFESSIONAL SERVICES:
35 Craighton Chiropractic - 814 Rezanof Dr. - 487-9798
47 Kodiak Auto Detailing - 1712 E. Rezanof Dr. - 486-3538
48 World Wide Movers - 111 Buttal Ave. - 486-5354
55 Bounty Bar - 3146 Viewcrest Lane - 486-1096

CAR RENTALS:
22 Budget Rent a Car - 428 W Marine Way - 486-8550
22 Rent-a-Heap - 428 W Marine Way - 486-8550

EATING, DRINKING ESTABLISHMENTS:
7 Bull Bar - 326 Shelikof St. - 486-3575
11 Harborside Coffee & Goods - 2108 Shelikof St. - 486-5862
13 The Chart Room - 236 W Rezanof Dr. - 486-5712
20 Henry's Great Alaskan Restaurant - 512 Marine Way - 486-8844
24 Subway of Kodiak - 326 Center Ave. - 486-7676
28 Monk's Rock Coffee House & Bookstore - 202 E Rezanof Dr. - 486-0905
32 Old Powerhouse Restaurant - 516 E Marine Way - 481-1088
49 Harborside Fly-By - 1715 Mill Bay Rd. - 486-5864
54 Subway of Kodiak - 2911 Mill Bay Rd. - 481-3727

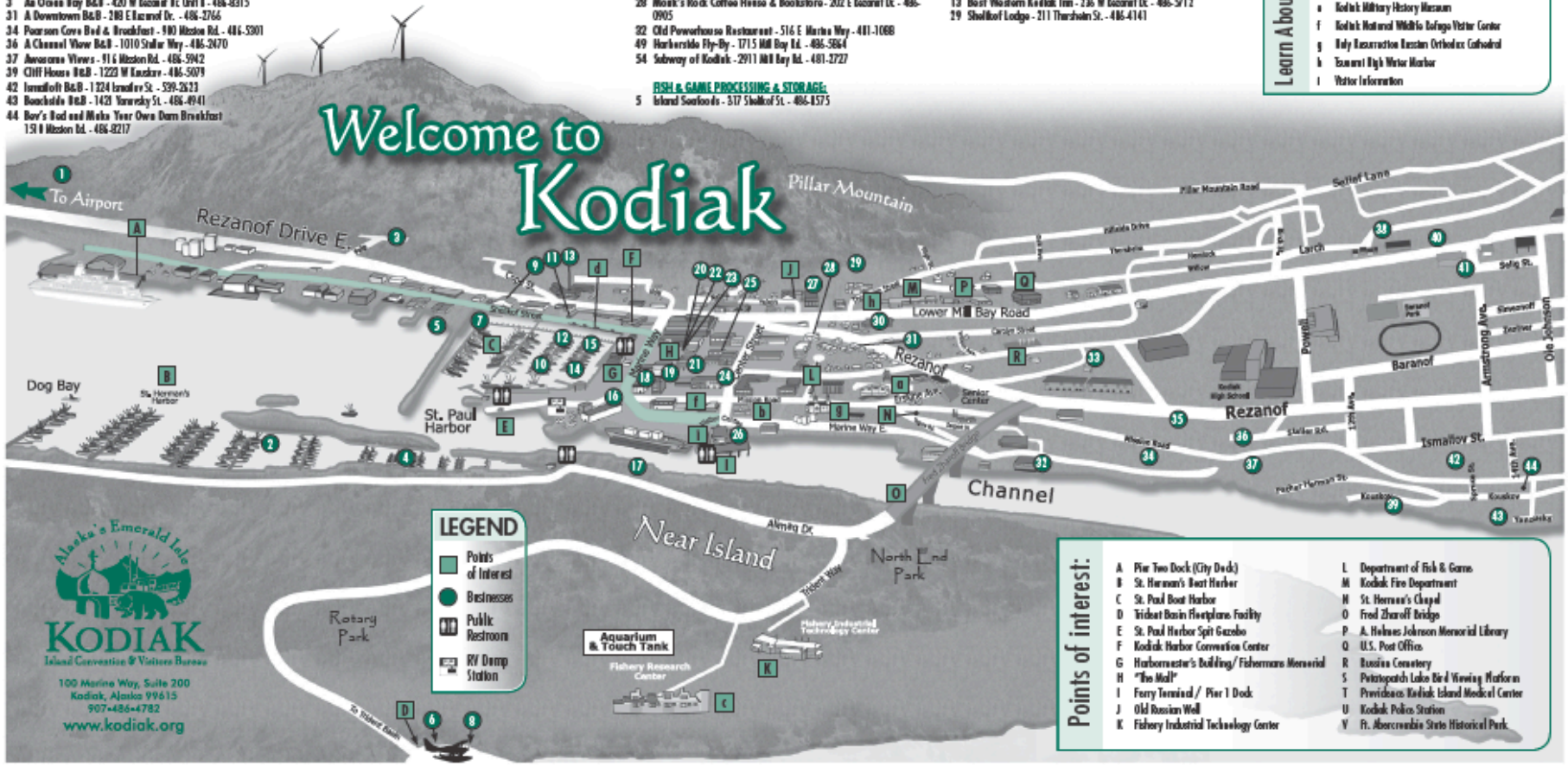
FISH & GAME PROCESSING & STORAGE:
5 Island Seafoods - 317 Shelikof St. - 486-8575

GIFTS, SHOPPING & RETAIL SERVICES:
9 Carver's House of Cigars - 322 Shelikof St. Ste. A - 512-0775
9 Dead Hungry Studio & Gallery - 322 Shelikof St - 942-1417
19 Bear Town Market - 312 W Marine Way - 486-4449
21 Ardinger's - 412 Marine Way - 486-3259
22 Port Gifts - 428 Marine Way - 486-8550
23 Normans Fine Gifts - 414 Marine Way - 486-3315
25 Flying Goose Quilt Shop - 202 Center Ave. Ste. 220 - 486-8700
27 Kodiak Island Brewing Company - 117 Lower Mill Bay Rd. - 486-2537
41 Northern Exposure Gallery - 1314 Mill Bay Rd. - 486-4856
41 Wild Trader's - 1314 Mill Bay Rd. - 486-3271
46 Ardinger's - 1710 Mill Bay Rd. - 486-5554
51 Coat Savers - 2161 Mill Bay Rd. - 486-2408
57 Alaska Wilderness Wines - 498 Shearwater Way - 486-1420

HOTELS, MOTELS & HOSTELS:
13 Best Western Kodiak Inn - 236 W Rezanof Dr. - 486-5712
29 Shelikof Lodge - 211 Thorsheim St. - 486-4141

MEDIA:
33 KMXT - 628 Egan Way - 486-3181
40 KVOK/KRXX - 1315 Mill Bay Rd. - 486-5151

SPORTING GOODS:
30 Mack's Sport Shop - 212 Lower Mill Bay Rd. - 486-4276
38 Orion's Mountain Sports - 1247 Mill Bay Rd. - 486-8380



Kodiak Island: 5 Top FAQs

Important Numbers

TAXIS: (907) 486-2515

HOSPITAL: Providence Kodiak Island Medical Center, 486-3281

WALK-IN HEALTH CLINIC: Kodiak Island Ambulatory Care Clinic, 486-6188

VISITOR CENTER: Kodiak Island Convention & Visitors Bureau, 486-4782

POLICE DEPARTMENT: Non-Emergency 486-8000

EMERGENCY DIAL 911

Internet access is available at:

A Holmes Johnson Memorial Library
319 Lower Mill Bay Rd.

Harborside Fly-By
1715 Mill Bay Rd.

Mill Bay Coffee & Pasteries
3833 E Rezanof Dr. Ste. A

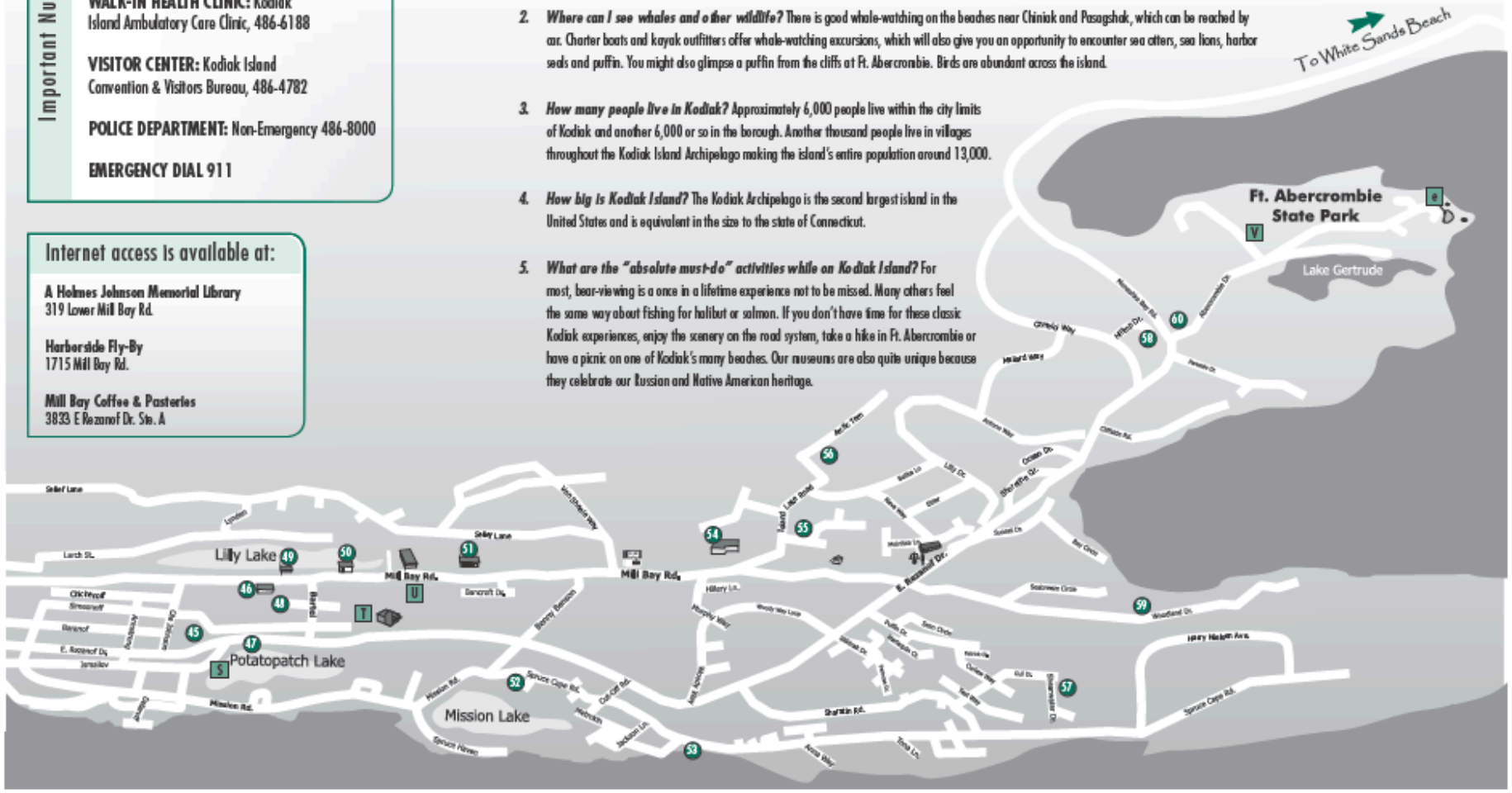
1. ***Where can I see bears?*** The vast majority of Kodiak bears live in the 1.3 million acres of the Kodiak Island National Wildlife Refuge, which can only be reached by air or boat charter. Carry binoculars as you drive the road system and you may get lucky and see bears on the hillsides far outside of town.

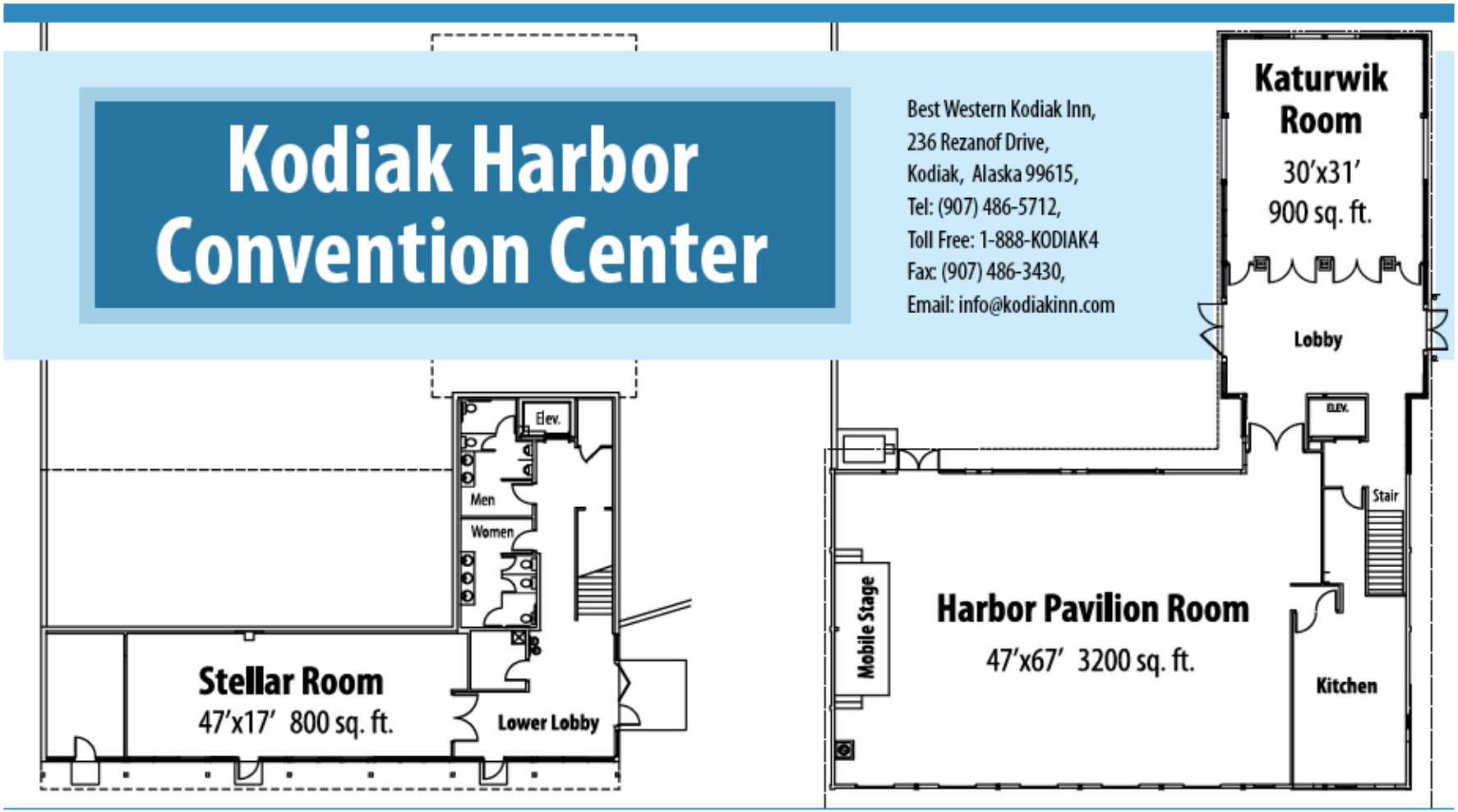
2. ***Where can I see whales and other wildlife?*** There is good whale-watching on the beaches near Chiniak and Pasagshak, which can be reached by car. Charter boats and kayak outfitters offer whale-watching excursions, which will also give you an opportunity to encounter sea otters, sea lions, harbor seals and puffin. You might also glimpse a puffin from the cliffs at Ft. Abercrombie. Birds are abundant across the island.

3. ***How many people live in Kodiak?*** Approximately 6,000 people live within the city limits of Kodiak and another 6,000 or so in the borough. Another thousand people live in villages throughout the Kodiak Island Archipelago making the island's entire population around 13,000.

4. ***How big is Kodiak Island?*** The Kodiak Archipelago is the second largest island in the United States and is equivalent in the size to the state of Connecticut.

5. ***What are the "absolute must-do" activities while on Kodiak Island?*** For most, bear-viewing is a once in a lifetime experience not to be missed. Many others feel the same way about fishing for halibut or salmon. If you don't have time for these classic Kodiak experiences, enjoy the scenery on the road system, take a hike in Ft. Abercrombie or have a picnic on one of Kodiak's many beaches. Our museums are also quite unique because they celebrate our Russian and Native American heritage.




Kodiak Harbor Convention Center
Best Western Kodiak Inn,
236 Rezanof Drive,
Kodiak, Alaska 99615,
Tel: (907) 486-5712,
Toll Free: 1-888-KODIAK4
Fax: (907) 486-3430,
Email: info@kodiakinn.com
Katurwik Room
30'x31'
900 sq. ft.
Lobby
Elev.
Men
Women
Stellar Room
47'x17' 800 sq. ft.
Lower Lobby
Mobile Stage
Harbor Pavilion Room
47'x67' 3200 sq. ft.
Stair
Kitchen

Banquet Program

Banquet Entertainment
Jim Brashear – presentation, "*The Fisheries Influence*"
White Twang – music

Live Auction
Auctioneer: Michael Bach

Awards
Wally Noerenberg Award
Meritorious Service Award
Alaska Chapter Service Award
Cultural Diversity Travel Award
Molly Ahlgren Scholarship
Almost Darwin Award

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
Donald Kramer	Surry, BC	1982
Raymond Beamesderfer	Oregon City, OR	1984
Jeff Adams	Fairbanks, AK	1987
Andrea Hough Tesch	Fort Richardson, AK	1987
Jason Mann	Surrey, BC	1987
Brenda Wright	Juneau, AK	1987

** 2012 Alaska Chapter AFS Conference Schedule **

Sunday 21 October

Social
6:00 pm – Complimentary Social at Shelikof Lodge (food, beverages provided)

Monday 22 October

Continuing Education
9:00 am – 5:00 pm – Scientific Writing (Pavillion Room)
9:00 am – 5:00 pm – DIDSON (Stellar Room)
8:00 am – 5:00 pm – Aircraft Survival Training (Convention Center Lobby)

Social
5:00 pm – 7:00 pm – Social at Kodiak Island Brewery (appetizers provided)

Tuesday 23 October

Continuing Education
8:00 am – 5:00 pm – Scientific Writing (Pavillion Room)

Tours
1. Seafood Processors – meet at Convention Center at 10:00 am
2. Kodiak Regional Aquaculture Association Pillar Creek Hatchery – meet at Convention Center at 10:00 am
3. Kodiak Electric Association Wind Turbines – meet at Convention Center at 1:00 pm
4. U.S. Coast Guard Air Station Kodiak Base Facility – meet at Convention Center at 1:30 pm

Social
5:30 pm – 8:30 pm – Welcome Social at NOAA and UAF Facilities (Shuttle busses pick up at Convention Center about every 10 min beginning at 5 pm)

Wednesday 24 October
Pavillion Room (Conference Center)

7:30 – 8:00 am – Continental breakfast

PLENARY SESSION

8:00 – 8:20 am
Welcome – Trent Sutton
Opening remarks – Mark Wipfli
Welcome to Kodiak Island – Melissa Borton, Tribal Administrator, Native Village of Afognak

8:20 – 9:00 am – Keynote 1
Frank Asche
The Oceans as a Source for Food and Resources: Seafood

9:00 – 9:40 am – Keynote 2
Franz Mueter
Ecosystems, Complexity, and Sustainability from Global to Regional to Local Scales

9:40 – 10:00 am – Break

10:00 – 10:40 am – Keynote 3
Patrick Saltonstall
Alutiiq Fishing through the Ages

10:40 – 11:00 am
Announcements and updates

Wednesday 24 October
Pavillion Room (Conference Center) – Concurrent Session #1

Marine Ecosystem Dynamics and Sustainable Fisheries

Session Co-Chairs: Gordon Kruse and Vanessa von Biela

11:00 – 11:20 am
From Spilled Oil to Long Term Ecosystem and Herring Monitoring
Molly McCammon, W. Scott Pegau, Kristine Holderied, Brenda Ballachey, Thomas Weingartner, Russell Hopcroft, and Stanley D. Rice

11:20 – 11:40 am
Effects of Climate and Gadid Predation on Red King Crab Population Dynamics in Alaska
Gordon H. Kruse, Jie Zheng, and William R. Bechtol

11:40 – noon
Recovery of Cook Inlet Beluga Whales: Projecting Future Needs from Past Unknowns
William R. Bechtol

Noon – 1:00 pm – Lunch (on your own)

1:00 – 1:20 pm
Groundfish Feeding Habits in the Bering Sea
Alexis M. Hall and Gordon H. Kruse

1:20 – 1:40 pm
Seasonal and Ontogenetic Patterns of Resource Use by Juvenile Sablefish, *Anoplopoma fimbria*, in Southeast Alaska
Karson M. Coutré, Anne H. Beaudreau, and Patrick W. Malecha

1:40 – 2:00 pm
A Survey of Fish Assemblages in Shallow, Marine Waters near Wainwright, Alaska
John Seigle, John Rose, Joel Gottschalk, Laura Gutierrez, and Erling Westlien

2:00 – 2:20 pm
Using Otolith Growth Increments to Test Mechanisms of Production in the Nearshore Northeast Pacific Ocean
Vanessa. R von Biela, Christian E. Zimmerman, Gordon H. Kruse, Franz J. Mueter, and David C. Douglas

2:20 – 2:40 pm
Benefits of Living Life on the Edge: Enhanced Growth and Foraging Opportunities for Juvenile Salmon Inhabiting the Margins of the Sitka Eddy
Jamal Moss, Marc Trudel, Brian Beckmann, William Crawford, Wyatt Fournier, Emily Fergusson, and Terry Beacham

Wednesday 24 October
Pavillion Room (Conference Center) – Concurrent Session #1

2:40 – 3:00 pm
Variations in Walleye Pollock (*Theragra chalcogramma*) Maturation Rates in the Gulf of Alaska
Benjamin C. Williams, Gordon H. Kruse, and Martin W. Dorn

3:00 – 3:20 pm – Break

3:20 – 3:40 pm
Single Nucleotide Polymorphisms (SNPs) and Sustainable Fisheries: Evidence for Temporally Stable Alaskan Sockeye Salmon Populations over Four Decades of Commercial Fishing
Daniel Gomez-Uchida, James E. Seeb, Christopher Habicht, and Lisa W. Seeb

3:40 – 4:00 pm
Using Model Simulations to Compare Two Commercial Salmon Management Strategies
Justin Carney and Milo Adkison

Recent Advances in Marine Biology
Session Chair: Dan Urban

4:00 – 4:20 pm
Novel Technologies and Charismatic Megafauna: How We Are Learning About the Elusive North Pacific Giant Octopus (*Enteroctopus dofleini*)
Reid S. Brewer

4:20 – 4:40 pm
Building a More Robust Video Assessment for Lingcod and Rockfish
Mike Byerly, Kenneth Goldman, Margaret Spahn, and Sigfus Sigurdsson

4:40 – 5:00 pm
The Toxicity of Creosote Pilings to Developing Herring Embryos with a Linked Field Study in Juneau, AK
Danielle Duncan, Michael Stekoll, Stanley "Jeep" Rice, Mark Carls, and Robert Perkins

5:00 – 6:30 pm
Business meeting (In Stellar Room – everyone is invited)

6:30 – 9:00 pm
Poster session and social (In Pavillion); *Authors to be at their posters 7-8 pm*

Wednesday 24 October
Stellar Room (Conference Center, lower level) – Concurrent Session #2

Elasmobranchs in Alaska
Session Co-Chairs: Thomas Farrugia and Andy Seitz

11:00 – 11:20 am
The Spiny Issue of Ageing Spiny Dogfish: Historical Dogma vs. New Methods
Cindy A. Tribuzio, Calvin Blood, Beth Matta, Chris Gburski, Wally Bubley, and Gordon H. Kruse

11:20 – 11:40 am
The Spatial Distribution of Spiny Dogfish (*Squalus suckleyi*) in the Gulf of Alaska: The Use of Fishery Dependent Data, Fishery Independent Data, and Generalized Modeling for the Spatial Management of Catch and Bycatch
Jason R. Gasper and Gordon H. Kruse

11:40 – noon
Thermal Physiology of Salmon Sharks, *Lamna ditropis*
Kenneth J. Goldman

Noon – 1:20 pm – Student/Mentor lunch (Stellar Room)

1:20 – 1:40 pm
Reproductive Biology of the Salmon Shark, *Lamna ditropis*, in the Eastern North Pacific Ocean
Christina L. Conrath, Kenneth J. Goldman, and Cindy A. Tribuzio

1:40 – 2:00 pm
Description of Injuries Sustained by Skates (Rajidae) Incidentally Captured by the Bering Sea Longline Fleet
Daniel B. Michrowski and Terrance J. Quinn, II

2:00 – 2:20 pm
Movement Patterns of Skates in the Gulf of Alaska and Implications for the Management of a Skate Fishery
Thomas J. Farrugia and Andrew Seitz

Marketing Sustainability of Alaskan Salmon Fisheries
Session Chair: Hal Geiger

2:20 – 2:40 pm
The Marine Stewardship Council's Fisheries Ecolabeling Program and Alaska Salmon
Jim Humphreys and Megan Atcheson

Wednesday 24 October
Stellar Room (Conference Center, lower level) – Concurrent Session #2

2:40 – 3:00 pm
Responsible Fishery Management and Sustainable Seafood-A New Assessment/Certification Model
Randy Rice

3:00 – 3:20 pm – Break

3:20 – 3:40 pm
The Role of NGOs in Promoting Sustainable Wild Salmon Fisheries
Randy Ericksen

3:40 – 4:00 pm
Defining Seafood Sustainability in the Global Marketplace
Dave Martin

Ensuring Subsistence Through Partnerships
Session Chair: Aaron Martin

4:00 – 4:20 pm
The Tanana Chiefs Conference's Partnerships in the Fisheries Community. Is It Successful?
Alyssa Frothingham

4:20 – 4:40 pm
How Many Fish are "Needed" for Subsistence?
Toshihide "Hamachan" Hamazaki

4:40 – 5:00 pm
Synchronous Cycling of Ichthyophoniasis with Chinook Salmon Density Revealed during the Annual Yukon River Spawning Migration
Stanley Zuray, Richard Kocan, and Paul Hershberger

5:00 – 6:30 pm
Business meeting (In Stellar Room – everyone is invited)

6:30 – 9:00 pm
Poster session and social (In Pavillion); *Authors to be at their posters 7-8 pm*

Wednesday 24 October
Harbor Room (Best Western Kodiak Inn) – Concurrent Session #3

Hatchery Programs in Alaska: Reviewing the Old, Evaluating the New

Session Co-Chairs: Steve Heinl, Ben Daly and Milo Adkison

11:00 – 11:20 am
An Overview of Alaska's Sport Fish Hatchery Program
Jeff Milton

11:20 – 11:40 am
Southeast Alaska Purse Seine Fisheries Before and After Chum Salmon Enhancement
Andrew W. Piston

11:40 – noon
Hatchery Salmon Straying Studies in Prince William Sound, Alaska
Richard E. Brenner and Steven D. Moffitt

Noon – 1:20 pm – Past presidents lunch (Harbor Room)

1:20 – 1:40 pm
SNPs from Archived and Contemporary Tissues Show Genetic Imprints of Hatchery Strays on Wild Chum Salmon Populations in Prince William Sound, Alaska
Christopher Habicht, James Jasper, Steve Moffit, Rich Brenner, Jennifer Marsh, Bert Lewis, W. Stewart Grant, Elisabeth Fox, Zac Grauvogel, and Serena Rogers

1:40 – 2:00 pm
A Design for Evaluating the Efficacy of Salmon Enhancement Activities in Lower Cook Inlet, Including a New Stocking Project in Kamishak Bay
Ted Otis, Caroline Cherry, and Stew Grant

2:00 – 2:20 pm
Research Program to Address Interactions of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska
Ron Josephson, John Burke, Dave Bernard, John H. Clark, Jeff Hard, Steve Reifenstuhl, Bill Smoker, Bill Templin, and Alex Wertheimer

2:20 – 2:40 pm
A Responsible Approach to King Crab Rehabilitation in Alaska
Benjamin Daly

2:40 – 3:00 pm
Cannibalism in Red King Crab: Habitat, Ontogeny, and the Predator Functional Response
William Christopher Long and Laura Whitefleet-Smith

Wednesday 24 October
Harbor Room (Best Western Kodiak Inn) – Concurrent Session #3

3:00 – 3:20 pm – Break

Water Temperatures in Alaska Freshwater Habitats

Session Co-Chairs: Jeff Falke and Sue Mauger

3:20 – 3:40 pm
Overview and Applications of Predictive Stream Water Temperature Models for Fish Conservation and Management
Jeffrey A. Falke and Daniel J. Isaak

3:40 – 4:00 pm
Temperature Monitoring of Alaskan and Canadian Yukon River Tributaries
Heather A. Leba, Jeremy Mears, Aaron E. Martin, and Al von Finster

4:00 – 4:20 pm
How Geomorphic Characteristics Influence Stream Thermal Regimes: Consequences for Salmon Spawn-Timing and the Species They Support in River Systems
Peter J. Lisi, Daniel E. Schindler, Jonny Armstrong, Kale T. Bentley, KathiJo Jankowski, Laura X. Payne, and George R. Pess

4:20 – 4:40 pm
Retrospective Analysis of Juvenile Chinook Salmon Growth in an Interior Alaska River: Insight Into Marine Survival and Density Dependence
Megan T. Perry, Mark S. Wipfli, Nicholas F. Hughes, Jason R. Neuswanger, Amanda E. Rosenberger, and Matthew J. Evenson

4:40 – 5:00 pm
Using Thermal Infrared Imagery for Strategic Salmon Habitat Protection on the Kenai Peninsula, Alaska
Sue Mauger and Russell Faux

5:00 – 6:30 pm
Business meeting (In Stellar Room – everyone is invited)

6:30 – 9:00 pm
Poster session and social (In Pavillion); *Authors to be at their posters 7-8 pm*

Thursday 25 October
Pavillion Room (Conference Center) – Concurrent Session #1

7:30 – 8:00 am – Continental breakfast

Recent Advances in Marine Biology (continued from Wed)
Session Chair: Dan Urban

8:00 – 8:20 am
Foraging Behavior and Capture Success of Yearling Chinook Salmon Feeding on Pacific Herring: Effects of Turbidity and Prey Density
Erik R. Schoen, David A. Beauchamp, and Adam G. Hansen

8:20 – 8:40 am
Bayesian Implementation of a Time Stratified Lincoln-Petersen Estimator for Salmon Abundance in the Upper Matanuska River, Alaska, U.S.A.
Suresh Andrew Sethi and Theresa L. Tanner

8:40 – 9:00 am
Monitoring Anadromous Lampreys in Alaska: Existing and Novel Approaches
Kevin A. Siwicke and Andy C. Seitz

9:00 – 9:20 am
Nearshore Rockfish Hydroacoustic Surveys in the Western Gulf of Alaska
Philip Tschersich

9:20 – 9:40 am
Using Acoustic Assessment of Pelagic Backscatter to Assess Prey Use and Niche Separation of Fin and Humpback Whales Near Kodiak Island, Alaska
Briana H. Witteveen, Alex De Robertis, Lei Guo, and Kate M. Wynne

9:40 – 10:00 am
Mapping Tanner Crab Habitat in the Kodiak Area of the Gulf of Alaska
Carrie L. Worton, David Barnard, Gregg Rosenkranz, and Christian de Moustier

10:00 – 10:20 am – Break

Thursday 25 October
Pavillion Room (Conference Center) – Concurrent Session #1

Understanding Fish Movement
Session Co-Chairs: Julie Nielsen and Andy Seitz

10:20 – 10:40 am
Estimating the Distribution and Abundance of Stocked McDonald Lake Sockeye Salmon in Southern Southeast Alaska Commercial Net Fisheries
Malika T. Brunette, Andrew W. Piston, and Steven C. Heinl

10:40 – 11:00 am
Migratory Pathways and Overwintering Habitat Use by Juvenile Coho Salmon in Big Lake, Alaska
Jonathon Gerken

11:00 – 10:20 am
Testing Sampling Assumptions At a Large Riverine Sonar Project Using Acoustic Tags
Bruce McIntosh and Naomi Brodersen

11:20 – 11:40 am
Estimation of Chinook Salmon Escapement, Distribution, and Run Timing in the Togiak River Watershed Using Radio Telemetry, Togiak National Wildlife Refuge, Alaska
Theresa L. Tanner and Suresh A. Sethi

11:40 – noon
Spawning Distribution and Migratory Timing of Kuskokwim River Inconnu
Lisa Stuby

Noon – 1:20 pm – Lunch (box lunch provided in lobby)

1:20 – 1:40 pm
Dispersal of Adult Dolly Varden from the Wulik River, Alaska, Evaluated Using Satellite Telemetry
Andrew C. Seitz, Michael Courtney, and Brendan Scanlon

1:40 – 2:00 pm
Assessing Metapopulation Structure of Arctic Grayling on Alaska's North Slope
Heidi E. Golden

2:00 – 2:20 pm
A Traditional Tagging Study Provides Long-Range Movement Information for Lingcod, *Ophiodon elongates,* in Southeast Alaska
Jennifer P. Stahl

Thursday 25 October
Pavillion Room (Conference Center) – Concurrent Session #1

2:20 – 2:40 pm
Net Squared Displacement (NSD): A Renaissance Statistic for Movement Ecology
Julie K. Nielsen and Andrew C. Seitz

2:40 – 3:00 pm
Spatial Models with Movement: Report from a Workshop on Walleye Pollock in the Bering Sea
Terrance J. Quinn II, James N. Ianelli, Steven X. Cadrin, Vidar Wespestad, and Steven J. Barbeau

3:00 – 3:20 pm – Break

Crab Fisheries, Biology, and Ecology
Session Chair: Robert Foy

3:20 – 3:40 pm
Standardization of CPUE Data from the Aleutian Islands Golden King Crab Fishery
M.S.M. Siddeek, J. Zheng, and Doug Pengilly

3:40 – 4:00 pm
Ghost Fishing in the Southeastern Alaska Commercial Dungeness Crab Fishery
Jacek Maselko, Gretchen Bishop, and Peter Murphy

4:00 – 4:20 pm
Population Structure and Trophic Positioning of Snow Crabs, *Chionoecetes opilio,* in the Alaskan Arctic
Lauren M. Divine, Katrin Iken, and Bodil A. Bluhm

4:20 – 4:40 pm
Eastern Bering Sea Snow Crab Growth – A Lab Perspective
Laura M. Stichert and Douglas Pengilly

4:40 – 5:00 pm
Contribution of Fecundity and Embryo Quality to Variability in Reproductive Potential of Eastern Bering Sea Snow Crab
Joel B. Webb, Laura M. Slater, Ginny L. Eckert, and Gordon H. Kruse

5:00 – 6:00 pm – Break

6:00 – 10:00 pm – Banquet (In Pavillion)

Thursday 25 October
Stellar Room (Conference Center, lower level) – Concurrent Session #2

7:30 – 8:00 am – Continental breakfast

Ensuring Subsistence Through Partnerships (continued from Wed)
Session Chair: Aaron Martin

8:00 – 8:20 am
What Can Be Learned From Assessment of Salmon Escapements to Maintain Subsistence Fisheries: Two Case Studies in Southwest Alaska
Doug McBride, Derek Hildreth, and Theresa Tanner

8:20 – 8:40 am
The Native Village of Eyak's (NVE) Collaborative Partnerships in Subsistence Fisheries Resource Monitoring
Vija Pelekis

8:40 – 9:00 am
Association of Village Council Presidents: Building Partnerships and Future Direction
Casie Stockdale

Aquatic Invasive Species Threats to Alaska's Fisheries and Aquatic Resources
Session Chair: Cecil Rich

9:00 – 9:20 am
An Invasive Aquatic Plant, *Elodea,* Threatens Alaska's Fisheries and Aquatic Resources
Cecil F. Rich, Darcy Etcheverry, and Tricia L. Wurtz

9:20 – 9:40 am
Control and Eradication Efforts for Invasive Northern Pike (*Esox lucius*) in Southcentral Alaska
Kristine J. Dunker, Robert Massengill, David Rutz, Daniel Bosch, Jack Erickson, and Tammy Davis

9:40 – 10:00 am
Potential Fishery Impacts to Alaska from a Marine Invasive Species:
The colonial tunicate *Didemnum vexillum*
Linda R. Shaw

10:00 – 10:20 am – Break

Thursday 25 October
Stellar Room (Conference Center, lower level) – Concurrent Session #2

10:20 – 10:40 am
Effects of Riparian Invasives on Prey Resources for Juvenile Coho Salmon in Southcentral Alaskan Streams
David A. Roon, Mark S. Wipfli, Tricia L. Wurtz, and James J. Kruse

10:40 – 11:00 am
An Overview of Sampling for Marine Non –Indigenous Species in Alaska, a Citizen Science Approach to Monitoring for Early Detection of Invasions, and a New Potential Threat Resulting from the Japan Tsunami.
Gary Freitag and Linda R. Shaw

11:00 – 11:20 am
A Multi-Taxa Survey for Aquatic Invasive Species in Selected Rivers of Kodiak Island, Alaska
Bill Pyle

11:20 – 11:40 am
Invasive Species Management Programs in Alaska – A Survey of Statewide Expenditures: 2007-2011
Tobias Schwörer, Rebekka N. Federer, and Howard J. Ferren II

11:40 – 12:00 pm
Invasive Species Outreach Tools and Resources for Fisheries Professionals
Katrina Mueller

12:00 – 1:20 pm – Lunch & Social Media Presentation (Stellar Room)

Challenges and Opportunities in a Transdisciplinary World: Working at the Intersection of Social and Natural Sciences in Fisheries

Session Co-Chairs: Anne Beaudreau, Courtney Carothers, and Phil Loring

1:20 – 1:40 pm
Interpreting Local Ecological Knowledge for Data-Poor Fisheries in Puget Sound
Anne H. Beaudreau

1:40 – 2:00 pm
Cultural Consensus Analysis in Climate Change Studies
Caroline Brown, Courtney Carothers, Katie Moerlein, Andres Lopez, Dave Andersen, and Brittany Retherford

Thursday 25 October
Stellar Room (Conference Center, lower level) – Concurrent Session #2

2:00 – 2:20 pm
Wild, Natural, Sustainable? Linking Social and Ecological Approaches to More Comprehensively Understand the Sustainability of Alaska's Commercial Fisheries
Philip A. Loring

2:20 – 2:40 pm
Sustainable Fisheries: How Externalities Impact Urban Fishery Management
Meagan Krupa and Branka Valcic

2:40 – 3:00 pm
Managing Harvest Risk with Catch-Pooling Cooperatives
Suresh Andrew Sethi, Michael Dalton, and Ray Hilborn

3:00 – 3:20 pm – Break

3:20 – 3:40 pm
Whale Interactions with Alaskan Longline Fisheries: The Good, the Bad and the Ugly in Transdisciplinary Research
Megan Peterson, Franz Mueter, and Courtney Carothers

3:40 – 4:00 pm
Using Local and Traditional Knowledge to Better Understand Sea Otter Recolonization: Perspectives from the Extension World
Sunny Rice, Ginny Eckert, and Zac Hoyt

4:00 – 4:20 pm
Strengthening Communities and Improving Fisheries Management through Public Engagement in Alaska's Copper River Watershed
Erica McCall Valentine

4:20 – 5:00 pm – Discussion

5:00 – 6:00 pm – Break

6:00 – 10:00 pm – Banquet (In Pavillion)

Thursday 25 October
Harbor Room (Best Western Kodiak Inn) – Concurrent Session #3

7:30 – 8:00 am – Continental breakfast

Physical, Biological, and Human Factors Affecting Fishes on the North Slope of Alaska

Session Co-Chairs: Jeff Adams, Matthew Whitman, and Jason McFarland

8:00 – 8:20 am
Shifting Balance of Lake Ice Regimes across the Alaskan Arctic Coastal Plain and Implications for Future Fish Habitat
Christopher D. Arp, Benjamin M. Jones, Matthew S. Whitman, and Mark S. Wipfli

8:20 – 8:40 am
Using Multiple Survey Methods to Examine Detection Probabilities of Arctic Fishes in Lakes on the North Slope, AK
Trevor B. Haynes, Amanda E. Rosenberger, Matthew Whitman, Joel A. Schmutz, and Mark S. Lindberg

8:40 – 9:00 am
Fish and Invertebrate Assemblages in Ponds and Lakes on the Arctic Coastal Plain, Alaska
Sarah M. Laske, Mark S. Wipfli, Amanda E. Rosenberger, and Christian E. Zimmerman

9:00 – 9:20 am
Seasonal Movement Patterns of Arctic Grayling (*Thymallus arcticus*) in a Small Beaded Stream on the Arctic Coastal Plain, Alaska
Kurt C. Heim, Mark S. Wipfli, Matthew S. Whitman, Nathan D. Sather, and Mary Beth Loewen

9:20 – 9:40 am
Feeding Ecology of Arctic Grayling (*Thymallus arcticus*) in a Small Beaded Stream on the Arctic Coastal Plain, Alaska
Jason J. McFarland, Mark S. Wipfli, and Matthew S. Whitman

9:40 – 10:00 am
FISHSCAPE: Changing Seasonality Of Arctic Rivers Disrupts Key Landscape Trophic Linkage Between Stream And Lake Ecosystems
Linda Deegan, Cameron MacKenzie, Heidi Golden, and Bruce Jon Peterson

10:00 – 10:20 am – Break

Thursday 25 October
Harbor Room (Best Western Kodiak Inn) – Concurrent Session #3

Nutrients and Food Webs in Lake and Stream Ecosystems
Session Co-Chairs: Bert Lewis, Christian Zimmerman, and Mark Wipfli

10:20 – 10:40 am
Marine Nutrients and Nutrient Supplements: Ecological Effects in Streams
Mark S. Wipfli and Bert Lewis

10:40 – 11:00 am
A Review of Lake Fertilization as a Fisheries Enhancement Tool in Alaska
Bert Lewis and Mark S. Wipfli

11:00 – 11:20 am
Impacts of Salmon Spawner Density and Stream Productivity on the Ecology of Stream-dwelling Fishes in Southwestern Alaska
Kale T. Bentley, Daniel E. Schindler, Jonathan B. Armstrong, Casey P. Ruff, Rui Zhang, and Peter J. Lisi

11:20 – 11:40 am
Marine-Nutrient Assimilation in Rearing Coho and Chinook Salmon in the Unalakleet River Watershed
Philip Joy, Mark Wipfli, Craig Stricker, and Wes Jones

11:40 – noon
Applications of Limnological Data in Western Alaska: Maximizing Production Through Understanding Food Web Dynamics
Heather Finkle and Darin C. Ruhl

Noon – 1:20 pm – Lunch (box lunch provided in lobby)

1:20 – 1:40 pm
Data and Literature Review of Factors Affecting the Declines in Sockeye Salmon Productivity in Chilkat and Chilkoot Lakes, Alaska
David W. Roscoe and Dana C. Schmidt

Fish and Aquatic Ecology
Session Co-Chairs: Ted Otis and Erik Schoen

1:40 – 2:00 pm
Effects of Flow on Chinook Salmon Recruitment in Two Interior Alaskan Rivers: Population-Level Evidence and Habitat-Related Mechanisms
Jason R. Neuswanger, Mark S. Wipfli, Matthew Evenson, and Nicholas F. Hughes

Thursday 25 October
Harbor Room (Best Western Kodiak Inn) – Concurrent Session #3

2:00 – 2:20 pm
The Role of Contrasting Estuarine Environments as Rearing Habitats for Juvenile Coho Salmon
Tammy D. Hoem Neher, Amanda E. Rosenberger, Christian E. Zimmerman, Coowe M. Walker, and Steven J. Baird

2:20 – 2:40 pm
Resident and Anadromous Fish Distribution and Density of Nushagak and Kvichak Headwater Streams
Sarah O'Neal and Carol Ann Woody

2:40 – 3:00 pm
Species ID for Free: Identifying Non-Target Species During Mixed Stock Assessment
Heather L. Liller, Elisabeth Fox , Heather A. Hoyt, Chris Habicht

3:00 – 3:20 pm – Break

3:20 – 3:40 pm
A Decade of Stock Identification Reveals the Patchwork of Contributors to Southeast Alaska Chinook Fisheries
Sara Gilk-Baumer and William D. Templin

3:40 – 4:00 pm
Scales of Escapement: Using Genetic Data to Assess Stock-Specific Run Timing
Lisa C. Fox, Tyler Dann, Jim Jasper, Chris Habicht, Mark Witteveen, Todd Anderson, and M. Birch Foster

4:00 – 4:20 pm
Mitochondrial Clade Distributions in Threespine Stickleback Populations Across the North Pacific Basin
Emily A. Lescak, Robert W. Marcotte, Daniel J. Prince, Jeffrey J. Colgren, Mark C. Currey, Leah A. Kenney, William A. Cresko, Frank A. von Hippel, and J. Andres Lopez

4:20- 4:40 pm
The Evolution of Physiological Color Change in Marine Sculpins
Thaddaeus Buser, Gregory C. Jensen, and J. Andres Lopez

4:40- 5:00 pm - open

5:00 – 6:00 pm – Break

6:00 – 10:00 pm - Banquet (In Pavillion)

Friday 26 October
Pavillion Room (Conference Center) – Concurrent Session #1

7:30 – 8:00 am – Continental breakfast

Bering Cisco Research in Response to a New Commercial Fishery

Session Chair: Randy Brown

8:00 – 8:20 am
An Introduction to Bering Cisco *Coregonus laurettae* Biology and Geographic Distribution
Randy J. Brown

8:20 – 8:40 am
An overview of the lower Yukon River Commercial Whitefish Fishery, 2005-2012
Larry DuBois

8:40 – 9:00 am
Determining Population Relationships for Two Sibling Species of *Coregonus*: Arctic and Bering Cisco (*C. autumnalis and C. laurettae*)
Robert W. Marcotte and J. Andrés López

9:00 – 9:20 am
Phenotypic Variation among Adult Bering Cisco from the Yukon, Kuskokwim, and Susitna River Drainages in Alaska
J. Andrés López, Randy J. Brown, Scott Ayers, William K. Carter III, Andrew J. Padilla, J. Michael Thalhauser

9:20 – 9:40 am
Estimating Stock Composition of Yukon Delta Bering Cisco Harvest using Strontium Isotopes in Otoliths
Andrew J. Padilla, Randy J. Brown, and Matthew J. Wooller

9:40 – 10:00 am
Location, Migration Timing, and Description of Kuskokwim River Bering Cisco Spawning Origins
J. Michael Thalhauser, LaDonn Robbins, Randy J. Brown, and Ken Harper

10:00 – 10:20 am – Break

Friday 26 October
Pavillion Room (Conference Center) – Concurrent Session #1

Alaska Seafood Processing, Quality, and Marketing: Challenges and Advances

Session Co-Chairs: Alexandra Oliveira and Ray RaLonde

10:20 – 10:40 am
Refined Liquid Smoke: a Potential Antilisterial Additive to Cold-Smoked Sockeye Salmon (*Oncorhynchus nerka*)
Naim Montazeri, Brian H. Himelbloom, Alexandra C.M. Oliveira, Mary Beth Leigh, and Charles A. Crapo

10:40 – 11:00 am
Paralytic Shellfish Toxin and Commercial Shellfish: Development Toward Reduced Cost Testing
Julie Matweyou

11:00 – 11:20 am
Shellfish Aquaculture in Alaska: Progress Toward Developing a New Industry for Coastal Communities
Raymond RaLonde

11:20 – 11:40 am
The Food Safety Modernization Act: The Next HACCP?
Chuck A. Crapo

11:40 – noon
Producing Edible Cod (*Gadus macrocephalus*) Liver Oil with Short-Path Distillation
Alexandra C.M. Oliveira

Noon – 12:30 pm
Awards (Pavillion)

12:30
Adjourn

Friday 26 October
Stellar Room (Conference Center, lower level) – Concurrent Session #2

7:30 – 8:00 am – Continental breakfast

Fish, Food Security, and Health: Supporting Local Communities through Supporting Local Fisheries

Session Co-Chairs: Andrea Bersamin and Phil Loring

8:00 – 8:20 am
Fish, Fisheries, and a Human Health Approach to Understanding Food Security
Phil Loring and Andrea Bersamin

8:20 – 8:40 am
Food Security in the Kenai Peninsula of Alaska: What Role for Locally Caught Seafood?
Philip A Loring, S.C. Gerlach, and Hannah L. Harrison

8:40 – 9:00 am
Fisheries-to-Schools: a Model for Promoting Food Security in Alaska Native Communities
Andrea Bersamin, Betty Izumi, Bret Luick, Quentin Fong, and Pei Cathy Xu

9:00 – 9:20 am
The Triple Bottom Line – Fostering Community and Conservation Benefits in Gulf of Alaska Fisheries
Rachel Donkersloot and Becca Robbins Gisclair

9:20 – 9:40 am
Paralytic Shellfish Poison (PSP) in Dungeness Crabs (*Metacarcinus magister*): Results of a Study in Northern Lynn Canal and the Complexities Involved with Monitoring and Developing Strategies to Protect Human Health
Raymond RaLonde

Freshwater Habitat Modeling

Session Chair: Allison Bidlack

9:40 – 10:00 am
Modeling Juvenile Salmonid Distributions in Headwater Streams of the Kenai Lowlands Using Catchment Topography and Wetland Geomorphology
Coowe M. Walker, Ryan S. King, Dennis F. Whigham, and Steven J. Baird

10:00 – 10:20 am – Break

Friday 26 October
Stellar Room (Conference Center, lower level) – Concurrent Session #2

10:20 – 10:40 am
Using Multispectral Aerial Imagery and GIS-based Approaches to Quantify Juvenile Salmon Rearing Habitat and Develop Salmon Habitat Models: A Case Study
Christine L. Woll, Jesse Coleman, Trent Sutton, Anupma Prakash, and Mark Lisac

10:40 – 11:00 am
Intrinsic Potential Habitat Modeling for Chinook Salmon in the Copper River Watershed, Alaska
Allison Bidlack, Lee Benda, Gabe McMahan, and Gordon Reeves

11:00 – 11:20 am
Potential Impacts of Climate Change on Freshwater Ecosystems in Alaska: Modeling Coho Salmon Life-cycles in the Chuitna Watershed
Jason Leppi, Ryan Wilson, Dan Rinella, Bob Prucha, and Wendy Loya

11:20 – 11:40 am
Modeling Anchor River Chinook Salmon Population Dynamics and the Potential Effects of Climate Change
Frank Ligon, Jeffry Anderson, Joshua Strange, Jody Lando, and James Boersma

11:40 – 12:00 pm
An Integrated Hydrologic Modeling Approach to Improve Habitat Mapping and Ecological Risk Assessment for Wild Salmon in Alaska
David M. Albert, Cameron Wobus, Robert H. Prucha, and Ann Maest

Noon – 12:30 pm
Awards (Pavillion)

12:30
Adjourn

POSTER SESSION

6:30 – 10:00 pm – Pavillion Room (Convention Center)

Connections Across Many Scales: the Western Alaska Salmon Stock Identification Project (WASSIP) - *Alaska Department of Fish and Game (Tyler Dann contact)*

Did Flatfish Evolve More than Once? - *Matthew A. Campbell, Wei-Jen Chen, J. Andrés López*

Early Marine Growth Patterns of Situk River Steelhead, *Oncorhynchus mykiss* - *Matt Catterson, Megan McPhee, Trent Sutton, David Love*

The Kodiak Ocean Science Discovery Program – Bridging the Gap Between Working Scientists and Classroom Science - *Switgard Duesterloh*

Shallow-water Residency and Limited Dispersal of Atlantic Halibut in the Gulf of Maine - *Mark D. Evans, Andrew C. Seitz, and J. Kohl Kanwit*

Characteristics of Atlantic Halibut *Hippoglossus hippoglossus* in Norwegian Fjords Revealed by Pop-up Satellite Archival Transmitting (PSAT) Tags - *Mark D. Evans, Andrew C. Seitz, Kathrine Michalsen, and Jennifer L. Nielsen*

Stream Temperature Response to Variable Glacier Coverage in Coastal Watersheds of Southeast Alaska - *Jason B. Fellman, Sonia Nagorski, Sanjay Pyare, Andrew W. Vermilyea, Durelle Scott, and Eran Hood*

Stakeholder Participation in the Polish Commercial Fishing Fleet - *Elizabeth Figus*

Effects of *Ichthyophonus* on Spawning Chinook Salmon in the Yukon River Drainage - *Theresa P. Floyd, Larissa Horstmann-Dehn, Trent Sutton, and Cal Skaugstad*

Analysis of Benthic Communities on Alaskan Weathervane Scallop Beds - *Jessica R. Glass, Gordon H. Kruse and Gregg E. Rosenkranz*

In-stream Habitat Restoration on the Sitkoh River, Southeast Alaska: Lessons in Partnerships, Implementation, and Effectiveness Monitoring - *Scott Harris, Marty Becker, and Mark Kaelke*

Spatial Variation in Abundance and Condition of Juvenile Chum Salmon (*Oncorhynchus keta*) in Response to Marine Factors in Southeast Alaska - *Michael Kohan, Megan McPhee, Joe Orsi, Franz Mueter and Phil Mundy*

Changes in an Arctic Grayling Fishery Following the Introduction of a Non-native Aquatic Weed, *Elodea nuttallii*, Altered Flow Regimes and Changes in Management Policy - *Nicholas Lisuzzo and Amy Larsen*

Evidence of Stabilizing Selection on the MDH1 Gene Regulatory Region in Alaskan Cisco Species - *Robert W. Marcotte, J. Andrés López and Jacinta R. Matthais*

Spatial and Temporal Variability in the Trophic Roles of Chukchi Sea Fishes - *Jennifer M. Marsh and Franz J. Mueter*

Evaluation of Fish By-Product and Plant Protein-Based Diets on Juvenile Least Cisco Hatchery Performance - *Patricia L. McCall, Stacy L. Vega, Trent M. Sutton, Rick Barrows, Peter Bechtel, and Scott T. Smiley*

An In-Season Run Timing Prediction Model for Yukon River Chinook Salmon - *Bryce Mecum, Milo Adkison, Terrance J. Quinn II, Toshihide Hamazaki, Phil Mundy*

Exploring Factors Affecting Chinook Salmon Abundance in the Togiak River, Alaska - *Stephanie Meggers, Andrew Seitz, and Anupma Prakash*

Assessing Salmon Populations on the Copper River Using Remote RFID Streambed Readers - *Vija Pelekis*

Impact of Arctic Climate Warming on Juvenile Salmon Abundance and Condition in the Northeastern Bering and Chukchi Seas - *Melissa Prechtl, Megan McPhee, and Brian Beckman*

Trophic Patterns of Mercury Accumulation in a Nonanadromous Aquatic Ecosystem in Southwest Alaska - *Kyle R. Shedd, Frank A. von Hippel, and Collin Eagles-Smith*

Winter Movement Patterns and Habitat Use of Kotzebue Region Inconnu - *Nicholas Smith, Trent Sutton, Christian Zimmerman, Raymond Hander, Christine Moran, and Alex Whiting*

Long-Term Variability in Growth and Freshwater Age of Juvenile Sockeye Salmon in Lake Clark, Alaska - *Jennifer L. Wiley and Christian E. Zimmerman*

Plenary Session Abstracts

The Oceans as a Source for Food and Resources: Seafood

Dr. Frank Asche

Department of Industrial Economics
University of Stavanger, Norway

The world's oceans and waterways covers almost three quarters of the earths surface, but is the source of less than 10% of the food and resources used by humanity. A main reason for this is limited accessibility due to limitations in technology and knowledge. Improved technology has allowed catches and landings of seafood to increase until the early 1980s, as the planets largest hunting industry became more efficient. This development has threatened the resource base in most fisheries, and good management is currently necessary to protect the fisheries resources. The management systems have in themselves also changed the behavior of fishers and the economic activities and coastal communities based on fisheries. At the same time, the seafood market is not isolated from other international trends, and in recent decades, the seafood market has rapidly become globalized. This has created competition not only between products, but also between management systems and their trade-off between sustainability and efficiency. With improved technologies, the oceans are also used in novel ways as aquaculture for food production and drilling and windmills for energy production, creating new opportunities, but also new challenges.

Plenary Session Abstracts

Ecosystems, Complexity, and Sustainability from Global to Regional to Local Scales

Franz J. Mueter

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The theme of this year's meeting - Ecosystem, Fishery and Food Sustainability in a Changing World - explores sustainability at multiple levels and covers perhaps some of the most challenging problems in environmental management today. Among the numerous challenges – such as overfishing, invasive species, habitat alterations, pollution, and climate change – arguably the largest threats facing Alaska's marine and freshwater ecosystems arise from the consequences of anthropogenic CO_2 emissions, most notably warming waters and ocean acidification. The global nature of this problem, the interconnectedness of ecosystems, and the increasing globalization of cultures and economies imply that the social, ecological and economic sustainability of Alaska's ecosystems, fisheries, and food systems requires thinking and action at both local and global scales. I will review some of the concepts underpinning current sustainability debates, present case studies of some of the challenges and risks facing Alaska's fisheries, and outline approaches to maintaining healthy, sustainable fishery systems in Alaska while recognizing the need for adapting to change.

Plenary Session Abstracts

Alutiiq Fishing through the Ages

Patrick Saltonstall, MA, RPA Curator, Alutiiq Museum

Fish are one of the most predictable and abundant sources of food in the Kodiak region. For millennia, Alutiiqs have relied on salmon, trout, cod, halibut, herring, and rock fishes to feed their families and fuel their economies. This lecture explores the evolution of Alutiiq fishing practices and their links to the organization of ancient communities. With archaeological data, Saltonstall will show how Alutiiq people responded to social and environmental pressures by harvesting fish with greater efficiency. Learn about fishing technologies, the development of fish smoking, and how people built villages in Kodiak's most remote interior lakes to capture and store huge quantities of salmon.

SPECIAL SESSION: Marine Ecosystem Dynamics and Sustainable Fisheries

From Spilled Oil to Long Term Ecosystem and Herring Monitoring

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After 22 years post Exxon Valdez oil spill, two major long-term programs have evolved to monitor several aspects of the spill area ecosystem, from bottom up oceanography to top down predators. Oil toxicity, contamination, and species recovery were the focus during the response and damage assessment years; now ecosystem monitoring and response to change is the focus of research and monitoring supported by the Exxon Valdez Oil Spill Trustee Council. The spill area – including Prince William Sound and lower Cook Inlet - is productive in many aspects, yet herring have not fully recovered. Two related programs will monitor the ecosystem and herring changes relatively intensely over the next 20 years, spending approximately $3 million per year (inflation proofed). The Long Term Monitoring program – now referred to as Gulf Watch Alaska –has 3 major focal areas (oceanography, benthic, and pelagic species totaling about 15 projects), and will follow these focal areas consistently for the next 20 years. Some species such as killer whales and sea otters have been monitored extensively since the 1989 oil spill, so in 2032, there will be more than 40 years of data important to several species and the ecosystem. Herring have not recovered since their collapse, first realized in 1993, and have a suite of 10 studies focused on understanding why they have not recovered. This talk will cover details on the scope and objectives of the two long-term programs, as we begin the next two decades of intensive monitoring and synthesis. From these efforts, we expect to have a much better understanding of how the ecosystem changes and herring respond, giving managers more information and understanding of observed trends and changes.

SPECIAL SESSION: Marine Ecosystem Dynamics and Sustainable Fisheries

Effects of Climate and Gadid Predation on Red King Crab Population Dynamics in Alaska

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We contrasted the population dynamics of red king crab stocks from three systems: Kodiak Island (Gulf of Alaska, GOA), Bristol Bay (southeastern Bering Sea, BS) and Norton Sound (northern BS). In the late 1970s a climate regime shift caused a benthic community reorganization involving a switch from invertebrates to groundfish, dominated by gadoids, in the GOA and southeastern BS. In the northern BS, this climate change resulted in a large biomass increase without major changes in benthic community composition. Unlike the ice-free GOA, generally warmer conditions since the late 1970s in the BS have been interrupted by occasional years of extensive winter sea ice, which periodically has returned the BS to pre-regime-shift temperature conditions. Crab abundance fluctuated most widely for Kodiak, followed by Bristol Bay, and then Norton Sound; the magnitude of fluctuations in crab abundance appears related to the magnitude of recruitment variability and fishing intensity. Processes regulating crab recruitment strength remain elusive, but appear to involve parental stock size, as well as bottom-up (climate-driven) and top-down (predation) mechanisms. We speculate about bottom-up mechanisms, which seem to be indexed by the Pacific Decadal Oscillation index. Predation is indicated by a negative association between crab recruitment and biomass of Pacific cod *(Gadus macrocephalus)* and other groundfish for both Kodiak and Bristol Bay, but not for Norton Sound. Understanding the role of predation is constrained by variable overlap between groundfish predators and crab prey, as well as absence of field observations on predation in nearshore juvenile crab nursery habitats.

SPECIAL SESSION: Marine Ecosystem Dynamics and Sustainable Fisheries

Recovery of Cook Inlet Beluga Whales: Projecting Future Needs from Past Unknowns

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Beluga whales (*Delphinapterus leucas*) have a long history of contributing to the subsistence needs of Alaska Natives in the Cook Inlet region. Systematic abundance surveys of the Cook Inlet belugas (CIB) only began in 1993, but showed a 47% population decline during 1994–1998, and a 1.5% annual decline through 2008. The population was listed as endangered under the Endangered Species Act in 2008 with a draft recovery plan currently being developed through science and stakeholder panels. The spatial distribution of the CIB population currently appears to be limited to Upper Cook Inlet, an area important for development of natural resources such as oil, gas, and minerals, but also recognized for commercial and recreational fisheries. Part of the information needed for a recovery plan includes potential threats that could be limiting CIB productivity, and mitigation measures to facilitate future recovery. In this presentation I will discuss the CIB prey field, a resource important to the Cook Inlet economy and for human consumption. While CIB can be viewed as competing with human consumptive uses for the prey field, little information is available on the spatial or temporal distribution of prey immediately in the CIB habitat. I then discuss uncertainties with respect to establishing mitigation measures in light of potential future ecosystem changes.

SPECIAL SESSION: Marine Ecosystem Dynamics and Sustainable Fisheries

Groundfish Feeding Habits in the Bering Sea

Alexis M. Hall and Gordon H. Kruse

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Commercially important groundfish in the Bering Sea require an intact and productive food web for them to sustain valuable fisheries. Groundfish prey, such as king, Tanner and snow crabs, are also commercially important, but generally remain at low levels due to historical fishing practices and changes to the marine environment. As a result, the groundfish prey base may have changed over time, leading to changes in system productivity that could affect the sustainability of future fisheries. The purpose of this project was to examine trends in prey consumption of different commercially important groundfish species (*Atheresthes stomias*, *Hippoglossus stenolepis*, *Limanda aspera* and *Lepidopsetta polyxystra*) among years, capture depths, substrate type and sampling locations. The National Marine Fisheries Service collected the groundfish stomachs from 1984 to 2010. Stomach samples were identified to the lowest taxonomic level and placed into different prey groups for statistical analysis. General linear models were constructed to determine which variables were significant in predicting prey consumption of groundfish and multivariate regression analysis was used to examine the variability in prey consumption among the four variables examined. All variables were found to be significant in predicting changes in the percent weight and percent frequency of occurrence of prey items found in the stomachs of the four groundfish. The variety of prey shows that groundfish are opportunistic feeders, consuming a variety of fish, small invertebrates and crabs. Differences in prey consumption among years may reflect differences in predator and prey abundances and intensity of commercial fishing.

Student

SPECIAL SESSION: Marine Ecosystem Dynamics and Sustainable Fisheries

Seasonal and Ontogenetic Patterns of Resource Use by Juvenile Sablefish, *Anoplopoma fimbria*, in Southeast Alaska

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Sablefish (*Anoplopoma fimbria)* are a long lived demersal fish inhabiting the waters of the North Pacific Ocean and the Bering Sea and support the third most valuable groundfish fishery in Alaska. Juvenile sablefish are commonly found in nearshore bays; however, the characteristics that make this habitat preferable are not well understood. The current study will investigate the diet composition and habitat use of juvenile sablefish in order to quantify seasonal and ontogenetic shifts in diets. Samples are to be obtained over multiple seasons (summer, fall, and spring) from St. John Baptist Bay, Baranof Island, Alaska, where they have been consistently found. In July 2012, 302 juvenile fish (260-455 mm fork length; 0-2 years) were caught during daytime angling trips and their stomach contents sampled using gastric lavage. Preliminary food items identified include teleosts such as gadids, clupeids, and hexagrammids as well as invertebrates, primarily amphipods, euphausiids and larval crustaceans; 42% of the fish had empty stomachs. Future sampling will include extended angling hours with the addition of early morning and night sampling, allowing a more thorough understanding of sablefish feeding periodicity. This information will ultimately contribute to an improved understanding of sablefish life history, including the factors that affect growth and survival during early life stages.

Student

SPECIAL SESSION: Marine Ecosystem Dynamics and Sustainable Fisheries

A Survey of Fish Assemblages in Shallow, Marine Waters near Wainwright, Alaska

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As renewed offshore exploration of oil and gas resources becomes a reality in the Alaskan Arctic marine environment, planning for and assessing the potential impacts of future development-related infrastructure has begun. Understanding the nearshore and shallow coastal ecosystems of the Arctic coast of Alaska is of special importance to numerous stakeholders including: industry, regulatory agencies, environmental advocacy groups, and, most importantly, the Arctic communities that rely on subsistence resources in these areas. ABR biologists were contracted by Shell Exploration and Production to begin performing surveys of shallow (<15 ft) marine waters near Wainwright, Alaska in the summer of 2012. Survey work consisted of seining, fyke netting, pelagic and bottom trawling of shallow waters to assess fish assemblages. Additional work in 2012 will include an analysis of subsistence fishing effort in the community of Wainwright. This presentation will cover preliminary results of fish surveys in 2012 near Wainwright and will include a discussion of additional long term project goals.

SPECIAL SESSION: Marine Ecosystem Dynamics and Sustainable Fisheries

Using Otolith Growth Increments to Test Mechanisms of Production in the Nearshore Northeast Pacific Ocean

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Understanding the physical drivers of fisheries production is necessary for forecasting in the face of changing climatic conditions and has been extensively examined in continental shelf and basin systems, but not in nearshore systems. Annual growth records in otoliths of nearshore fish provide a proxy to test mechanisms of production. We examined otoliths from nearshore black rockfish (*Sebastes melanops*) captured at four sites in the Gulf of Alaska (GOA) and four sites in the California Current (CC). The relationships between pelagic production and temperatures, upwelling, and chlorophyll over the summer (Apr-Sep) were assessed using mixed-models. Mixed-models allow individual otolith growth increments from all individuals captured at all eight sites to be examined simultaneously and do not require relationships between environmental variables and growth to be similar among sites. Based on studies from continental shelf and basin systems, we anticipated increased GOA nearshore fish growth with warmer temperatures, relaxed downwelling, and increased chlorophyll and increased CC neashore fish growth with cooler temperatures, increased downwelling, and increased chlorophyll. Nearshore fish growth was not consistently associated with temperature, but was related to upwelling and chlorophyll concentrations across the study range. Relationships between fish growth and upwelling differed among sites and did not follow anticipated patterns at several sites. The growth of fish from sites in the northern GOA increased during summers with downwelling, fish growth in southeast Alaska and British Columbia increased growth with upwelling, and fish growth decreased with upwelling at sites in Washington and California. Increased fish growth was associated with increased chlorophyll concentrations as anticipated. Results suggest that upwelling and chlorophyll concentrations may influence nearshore production at higher trophic levels.

Student

SPECIAL SESSION: Marine Ecosystem Dynamics and Sustainable Fisheries

Benefits of Living Life on the Edge: Enhanced Growth and Foraging Opportunities for Juvenile Salmon Inhabiting the Margins of the Sitka Eddy

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Salmon stocks from Alaska, British Columbia, and the Pacific Northwest use the Gulf of Alaska as a migratory corridor which creates potential for inter- and intraspecific competition during periods of high density or spatial overlap. Juvenile pink (*Oncorhynchus gorbuscha*), chum (*O. keta*), and sockeye (*O. nerka*) salmon migrating through the coastal Gulf of Alaska (GOA) during 2010 were distributed throughout the Sitka eddy during the month of July. This study is a basic investigation into how these often large, prominent, and dynamic oceanographic features may influence the health and ultimately the survival of salmon during early ocean residence. Short-term growth rate, energetic condition, and prey quality were contrasted with geographic position of fish within the eddy as measured by seas surface height. Fish located along the eddy perimeter displayed the highest levels of Insulin-like growth factor, a hormone that is indicative of elevated short term growth rate. Plankton density was also greatest around the eddy perimeter. The position, timing, and strength of the Sitka eddy combined with juvenile salmon outmigration timing may positively affect growth through increased foraging opportunities. This affect would mitigate increased competition in years of high abundance and could result in increased survival for certain stocks.

SPECIAL SESSION: Marine Ecosystem Dynamics and Sustainable Fisheries

Variations in Walleye Pollock (*Theragra chalcogramma*) Maturation Rates in the Gulf of Alaska

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The life history and reproductive biology of walleye pollock *(Theragra chalcogramma)* are germane to the implementation of modern stock assessments for establishing the spawning stock biomass. Stock assessments often assume that the spawning season is constant among years; however, environmental conditions and population abundance influence the timing of maturation. Adult abundance and stage of reproductive maturity have been monitored in early spring in Shelikof Strait, western Gulf of Alaska, for almost three decades. Utilizing these data we developed generalized linear models to examine the oceanographic and population drivers of interannual trends in walleye pollock maturity.

Student

SPECIAL SESSION: Marine Ecosystem Dynamics and Sustainable Fisheries

Single Nucleotide Polymorphisms (SNPs) and Sustainable Fisheries: Evidence for Temporally Stable Alaskan Sockeye Salmon Populations over Four Decades of Commercial Fishing

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The spatial and temporal monitoring of genetic diversity is a promising tool for evaluating the sustainability of economically important populations and enabling conservation and management applications. We genotyped nuclear and mitochondrial SNPs in six paired archived and contemporary collections of Alaskan sockeye salmon that vary geographically and in life history attributes to evaluate the stability of allele frequencies over 25 – 42 years (4.9 – 8.4 generations). First, our results show that temporal changes were dramatically (between 40- and 250-fold) smaller than spatial differences in allele frequencies when based on nuclear SNPs. Second, the magnitude of temporal change was consistent with a model of genetic drift: (i) SNPs with high levels of differentiation (large θ) and candidates for diversifying selection were not more likely to show significant temporal changes than small-θ SNPs and (ii) the fraction of single-locus significant tests was consistent with theoretical predictions relating sample size and the annual number of breeders (N_b). Third, estimates of N_b were bound by infinitely large upper 95% CIs, except for one paired collection with unique life-history attributes of both a smoltification phase and generation time shorter than the other paired collections. These results are consistent with findings for other wild, but not artificially propagated, Pacific salmon populations, and argue for (i) conservation of population diversity that provides a natural portfolio against temporal fluctuations in abundance and (ii) the implementation of multigenerational SNP datasets for management of one of world's largest, most profitable and sustainable fisheries.

SPECIAL SESSION: Marine Ecosystem Dynamics and Sustainable Fisheries

Using Model Simulations to Compare Two Commercial Salmon Management Strategies

Justin Carney and Milo Adkison

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Commercial salmon fisheries in Alaska are managed with the goal of obtaining an escapement within a preset range. Emergency order openings and a fixed fishing schedule are two strategies used in the commercial sockeye salmon (*Oncorhynchus nerka*) fisheries in Bristol Bay, Alaska. The Egegik District managers open and close the fishery based on the current year's escapement and estimates of the overall run strength to achieve escapement within the goal range. The Togiak District managers open fishing based on a fixed fishing schedule (although the schedule can be modified if the escapement goal is unlikely to be met). We develop model simulations of the two management strategies. We then simulate a fixed fishing schedule on the Egegik District and management through the use of emergency order openings on the Togiak District. The differences between the model simulations and the actual management strategy allow a comparison of the two management strategies.

Student

SPECIAL SESSION: Recent Advances in Marine Biology

Novel Technologies and Charismatic Megafauna: How We Are Learning About the Elusive North Pacific Giant Octopus (*Enteroctopus dofleini*)

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In 2011, federal waters pot fisheries for Pacific cod (Gadus macrocephalus) were closed due to the by-catch of octopus exceeding Over Fishing Limits. The current methods of estimating octopus population level parameters are not based upon the ecology of the species. New technologies have allowed researchers to investigate growth, movement and mortality of octopus in Alaska. Using Visible Implant Elastomer (VIE) tags and GoPro HD video, we are beginning to understand some of these population level parameters that may guide future fisheries management.

SPECIAL SESSION: Recent Advances in Marine Biology

Building a More Robust Video Assessment for Lingcod and Rockfish

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Underwater video observations of fish and the habitats they occupy have been used extensively in marine science for ecological studies. Special considerations are needed when using these techniques for fish population assessments. Careful attention to sampling designs that minimize bias and increase precision is needed as well as thoroughly addressing assumptions of the methodology. An understanding of the fishes biology, habitat requirements, and behavior can assist in refining the sampling approach. We address some of these issues in using a remotely operated vehicle *ROV* to estimate the local abundance of lingcod and demersal shelf rockfish at index sites in the northern Gulf of Alaska. This habitat-based approach builds on an understanding of fish movement, depth, and substrate preferences and utilizes multibeam sonar to locate index sites and delineate substrate type. Sampling decisions were based on attempting to increase precision and minimize bias while balancing by the logistical constraints of operating an ROV in broad range of conditions including high current high relief habitats. Specific assumptions of responsive movement and detectability are addressed. Finally, the use of stereo video for measuring fish length and as a method of using distance sampling for estimating fish density are discussed.

SPECIAL SESSION: Recent Advances in Marine Biology

The Toxicity of Creosote Pilings to Developing Herring Embryos with a Linked Field Study in Juneau, AK

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This study finds a significant dose-response relationship between part-per-billion polyaromatic hydrocarbon (PAH) concentrations of creosote-treated wood leachate and skeletal defects and impaired swimming ability in developing Pacific herring (*Clupea pallasi*) embryos. Creosote-treated wood, a common building material for docks and harbors, contains up to 85% PAH; chronic low level leakage of PAHs may be harmful to essential fish habitat, particularly for early life stages, including Pacific herring that spawn nearshore on vegetation or dock structures. For this study, Pacific herring embryos were exposed to seven doses of creosote-treated wood effluent under controlled laboratory conditions until onset of hatch. Dose levels of PAH, monitored by GCMS, ranged from 0.12 to 30.33 ppb. At 9.52 ppb creosote-derived PAH, 20% of the population exhibited skeletal defects and/or impaired swimming ability. At 17.75 ppb, 50% of the population was affected. While the PAH compounds leaching out of the treated wood are clearly toxic at low part per billion levels, it is not clear if these concentrations can be achieved in the field. Currently, a seasonal field study of three creosoted docks in the Juneau area using passive hydrocarbon samplers is in progress to determine if toxic thresholds can be measured in the environment.

Student

SPECIAL SESSION: Recent Advances in Marine Biology

Foraging Behavior and Capture Success of Yearling Chinook Salmon Feeding on Pacific Herring: Effects of Turbidity and Prey Density

Erik R. Schoen[1], David A. Beauchamp[2], and Adam G. Hansen[1]

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The environmental conditions affecting salmon feeding and growth during their first months at sea are considered critical to ocean survival. Foraging models for piscivorous fishes generally focus on encounter rates between predators and prey, but predation can also be limited if predators do not successfully capture the prey they encounter. Turbidity and fine-scale prey density are highly variable in the coastal habitats of juvenile Chinook salmon and may influence capture success rates. We conducted foraging experiments with yearling hatchery-origin Chinook salmon feeding on small schools of wild age-0 Pacific herring in a 4.6-m diameter seawater tank to test the following hypotheses: 1) Salmon encounters with herring often fail to result in the capture of prey. 2) Increased turbidity reduces capture success rates. 3) Increased turbidity is less limiting to predation rates at high prey densities than at low prey densities. Herring usually evaded attack; capture success averaged only 7 % overall. In addition, salmon often spent several minutes following herring before attacking, thus magnifying the costs of unsuccessful attacks on the predation rate. Capture success tended to decrease with increasing turbidity, although variability was high. These results indicated that the capture success of juvenile salmon feeding on fish can be low enough to influence predation rates substantially. We will discuss the implications of these results for salmon foraging on patchy prey resources in turbid environments, such as plankton blooms and river plumes.

SPECIAL SESSION: Recent Advances in Marine Biology

Bayesian Implementation of a Time Stratified Lincoln-Petersen Estimator for Salmon Abundance in the Upper Matanuska River, Alaska, U.S.A.

Suresh Andrew Sethi[1] and Theresa L. Tanner[2]

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Time stratified Lincoln-Petersen mark-recapture models can generate estimates of salmon abundance that are robust to capture heterogeneity. In this talk, we will present a Bayesian implementation of these estimators using WinBUGS that provides a flexible framework to formulate different model structures, including random effects structures and models with functional relationships between parameters and covariates, and can successfully generate estimates in the face of sparse data. The models area applied to 2009 data from the Matanuska River to provide abundance estimates of chum, coho, and sockeye salmon. For each species, we formulated a suite of twelve model structures and used deviance information criterion based multimodel inference and model averaging to estimate abundance. Model averaged point estimates for upper river 2009 chum, coho, and sockeye salmon were 54,720, 11,430, and 13,750, fish respectively, supporting a growing body of ecological research which demonstrates that glacial river systems can sustain significant Pacific salmon runs. Results identified time varying probability of capture for chum and coho salmon, and population estimates were 17% and 8% higher, respectively, than estimates from a simple pooled Lincoln-Petersen model which has been demonstrated to be biased low in the face of capture heterogeneity. Capture heterogeneity was not found for sockeye salmon and the model averaged time stratified and pooled Lincoln-Petersen estimates agreed closely. Time stratified models can potentially produce more accurate estimates, however, the additional model complexity results in less precise abundance estimates compared to the simple pooled Lincoln-Petersen estimator.

SPECIAL SESSION: Recent Advances in Marine Biology

Monitoring Anadromous Lampreys in Alaska: Existing and Novel Approaches

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Lampreys are increasingly recognized as important in both freshwater and marine ecosystems, but initiating formal monitoring is difficult and expensive. However records of marine-phase lamprey are captured in several existing surveys including National Marine Fisheries Service (NMFS) observer reports, NMFS Ecosystem Monitoring Assessment (EMA), and NMFS trawl surveys. These datasets were examined for spatial and temporal patterns to discern trends in abundance and distribution of two marine-phase lampreys (*Lethenteron camtshaticum* and *Entosphenus tridentatus*). Biennial gaps of trawl survey coverage exist along the Bering slope, a region where *E. tridentatus* is abundant, so lamprey attack rates on Pacific cod (*Gadus macrocephalus*) were examined to be used as a proxy for lamprey distribution and abundance in this region. Both actual lamprey catches and attack rates identify regions of lamprey concentration in the ocean and trends in abundance over time. The addition of scanning for attacked fish is a manageable addition to already occurring surveys that can fill data poor regions and years. These results set the stage for a simple "add-on" lamprey monitoring program that focuses on the marine-phase of two anadromous species in Alaska and provides managers with useful baseline information by which goal successes can be measured.

Student

SPECIAL SESSION: Recent Advances in Marine Biology

Nearshore rockfish hydroacoustic surveys in the western Gulf of Alaska

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The economic importance of black rockfish *Sebastes melanops* in Kodiak Archipelago and south Alaska Peninsula waters has provided the impetus to develop a population-based management plan for the commercial jig fishery. Hydroacoustic surveys conducted from 2007 to 2012 have been used to generate rockfish abundance estimates in the Kodiak Management Area, Chignik Management Area, and the Shumagin Islands Section of the Alaska Peninsula Management Area. Live-capture and underwater video sampling were used at most survey locations to apportion the rockfish abundance estimates by rockfish species and generate a nearshore rockfish species distribution profile. This talk will outline the methodologies used to acquire, process, and summarize the hydroacoustic data as well as the rockfish species apportionment of the abundance estimates.

SPECIAL SESSION: Recent Advances in Marine Biology

Using acoustic assessment of pelagic backscatter to assess prey use and niche separation of fin and humpback whales near Kodiak Island, Alaska

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Fin and humpback whales are top-level predators and depend on seasonally intensive feeding to meet high energetic demands. As a result, consumption by these whales is substantial and directed at a variety of zooplankton and forage fish in diverse habitats. In the waters surrounding the Kodiak Archipelago, fin and humpback whales can be found year-round and frequently overlap spatially and temporally. The Gulf Apex Predator Prey study (GAP) investigated the prey use and potential for niche separation between these two sympatric species by combining concurrent analysis of horizontal and vertical whale distribution, through attachment of real-time suction cup tags, with acoustic assessment of pelagic backscatter. Pelagic backscatter was classified as either “fish” or “zooplankton” using multi-frequency differencing techniques. Results suggest that fin whales likely rely more heavily on zooplankton, while humpback whales favor fish. Humpback whales were also shown to have a preference for capelin over juvenile pollock and zooplankton when all were available. However, the diets of these whales may overlap when zooplankton, primarily euphausiids, densities are very high.

SPECIAL SESSION: Recent Advances in Marine Biology

Mapping Tanner Crab Habitat in the Kodiak Area of the Gulf of Alaska

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Alaska Department of Fish and Game (ADF&G) manages commercial fisheries for Tanner crabs in the Gulf of Alaska (GOA) and conducts annual bottom trawl surveys to assess the populations and provide data to set harvest limits. Bottom trawling is limited to trawlable habitat that comprises only a proportion of the total survey area. The current practice of expanding Tanner crab densities from trawlable habitat to large areas of unknown habitat can potentially create bias in overall population estimates; this is critical because state regulations require that population estimates exceed a lower threshold before opening Tanner crab fisheries. For a benthic species like Tanner crab, understanding the relationships between habitat and abundance is essential for extrapolating population density estimates to larger scales. The goal of this project is to map and describe important Tanner crab *Chionoecetes bairdi* habitat northeast of Kodiak Island in the GOA. For the first time, we used WASSP multibeam sonar and a towed benthic imaging system (CamSled) to deliver full-coverage maps of bathymetry and seafloor acoustic backscatter and to provide both classified substrates and biological observations for Tanner crab habitat. We hypothesize that Tanner crabs have preferred habitats and are associated with specific bottom characteristics that can be recognized in data collected by a multibeam sonar system: substrate, biota, and geomorphologic characteristics (depth, hardness, slope, rugosity). This information will be used to increase understanding of the spatial distribution of Tanner crab and their habitat and will aid in interpretation of stock assessment data.

SPECIAL SESSION: Elasmobranchs in Alaska

The Spiny Issue of Ageing Spiny Dogfish: Historical Dogma vs. New Methods

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The dogma of using the dorsal fin spine to age spiny dogfish (*Squalus suckleyi*) has been in existence for over 30 years. With these well established methods, the species has a rather long history of published literature on age and growth. However, a problem with this method is that the dorsal fin spine, which protrudes from the body into the environment, is sometimes broken and often worn, thus creating lost or difficult-to-read annuli. Recent research on an Atlantic congener (*Squalus acanthias*) found that a technique using histological staining of vertebrae thin sections made it possible to count annuli, thus eliminating the sources of uncertainty associated with worn spines. However, this vertebral method has yet to be tested in the much longer lived North Pacific spiny dogfish. Our study examines both age structures and compares inter- and intra-reader as well as inter-lab variability in reading annuli to determine which method produces the most precise ages for the North Pacific spiny dogfish. Results suggest a substantial decrease in intra- and inter-reader variability when the vertebrae method is compared to the dorsal fin spine method. Preliminary analyses also show that there are multiple sources of measurement error when using the spine method, sources that do not exist with the vertebrae method, and that inter-reader variance increases substantially more with increasing age with the spine method than with the vertebrae method.

SPECIAL SESSION: Elasmobranchs in Alaska

The Spatial Distribution of Spiny Dogfish (*Squalus suckleyi*) in the Gulf of Alaska: The Use of Fishery Dependent Data, Fishery Independent Data, and Generalized Modeling for the Spatial Management of Catch and Bycatch.

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The spiny dogfish (*Squalus suckleyi*) is a common bycatch species in commercial longline fisheries in the Gulf of Alaska (GOA). This small shark is widely considered as a nuisance and most dogfish bycatch is discarded. Their spatial distribution in the GOA is poorly understood. A better understanding of areas of high bycatch would provide critical information to fishery managers, whether they seek to convert discards into valuable fishery landings or whether they seek to reduce fishing mortality on this long-lived species. We analyzed the spatial distribution of spiny dogfish from fishery and survey data collected between 1996 and 2008 using generalized additive and generalized linear modeling techniques. Poisson, negative binomial, and quasi-Poisson error structures were investigated using goodness of fit statistics. The quasi-Poisson generalized additive model provided the best fit for predicting counts of dogfish and accommodating over-dispersion caused by areas with low dogfish counts. The results showed catches of spiny dogfish were concentrated east of Kodiak Island, Alaska, with a general shift in the distribution of dogfish to the west of Kodiak Island between 1996 and 2008. Greater bottom depth and fishing effort led to a non-linear decrease in dogfish catch over the time period examined. Contrary to common perception among the Alaskan fishing industry, results do not suggest a large increase in the dogfish population in the GOA. Further, modeling results show areas of high dogfish density that indicate core areas that are important to future stock assessments, critical habitat, and management of harvest and bycatch.

SPECIAL SESSION: Elasmobranchs in Alaska

Thermal Physiology of Salmon Sharks, *Lamna ditropis*

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Salmon sharks, *Lamna ditropis*, belong to the Family Lamnidae; a small group of sharks that possess vascular counter-current heat exchangers (*retia mirabilia*) allowing retention of metabolically generated heat, resulting in elevated body temperatures. Using acoustic telemetry, we recorded swimming depth and stomach temperature free-swimming salmon sharks in Prince William Sound, Alaska. Mean stomach temperature ranged from 25.0 to 25.7^{o}C. These sharks defended specific elevated temperatures regardless of changes in ambient temperature, which ranged from about 5–16^{o}C. The maximum observed elevation of stomach temperature over ambient was 21.2^{o}C. Because stomach temperatures were so strictly maintained relative to changes in ambient temperature, a thermal rate coefficient, k, (^{o}C min^{-1} ^{o}C thermal gradient^{-1}) for cooling of 0.053 min^{-1} was obtained via a 'control' experiment with a dead salmon shark. More recently, deep red muscle temperature data have been obtained to enhance our understanding of the thermal capacity of this species. Data show that free-swimming adult salmon sharks maintain a specific body core temperature independent of changes in ambient temperature through a combination of physical and physiological means, and essentially function as homeotherms. This unique ability is probably the underlying factor in the evolutionary niche expansion of salmon sharks into boreal waters and in their ability to actively pursue and capture highly active prey such as salmon.

SPECIAL SESSION: Elasmobranchs in Alaska

Reproductive Biology of the Salmon Shark, *Lamna ditropis*, in the Eastern North Pacific Ocean.

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Little information is available about the reproductive biology of the salmon shark, *Lamna ditropis*, in the Eastern Pacific ocean. Data needed to support stock assessment include more complete information on the reproductive timing, periodicity, and fecundity of this species. Female salmon shark specimens were collected from Alaska waters in the summer, fall, and winter months in order to examine these parameters. Females of this species were found to ovulate during the fall months of September and October and females captured in July were in either a resting or post-partum state indicating a short gestation of 9 to 10 months. The presence of two maturity stages in both the summer and fall months indicate a resting period of at least 14 months between parturition and ovulation. This study found fecundity was 3.86 (n = 7, SE = 0.14) with the majority of sharks having a fecundity of 4 sharks per litter. These data will aid in the development of demographic models for this species in this region in future stock assessments.

SPECIAL SESSION: Elasmobranchs in Alaska

Description of Injuries Sustained by Skates (Rajidae) Incidentally Captured by the Bering Sea Longline Fleet

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Large numbers of skates (Rajidae) are caught incidentally in the Eastern Bering Sea, particularly by vessels employing longline gear to target Pacific cod (*Gadus macrocephalus*). A portion of these skates are retained for sale; the majority is discarded, and the stock assessment uses a 100% mortality rate for conservatism. However, a fair number that have sustained various injuries from capture and handling have been caught again, so the mortality rate could be much lower. Our goal is to scientifically describe the injuries sustained, determine their frequency, as well as make inferences as to the relationship between crew handling methods and injury severity. Presented here is a preliminary of data collected during two trips aboard a commercial longline vessel: first, as a pilot study, in the winter of 2011/12, and second, during summer of 2012. This research is designed to lay the foundation for a planned future study where quantitative estimates of the discard mortality of these skates will be determined.

Student

SPECIAL SESSION: Elasmobranchs in Alaska

Movement Patterns of Skates in the Gulf of Alaska and Implications for the Management of a Skate Fishery

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Skates are in growing demand worldwide, specifically in European and Asian markets. As part of supplying this demand, the U.S. landings of skates in 2008, mainly from the Atlantic Ocean, was estimated at 65 million pounds, worth US$11 million. However, many Atlantic Ocean skate stocks are declining. In contrast, Alaska has relatively healthy skate stocks that can only be retained as non-target catch in federal and state waters of Alaska. Big skates (*Raja binoculata*) are the most frequently landed skate in the Gulf of Alaska and are managed by two management agencies, that each divide the skate non-target catch quota into multiple management areas and assume that big skates do not move among these areas. If a directed skate fishery is to be developed, more ecological data such as movement patterns and habitat use need to be explored. We deployed pop-up archival transmitting (PAT) tags on seven big skates in Prince William Sound, Alaska in July 2011 and set them to pop up in May and June 2012. This was the first instance of an electronic tag being deployed on any skate species in the Pacific Ocean and provided novel data on the movement patterns, temperature and depth utilization of big skates. It also provided a fishery-independent estimate of the connectivity of big skates between management areas. Ecological data such as these are crucial when managing a novel fishery, and are necessary when employing an increasingly popular ecosystem-based management.

Student

SPECIAL SESSION: Marketing Sustainability of Alaskan Salmon Fisheries

The Marine Stewardship Council's Fisheries Ecolabeling program and Alaska Salmon

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The Marine Stewardship Council's Fisheries Ecolabeling program is the largest and most widely recognized global fisheries sustainability certification program, with over 10% of the world's capture fisheries engaged in the program and over 15,000 products in 75 countries using the MSC ecolabel. Alaska fisheries which are currently certified under the MSC program include Alaska salmon, pollock, Pacific cod, sablefish, halibut, and several species of flatfish. Alaska salmon has recently undergone a change in client to represent this fishery in the MSC program, and the reassessment of the fishery is currently underway. Other salmon fisheries in the North Pacific that are MSC certified are Annette Island Reserve Chinook, coho, pink, and chum salmon; British Columbia sockeye salmon; British Columbia pink salmon; Iterup Island (Russia) pink and chum salmon; Sakhalin Island (Russia) northeast pink salmon; and Ozernaya River (Russia) sockeye salmon. The market for certified sustainable seafood continues to grow, and Germany appears to be one of the leading markets. Independent third party certification with an ecolabel appears to be an important element in buying decisions.

SPECIAL SESSION: Marketing Sustainability of Alaskan Salmon Fisheries

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.

SPECIAL SESSION: Marketing Sustainability of Alaskan Salmon Fisheries

The Role of NGOs in Promoting Sustainable Wild Salmon Fisheries

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Non-governmental organizations (NGOs) have been involved in promoting sustainable seafood since the inception of the movement. NGOs have been involved with establishing certification schemes, setting sustainability standards, providing stakeholder input into fisheries assessments, working with seafood buyers to create market incentives for sustainable fishing practices, and providing technical advice to management agencies and fishing organizations to improve fisheries management and achieve sustainability certifications. Growing consumer demand for eco-labeled seafood has created greater incentives for sustainable fisheries management around the world. Recently, some have questioned the role of NGOs in the eco-labeling process and believe it should be far more restrictive than it has been. This presentation explores how NGOs have been involved in certifying sustainable Pacific salmon fisheries around the North Pacific and discusses the future role of NGOs in this process.

SPECIAL SESSION: Marketing Sustainability of Alaskan Salmon Fisheries

Defining Seafood Sustainability in the Global Marketplace

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There have been substantial efforts to define the criteria and indicators that can determine a sustainable fishery in practice. However, although it is possible to establish reliable, science-based metrics for defining sustainability, it is also clear that there are other social components to a wider understanding of sustainability that are important. Consequently, any organisation that wants to define sustainability standards must ensure that the contents of the standard are subject to considerable input from a very wide range of stakeholders. If a standard is to be credible in making a public claim related to the environmental performance of a fishery, it should meet a number of criteria including rigour, transparency, reliability, consistency, multi-stakeholder collaboration, appropriateness of claim, and alignment with best practices for standards. There is also value in having a range of standards in the marketplace offering different levels of achievement (e.g., "legal," "responsible," "sustainable"), provided they are accurate in their claims. Development of a robust benchmarking system with a graded assessment and performance indicators would effectively create a hierarchy of standards with different levels of ambition. Seafood ratings offered by numerous groups differ from a standard in that they represent a judgement made by that organisation, not a third party specialist certifier. Use of these ratings by retailers for consumer communications carries certain risks. Establishing minimum requirements for transparency, explanation of methodology, and public commentary would strengthen the rigour of ratings.

SPECIAL SESSION: Ensuring Subsistence Fisheries through Partnerships

The Tanana Chiefs Conference's Partnerships in the Fisheries Community. Is It Successful?

Alyssa Frothingham

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The subsistence lifestyle remains important to the people in the interior region covered by the Tanana Chiefs Conference (TCC), a nonprofit organization that represents 42 villages within the interior of Alaska. The region covers 235,000 square miles and represents nearly 10,000 Alaskan Natives. Fisheries resources represent a vital component of the subsistence harvest in many of these interior communities and it is important that these subsistence users have a voice in the management of their resources as resources are dwindling. Due to the small size of the Wildlife and Parks Department at TCC, we rely on partnerships with other agencies to ensure our people are educated, active and involved in management. Research projects such as our ongoing Subsistence Chinook Sampling project utilize subsistence fishers to collect samples that are sent to the Alaska Department of Fish and Game (ADF&G) for age and genetic analysis. The Alatna River Inconnu Population project presented an opportunity for the US Fish and Wildlife Service (USFWS) to work with TCC to fill data gaps on subsistence fish harvests while the residents of Allakaket work with TCC to gain a more prominent role in the future management and conservation of this resources. The annual Henshaw Creek Science Camp, a partnership between the Kanuti National Refuge and TCC, places emphasis on both western and traditional knowledge when teaching younger generations. Inter-agency projects with TCC provide information to subsistence users by assisting in education and through the involvement of subsistence interior residents in management decisions, while fisheries managers gain an insight into direct actions made.

SPECIAL SESSION: Ensuring Subsistence Fisheries through Partnerships

How Many Fish are "Needed" for Subsistence?

Toshihide "Hamachan" Hamazaki

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For evaluation and management of fisheries to meet subsistence needs, the amount of fish necessary for subsistence (ANS) is the standard. The ANS is determined based on historical harvest range. When the number of fish harvested by subsistence fishery is within the ANS range, it is considered that a reasonable opportunity was provided and subsistence fish "needs" were met. However, there are disagreements whether the ANS range reflects subsistence "needs." In order to answer this uncertainty, since 2008 during the post-season subsistence harvest survey in Yukon and Kuskokwim River, the ADF&G has been asking each household not only the number of fish harvested by the households, but also the number of fish they planned/wanted to harvest at the beginning of the season. From this, the "demanded" number of reasonable opportunity was provided fish for subsistence was estimated. In general, the estimated "demands" tends to be higher than the ANS range.

SPECIAL SESSION: Ensuring Subsistence Fisheries through Partnerships

Synchronous Cycling of Ichthyophoniasis with Chinook Salmon Density Revealed during the Annual Yukon River Spawning Migration

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When ichthyophoniasis was identified in returning Yukon River Chinook salmon, a multi-year epizootiologic study was designed to determine its impact on the health and survival of the host. Initially it was found that the disease caused pre-spawn mortality and degradation of flesh quality, making it unfit for human consumption. Subsequent studies revealed that disease prevalence and Chinook salmon population abundance increased and decreased simultaneously between 1999 and 2010, rising and falling synchronously 91% of the time for females ($X^2 = 0.003$) and 82% for males, there was however, no correlation between *Ichthyophonus* prevalence and population abundance ($R^2 = 0.14$). Annually, overall disease prevalence was significantly higher among females than males, increased linearly with fish size for both sexes, and increased in both sexes as the fish progressed upriver. From 2003 to 2010 disease prevalence decreased from 30% in males and 45% in females to just 5% and 9% respectively, paralleling a similar decline in salmon abundance during the same period. Because of the high costs and the extensive manpower required, multi-year disease studies such as this one are relatively rare in non-human species. In order for a study of this magnitude and complexity to be successful, it required funding from multiple sources and the cooperation of subsistence fishermen, processors, and governmental agencies over the entire length of the Yukon River. As a result of this cooperation a 12-year (continuing) epizootiologic study revealed much of the nature of the host-parasite relationship between *Ichthyophonus* sp. and Chinook salmon.

SPECIAL SESSION: Ensuring Subsistence Fisheries through Partnerships

What Can be Learned From Assessment of Salmon Escapements to Maintain Subsistence Fisheries: Two Case Studies in Southwest Alaska

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Assessment of salmon escapements and management for escapement goals has been a successful strategy in Alaska fisheries management, particularly for commercial and sport fisheries. Except for the largest subsistence fisheries, assessment of salmon escapements primarily to manage and maintain subsistence fisheries has been less common. Since 2000, Office of Subsistence Management (OSM), U.S. Fish and Wildlife Service (USFWS) provided funding through the Subsistence Fisheries Resource Monitoring Program for this purpose. In southwest Alaska, funding was provided to the USFWS to assess: sockeye salmon escapements into McLees Lake (Alaska Peninsula) through a weir 2000-2011; and Chinook salmon escapements into Togiak River (Bristol Bay) through a radio-tagging program 2008-2012. These data provided for accurate estimates of escapement, total return, exploitation, and spawning distribution. In both cases, these assessments provided important new and substantially more accurate information to fisheries managers than were possible through prior and less rigorous escapement assessments. Approximations of escapement levels necessary to sustain realized levels of subsistence harvest are now possible. This information was obtained through effective partnerships with federal, state, and Alaska native organizations.

SPECIAL SESSION: Ensuring Subsistence Fisheries through Partnerships

The Native Village of Eyak's (NVE) Collaborative Partnerships in Subsistence Fisheries Resource Monitoring

Vija Pelekis[1]

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Given the complex nature of managing a fishery that involves the overlapping needs of different user groups, the Native Village of Eyak (NVE) has fostered partnerships and research to become better involved in the management of its subsistence fisheries resources. NVE has conducted and participated in a host of fisheries monitoring projects that directly relate to the management these resources. Since 2000, these projects have been primarily supported through NVE's involvement in the Office of Subsistence Management's (OSM) Fisheries Resource Monitoring Program (FRMP) and Partner's for Fisheries Monitoring Program (PFMP). Through these programs, NVE has established productive partnerships and dramatically improved relationships with Federal, State, and private organizations. Moreover, these fisheries resource monitoring projects have increased NVE's role in the management of subsistence fisheries resources that are vital to the livelihood of community members. The various monitoring projects have also benefitted many local youth and rural Alaskans through educational and employment opportunities. This presentation will provide an overview of our current and past fisheries monitoring projects and the partnerships that made such research possible.

SPECIAL SESSION: Ensuring Subsistence Fisheries through Partnerships

Association of Village Council Presidents: Building Partnerships and Future Direction

Casie Stockdale

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The Association of Village Council Presidents (AVCP) is a non-profit tribal organization representing the 56 Tribes of the Calista Region, which spans over 58,000 square miles. The region is the traditional home to indigenous Yup'ik, Cup'ik, and Athabascan people. Salmon is an integral part of the culture, tradition, economy and diet of tribes in the region. Declining Chinook salmon returns have resulted in closed commercial and subsistence fisheries. The subsistence fisheries have been restricted to the point where villages are not meeting their basic subsistence needs. This region has economic, communication and logistical challenges coupled with the wide range of food security issues on both the Yukon and Kuskokwim Rivers. To deal with these issues cooperation of tribes and collaboration with other non-profit organizations as well as State and Federal management agencies is needed. Working toward playing a meaningful role in salmon research and management, AVCP is developing collaborative research projects involving local residents, in partnership with the Alaska Department of Fish and Game (ADF&G). AVCP's *Coastal Kuskokwim Salmon Harvest and Use Survey*, involved hiring local researchers to collect basic information on salmon harvest and use in communities in the Kuskokwim Area that have been previously unsurveyed or under-surveyed by subsistence monitoring programs. The *Lower Yukon Subsistence Chinook ASL and Genetic Sampling* project involves training local fisherman to collect samples of their subsistence caught Chinook. Samples are sent to ADF&G and the information collected contributes to the collective set of information needed to understand the overall Yukon River king salmon run. Continued efforts to involve Tribal members, that develop partnerships and collaborative research projects will successfully filled data gaps and make contributions to Chinook salmon research. Now a future direction has been recommended with greater tribal self-governance to build capacity in tribes, to assist the state and federal management agencies in more effective management of salmon. This system will help ensure that salmon are available to meet the essential food security needs. The Executive Boards of AVCP and Tanana Chief Conference have found that strengthening partnerships and unifying Tribes through inter-tribal fish commissions is the best future approach for the long-term health and well-being of the people and salmon resources of the Yukon and Kuskokwim Rivers.

SPECIAL SESSION: Hatchery Programs in Alaska: Reviewing the Old, Evaluating the New

An Overview of Alaska's Sport Fish Hatchery Program

Jeff Milton

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The Alaska Department of Fish and Game, Division of Sport Fish operates 3 hatcheries and maintains cooperative agreements with several PNP facilities to produce and stock sport fish at hundreds of sites across the state. These stocking programs are geared towards enhancing existing fisheries, creating new fisheries and providing variety in both species and setting. Be it aerially stocking hundreds of Arctic grayling fingerling into a trail accessible mountain lake or tens of thousands of catchable sized rainbow trout into a lake in the heart of Anchorage each stocking event must first be permitted through the Commercial Fisheries Division Fish Transport Permit (FTP) process. Each winter the Sport Fish Hatchery program drafts a 5 year Statewide Stocking Plan for Recreational Fisheries. This draft plan is presented to the public, resource managers and regulators for review and comment. Once approved it guides production and stocking activity for the year and is the enabling document for requesting FTPs. All Sport Fish stocking projects must be approved through the same process that regulates PNP releases. The FTP approval process includes review by state Pathology, Genetics, Sport and Commercial Fishery Management Staff. All Sport Fish produced smolt receive a thermal band as assigned by the State Tag Lab to allow post release ID and the majority of the freshwater stocked production is certified as 3N to limit the potential for negative interaction with wild stocks.

SPECIAL SESSION: Hatchery Programs in Alaska: Reviewing the Old, Evaluating the New

Southeast Alaska Purse Seine Fisheries Before and After Chum Salmon Enhancement

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Purse seine fisheries in Southeast Alaska have been managed primarily based on pink salmon run strength. In years of low pink salmon abundance, the amount of fishing time and area open for purse seine fishing is greatly reduced, leaving little opportunity for seine fishermen to have an economically viable season. Alaska's hatchery program was initiated in the 1970s with the goal of enhancing fisheries that were severely depressed due to low salmon abundance. In Southeast Alaska, most hatchery production has been focused on chum salmon, which are now the most valuable species in Southeast Alaska commercial fisheries, with an average ex-vessel value of $32 million a year from 2001 to 2010—well ahead of the next most valuable species, pink salmon, at $23 million a year. The increased harvest and value of enhanced chum salmon over the past two decades has provided a buffer against the economic effects of poor pink salmon catches in recent even years. Reduced fishing opportunity for pink salmon in even years since 2006 was alleviated to some degree by the ability to have fisheries targeting hatchery chum salmon in terminal harvest areas near hatchery release sites, illustrating the benefits of a hatchery program designed to boost harvest and stabilize the industry, while attempting to minimize impacts and interactions with wild stocks. It is widely recognized that there are risks to wild stocks associated with large-scale hatchery production, and the State of Alaska has recently implemented studies designed to assess impacts of stray hatchery pink and chum salmon on wild stocks. Over the past two decades, enhanced chum salmon have boosted Southeast Alaska harvests substantially, while wild stocks have generally continued to meet escapement goals and provide large harvestable surpluses of fish.

SPECIAL SESSION: Hatchery Programs in Alaska: Reviewing the Old, Evaluating the New

Hatchery Salmon Straying Studies in Prince William Sound, Alaska

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The Alaska Department of Fish and Game (ADF&G) surveys 214 index streams in Prince William Sound (PWS) to determine if wild salmon abundance meets sustainable escapement goals (SEGs). A critical assumption for determining whether SEGs are achieved is that salmon observed in streams are of wild origin. In a preliminary study conducted by ADF&G from 1997–1999 some streams in western and northern PWS contained high proportions of hatchery pink salmon with much lower proportions in eastern PWS streams. In recent studies we have confirmed these results for hatchery pink salmon—which made up 0–98% of stream escapement—while estimates of hatchery chum and sockeye salmon in wild stock spawning locations ranged from 0–63% and 0–33%, respectively. The prevalence of hatchery pink salmon strays in streams increased throughout the spawning season, while the prevalence of hatchery chum salmon decreased. Large increases in hatchery salmon production occurred in PWS during the past 25 years with the majority of these harvested in commercial fisheries. Hatchery salmon straying has implications for hatchery operations, wild salmon escapement goals, and could impact the health of wild salmon through a variety of genetic and ecological interactions. We will discuss spatial and temporal trends in hatchery salmon straying in PWS and mechanisms that could contribute to hatchery straying. Additional research will begin in 2013.

SPECIAL SESSION: Hatchery Programs in Alaska: Reviewing the Old, Evaluating the New

SNPs from Archived and Contemporary Tissues Show Genetic Imprints of Hatchery Strays on Wild Chum Salmon Populations in Prince William Sound, Alaska

Christopher Habicht[1], James Jasper[1], Steve Moffit[2], Rich Brenner[2], Jennifer Marsh[3], Bert Lewis[1], W. Stewart Grant[1], Elisabeth Fox[1], Zac Grauvogel[1], and Serena Rogers[1]

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Wild and hatchery salmon interactions have been the recent focus of research and debate. Much debated is the extent that straying hatchery salmon affect wild populations. While generational experiments show that artificial breeding and culture influence the genetics of hatchery-reared salmon, little is known about the interaction between hatchery and wild salmon in a natural setting. Here, we compare the genetic population structure of chum salmon (*Oncorhynchus keta*) in Prince William Sound (PWS), Alaska prior to hatchery production with contemporary population structure with the analysis of single nucleotide polymorphism (SNP) markers in archived scale and contemporary tissue samples. Fish scales are used to age individual fish and have been archived since the late 1960's for several populations in PWS. We compared allele frequencies for 135 SNPs in historical (1964–1982) and contemporary (2008–2010) collections from the four hatchery and wild populations with a model based on source-sink relationships. The results of this model, together with allele-frequencies comparisons, show a temporal shift toward hatchery allele frequencies in some wild populations. Spawn timing among stocks and distance from the release sites may influence introgression rates from hatchery to wild populations.

SPECIAL SESSION: Hatchery Programs in Alaska: Reviewing the Old, Evaluating the New

A Design for Evaluating the Efficacy of Salmon Enhancement Activities in Lower Cook Inlet, Including a New Stocking Project in Kamishak Bay

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Hatchery enhancement of salmon production has occurred in Alaska for decades, with large-scale operations continuing today in southeast and south-central Alaska. Evaluation of the effectiveness of these activities and any potential impacts they may have on wild stocks has slowly evolved over time. Mass-thermal marking of otoliths now allows researchers to identify fish of hatchery origin, determine total return and marine survival rates, and quantify the contribution hatcheries make to area subsistence, sport, and commercial fisheries. Likewise, the analysis of genetic markers can be used to understand the dynamics of new and growing populations and to quantify the genetic introgression from stray hatchery fish into wild populations. Unlike most areas where enhancement activities began prior to the development of these methods, we have a unique opportunity in Kamishak Bay to evaluate in real time the positive and negative effects associated with establishing a new salmon run on the Paint River, heretofore unexploited by anadromous fish due to a tidewater barrier. This presentation will describe the development of what's hoped to be a long-term enhancement evaluation program in Lower Cook Inlet that includes: 1) the collection of baseline genetic data from wild Kamishak Bay pink and chum salmon stocks, 2) a marked otolith recovery program to determine juvenile survival and adult stray rates, including the straying of wild fish into Paint River via the newly opened fish ladder, and 3) periodic genetic sampling to quantify possible genetic introgression. The marked otolith recovery program may also be used by hatchery and ADF&G staff to develop strategies to reduce stray rates and facilitate maximum utilization of enhanced fish while minimizing negative impacts on neighboring wild stocks.

SPECIAL SESSION: Hatchery Programs in Alaska: Reviewing the Old, Evaluating the New

Research Program to Address Interactions of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska

Ron Josephson[1], John Burke (Southern Southeast Regional Aquaculture Association), Dave Bernard (D.R. Bernard Consulting), John H. Clark (ADF&G, Division of Commercial Fisheries), Jeff Hard (NOAA, Northwest Fisheries Science Center), Steve Reifenstuhl (Northern Southeast Regional Aquaculture Association), Bill Smoker (School of Fisheries and Ocean Sciences, University of Alaska Fairbanks), Bill Templin (ADF&G, Gene Conservation Laboratory), and Alex Wertheimer (NOAA, Alaska Fisheries Science Center)

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In recognition of straying of hatchery fish, Alaska hatchery operators and the Alaska Department of Fish and Game (ADF&G) recently identified several priority questions related to our hatchery program:

(1) What is the genetic stock structure of pink and chum salmon in each region?
(2) What is the extent and annual variability in straying of hatchery pink salmon in Prince William Sound (PWS) and chum salmon in PWS and Southeast Alaska?
(3) What is the impact, if any, on fitness (productivity) of wild pink and chum salmon stocks due to straying of hatchery pink and chum salmon?

The ADF&G's Gene Conservation Laboratory will undertake analyses of genetic structure of pink and chum salmon. ADF&G recently awarded a contract to Prince William Sound Science Center to conduct activities needed to collect data to answer questions 2 and 3. The mass-marking of hatchery fish with otolith thermal marks provides the opportunity to estimate the actual number of wild-origin and hatchery-origin spawners in populations of pink and chum salmon in PWS and chum salmon in Southeast. The combination of thermal marks on all hatchery-origin pink and chum salmon coupled with application of available genetic techniques provides a means to set up a robust experiment to evaluate fitness of natural origin versus hatchery origin stray salmon spawning in the wild in streams of Prince William Sound and Southeast Alaska. We expect the results of this work will be valuable to both harvest and hatchery managers as well as others interested in Alaska salmon production.

SPECIAL SESSION: Hatchery Programs in Alaska: Reviewing the Old, Evaluating the New

A Responsible Approach to King Crab Rehabilitation in Alaska

Benjamin Daly

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The ecologically and commercially important red and blue king crab are depleted throughout much of the North Pacific; yet traditional management techniques have not helped many Alaskan populations recover, causing fisherman, scientists, managers, and coastal communities to seek alternative solutions. Stock enhancement has potential as a powerful management tool using the conceptual framework known as the "Responsible Approach" and has been proposed for the rehabilitation of depressed Alaskan red and blue king crab populations by increasing spawning stock abundance through the release of cultured juveniles. Researchers have demonstrated that red and blue king crabs can be cultured on a hatchery scale, which reduces the need to collect juveniles from wild populations and has provided a resource to delve deeper into crab biology than would have likely occurred. As a result, much is being learned about king crab early life history including predator response behavior, habitat requirements, and growth physiology. I provide a brief overview of recent king crab enhancement-based research in Alaska, describe how this research aligns with the responsible approach, and suggest avenues for future king crab enhancement-based research.

SPECIAL SESSION: Hatchery Programs in Alaska: Reviewing the Old, Evaluating the New

Cannibalism in Red King Crab: Habitat, Ontogeny, and the Predator Functional Response

William Christopher Long and Laura Whitefleet-Smith

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The red king crab (*Paralithodes camtschaticus*) population in the Gulf of Alaska crashed in the early 1980s and has not recovered despite the closure of the commercial fishery. Stock enhancement has been proposed as a potential means to help the stock recover. As the juvenile crab are highly vulnerable to predation, it is important to understand predator-prey relationships in order to optimize releases. In this study we examined the effect of habitat type and predator size on the predator functional-response in a laboratory experiment. We used year-1 and year-2 red king crabs as predators and year-0 red king crab as prey. Trials were run in mesocosms with either a bare sand bottom or with macroalgae mimic on top of sand at six prey densities. Year-1 predators exhibited a type II functional response in sand and a type I in the macroalgae mimic, while year-2 predators exhibited a type I functional response in sand and a type III in macroalgae mimic. For both predators predation was lower overall in the macroalgae mimic, though the difference in foraging efficiency was much greater for the year-2 predators. Prey crabs exhibited no net movement onto the macroalgae mimic in the presence of predators. This work demonstrates that the functional response can vary both with habitat and with predator age. It also suggests that releases of juvenile crab should be done in complex habitats and at low densities to minimize the risk of cannibalism.

SPECIAL SESSION: Water Temperatures in Alaska Freshwater Habitats

Overview and Applications of Predictive Stream Water Temperature Models for Fish Conservation and Management

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Water temperature is a key control on growth and survival of fishes and ultimately influences productivity and life-history expression. Consequently, understanding the natural variation in thermal conditions across broad spatial scales has important implications for conservation and management of Alaska's significant fisheries resources. Rates of climate change and air temperature increases are much faster in Alaska than in other parts of the globe which underscores the pressing need to better understand freshwater thermal regimes. However, disentangling complex relationships between patterns in stream temperature and the processes that drive them is challenging at spatial and temporal scales most relevant to fish populations. Features of the physical environment useful as covariates in water temperature predictive models have traditionally been difficult to measure, but new geospatial data sources make this information available across broad regions. Water temperature observations can be linked to these predictors and new types of statistical models for stream networks allow for prediction of stream temperature metrics at relatively fine spatial grains and across broad riverscapes while accounting for spatial dependency and providing valid spatial inference. We will summarize these new approaches and illustrate their utility to stream fish conservation and management applications using a few examples from the Pacific Northwest, including: 1) assessing the potential effects of climate change, 2) predicting the spawning distribution of a threatened species, and 3) evaluating population vulnerability to wildfire. We will conclude with some thoughts on monitoring water temperature and developing predictive water temperature models for freshwater habitats in Alaska.

SPECIAL SESSION: Water Temperatures in Alaska Freshwater Habitats

Temperature Monitoring of Alaskan and Canadian Yukon River Tributaries

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Studies have shown that climate change is having an impact on Arctic environments. Examples include thinning sea ice, an increase in sea and air temperature, melting permafrost, and the potential for some fisheries to decline due to changes in Arctic ecosystem. As a result of climate change, environmental conditions such as flooding, elevated water temperatures and extreme changes in flow may become more frequent and variable. Water temperature is a major driver of salmon egg survival, and fry and alevin development, thus drainage wide monitoring is necessary. This project, begun in 2010, is a collaborative effort among State, Federal, Tribal, and Canadian agencies currently monitoring temperature at escapement sites and mainstem project locations throughout the Yukon River drainage. The ultimate goal was to update data logger technology and deployment at existing sites and expand the network of monitored areas by creating new sites. Standardized monitoring protocols were implemented at all sites within the drainage, and data was collected prior to freeze up if data loggers could not remain under the ice. A total of six Alaskan sites were updated with new data logger technology (Maxim iButtons) in addition to existing Hobo ProV2 data loggers; ten new Canadian Yukon sites were created from 2010 through 2012. Significant differences were observed between iButton and ProV2 data for five sites in Alaska and the Yukon Territory. A publicly available water temperature database was also constructed in 2010 and will be continually updated with summarized site-specific data each year.

SPECIAL SESSION: Water Temperatures in Alaska Freshwater Habitats

How Geomorphic Characteristics Influence Stream Thermal Regimes: Consequences for Salmon Spawn-Timing and the Species They Support in River Systems

Peter J. Lisi[1], Daniel E. Schindler[1], Jonny Armstrong[1], Kale T. Bentley[1], KathiJo Jankowski[1], Laura X. Payne[1], and George R. Pess[2]

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Alaskan streams are characterized by substantial hydrologic and thermal variation among individual tributaries with potentially substantial implications for organisms living in these systems. We hypothesized that heterogeneous geomorphic characteristics of watersheds translate into diverse hydrologic and thermal environments experienced by salmon. Multivariate approaches were used to evaluate environmental characteristics of that contributed to variation in salmon spawning among 36 streams in the Wood River basin of southwest Alaska that range in temperatures from 2 to 18°C during the summer. Oxygen and hydrogen stable isotopes of water were also used to trace the relative contributions of rain and snow to surface discharge. Variation in summer temperature has the strongest effect on the variation in salmon spawn timing, where cold, steep, snow-dominated streams supported earlier spawning salmon populations whereas warmer, low-gradient, rain-dominated streams had salmon populations that spawn weeks to months later. We also assessed whether the variation in salmon spawn timing was associated with the phenology of scavenging activity of coastal brown-bears (*Ursus arctos*) and Glaucus–winged gulls (*Larus glaucescens*) throughout the river network. The diversity in salmon residence among spawning sites extended the length of season that salmon were available to scavengers from 2 to 4 weeks to more than 2 to 3 months. Thus, our research highlights how geomorphology and hydrology act as important drivers of water temperature which influences the intraspecific variation in salmon life-histories, with subsequent effects on species they support at the landscape level.

Student

SPECIAL SESSION: Water Temperatures in Alaska Freshwater Habitats

Retrospective Analysis of Juvenile Chinook Salmon Growth in an Interior Alaska River: Insight Into Marine Survival and Density Dependence

Megan T. Perry[1], Mark S. Wipfli[2], Nicholas F. Hughes[3], Jason R. Neuswanger[1], Amanda E. Rosenberger[4], and Matthew J. Evenson[5]

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Water temperature is an important density-independent variable that influences growth of juvenile salmonids rearing in fresh water. In the Chena River, a tributary of the Yukon River in Interior Alaska, temperature may be the most important factor regulating growth of rearing juveniles. In this study we tested the hypothesis that freshwater growth of juvenile Chinook salmon *Oncorhynchus tshawytscha* is positively correlated with marine survival, as measured by recruits per spawner. We used Generalized Additive Models (GAM) to investigate the growth in length of juveniles rearing at eight sites along the Chena River in 2009. Using a non-linear regression approach, we estimated water temperature from the Hunts Creek gauging station on the Chena River back to 1967. We used a simple individual based bioenergetics approach to estimate size of juvenile Chinook at the end of their first summer residency using actual and hind casted water temperature data to estimate fish length from the 1981 brood year forward. We used data from a stock recruit analysis conducted by the Alaska Department of Fish and Game to determine whether a relationship between water temperature, freshwater growth, and marine survival exists in the Chena River. We did not find evidence that marine survival is correlated with freshwater growth; however, we did find evidence suggesting that growth during the freshwater rearing period may be related to food availability following years when adult escapement is high.

Student

SPECIAL SESSION: Water Temperatures in Alaska Freshwater Habitats

Using Thermal Infrared Imagery for Strategic Salmon Habitat Protection on the Kenai Peninsula, Alaska

Sue Mauger[1] and Russell Faux[2]

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As stream temperatures rise in many non-glacial salmon streams in the years ahead, cold water refuges – areas within a stream which are persistently colder than adjacent areas during the summer – will be critical to the survival and persistence of salmonids and other fish species. Stream reaches with distinct groundwater interactions (i.e. springs and seeps) are potentially important for providing refuge from the warmest temperatures. In 2010 and 2012, we mapped cold water habitats using airborne thermal infrared (TIR) imagery along 66 miles of the Anchor River and 10 miles of the Ninilchik River on the Kenai Peninsula, Alaska. TIR imagery is a valuable tool for illustrating the location and thermal influence of point sources, tributaries and surface springs. Cook Inletkeeper will use these spatially-explicit thermal data, as well as other current research in these watersheds, to help Kachemak Heritage Land Trust determine which parcels with key Chinook and coho habitat are the highest priorities for permanent conservation. By linking state-of-the-art technology with conservation planning, we will improve landscape-scale resilience for salmon in Southcentral Alaska during a time of rapid climate and land-use change.

SPECIAL SESSION: Understanding Fish Movement

Estimating the Distribution and Abundance of Stocked McDonald Lake Sockeye Salmon in Southern Southeast Alaska Commercial Net Fisheries

Malika T. Brunette, Andrew W. Piston, and Steven C. Heinl

Alaska Department of Fish and Game, Division of Commercial Fisheries, Ketchikan, Alaska, 99901 USA

Sockeye salmon from McDonald Lake, in southern Southeast Alaska, contribute substantially to several mixed-stock commercial net fisheries. McDonald Lake sockeye salmon were classified as a management stock of concern at the 2009 Alaska Board of Fisheries meeting due to a series of escapements below the sustainable escapement goal (55,000–120,000 fish), and a formal action plan to reduce harvest and improve stock assessment was adopted. Fishery time and area restrictions identified in the action plan were based on limited coded-wire tag (CWT) studies and preliminary genetic stock identification (GSI) data, but more information was needed to assess the efficacy of the Action Plan. In order to provide updated migration and run timing information on McDonald Lake sockeye salmon, as well as supplement wild stock returns, Southern Southeast Regional Aquaculture Association (SSRAA) collected eggs from the escapement, reared fish to full-term smolt, and released them in McDonald Lake each spring from 2009 to 2011. All released fish were thermal-marked and otoliths were collected from the commercial harvest to track returns of stocked fish as they passed through the commercial fisheries. Our 2011 results from commercial fishery sampling generally corroborated earlier CWT and GSI results. These stocked fish appear to be a useful proxy to assess migration routes and run timing of wild McDonald Lake sockeye salmon.

SPECIAL SESSION: Understanding Fish Movement

Migratory Pathways and Overwintering Habitat Use by Juvenile Coho Salmon in Big Lake, Alaska

Jonathon Gerken

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Salmon migration, spawning, rearing and ultimately production within the waterbodies of the Matanuska-Susitna (Mat-Su) are dependent on connectivity of habitat. Approximately 78 culverts are present in the Big Lake drainage, with approximately 55 culverts (70%) assessed as potential fish passage barriers or partial barriers to juvenile salmon. In 2011, approximately 2,300 juvenile coho salmon *Onchorhyncus kisutch* were implanted with passive integrated transponder (PIT) tags to identify migration pathways, habitat use, and overwintering locations. Recapture events were composed of mobile tracking with minnow traps, the use of fixed antennae arrays, and capture in an ADF&G operated outmigrant fyke net. Approximately, 14% (*n* =332) tagged of the fish smolted in May - June of 2012. The goal of this paper is to elucidate the migratory pathways within the Big Lake drainage; identify two major overwintering areas; Blodgett Lake and Lucille Creek; and discuss differences between juvenile coho salmon cohorts in the context of growth, condition factor, migration rates, and habitat use.

SPECIAL SESSION: Understanding Fish Movement

Testing Sampling Assumptions At a Large Riverine Sonar Project Using Acoustic Tags

Bruce McIntosh and Naomi Brodersen

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The Yukon River supports one of the largest Chinook salmon *Oncorhynchus tshawytscha* and chum salmon *O. keta* subsistence fisheries in the state of Alaska. The Pilot Station sonar project is one of the primary tools used in making management decisions for the fisheries within the drainage. Estimates of upstream migration, by species, are produced from a combination of shore-based sonar and drift gillnetting at stations corresponding to sonar sampling strata. While the river at the sonar site is approximately 1000 m wide, sonar detection is limited to a practical effective range of approximately 300 m on each bank and testfishing is conducted with drift gillnets approximately 50 m in length. The accuracy of our estimates relies on meeting several untested assumptions about fish distribution, including that 1) salmon remain bank oriented in this area with the majority of salmon passage occurring within the detection range of the transducers, and 2) that those salmon are both available and representatively sampled in the areas fished with gillnets. To test these assumptions, a two-year acoustic tagging project is being conducted. In 2011 and 2012 approximately 200 adult Chinook salmon and 300 adult chum salmon were captured downriver of the sonar site, fitted with internal acoustic tags, and released. The trajectory of these salmon will be determined from tag detections as they migrated upstream past an array of stationary hydrophones deployed in the river at the sonar project. The track of each tagged fish will then be compared to the area ensonified and the established drift gillnetting stations.

SPECIAL SESSION: Understanding Fish Movement

Estimation of Chinook Salmon Escapement, Distribution, and Run Timing in the Togiak River Watershed Using Radio Telemetry, Togiak National Wildlife Refuge, Alaska

Theresa L. Tanner[1] and Suresh A. Sethi[2]

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Chinook salmon *Oncorhynchus tshawytscha* returning to spawn in the Togiak River watershed are harvested in subsistence, sport, and commercial fisheries. Recent Chinook salmon production throughout the region, as well as much of Alaska, is in decline. In response to stakeholder concerns, we instituted a comprehensive radio telemetry study to examine Chinook salmon run timing and spawning distribution within the Togiak River drainage beginning in 2008. Using fixed stations, aerial searches, and intense boat tracking, we were able to record fish movement and use within the system, as well as assign fates to our radio tagged fish. Our telemetry work revealed a spawning distribution that consistently differs from that observed in traditional aerial counts conducted from 1987 to 2005. Spawning distribution within the mainstem and between its tributaries is variable to some extent from year to year. We will also present information on fish movement, including preliminary data on lower river mainstem holding behavior. Tests to determine differences in run timing between tributary and mainstem spawning populations indicate that tributary fish entered the lower river earlier than mainstem spawning fish. A mark-recapture component was added to the study in 2010 to estimate spawning population abundance. The spawning population estimate for Chinook salmon that entered the Togiak River in 2010 is 10,096 fish (90% CI = {5,709 ; 18,849}). The spawning population estimate for 2011 is 7,041 fish (95% CI = {4,160 ; 14,143}), lower than the established Sustainable Escapement Goal threshold of 9,300 Chinook salmon.

SPECIAL SESSION: Understanding Fish Movement

Spawning Distribution and Migratory Timing of Kuskokwim River Inconnu

Lisa Stuby

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A multiple-year study utilizing radiotelemetry techniques was initiated in 2007 to expand our understanding of inconnu *Stenodus leucichthys* in the Kuskokwim River drainage. Management of the inconnu population for long-term sustainability requires a greater understanding of their life history. The primary purpose of this study has been to identify locations of spawning aggregations. 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 the Middle Fork of the Kuskokwim River and Tonzona River. Inconnu 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. No radiotagged inconnu were detected at the mouth of Highpower Creek, which was documented as a spawning area in 1972. Therefore an effort was made in 2012 to capture and deploy radio transmitters into inconnu that may spawn at or near Highpower Creek. 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.

SPECIAL SESSION: Understanding Fish Movement

Dispersal of Adult Dolly Varden from the Wulik River, Alaska, Evaluated Using Satellite Telemetry

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In northwest Alaska, Dolly Varden is highly valued as a subsistence fish and local residents harvest thousands of these fish each year. Many of these Dolly Varden undertake oceanic migrations during summers, yet little is known about their dispersal and distribution during this time. We studied the oceanic dispersal of Dolly Varden by attaching miniaturized pop-up satellite archival transmitting (PSAT) tags to 20 Dolly Varden in the Wulik River in early June 2012. PSAT tags measure and record temperature, depth and ambient light data for daily geoposition estimates at 10 minute intervals while externally attached to the fish. The tags release from the fish, float to the surface of the sea and transmit, via satellite, the pop-up position and archived data. The tagged fish demonstrated several dispersal types including: remaining at the tagging site (n=3), limited movement to the Wulik River mouth (n=3), southerly alongshore dispersal (n=3) and northerly offshore dispersal to the Russian Chukchi Sea (n=5) and the Alaskan Beaufort Sea (n=1). In addition, three tags reported to satellites, but no positional fixes were obtained, likely as a result of the tags not being in saltwater. Finally, two tags did not report to satellites. These results suggest that Dolly Varden that overwinter in the Wulik River undertake a variety of summer dispersal strategies including transit through and occupancy of areas that may be impacted by future human activities.

SPECIAL SESSION: Understanding Fish Movement

Assessing Metapopulation Structure of Arctic Grayling on Alaska's North Slope

Heidi E. Golden

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Using a combination of genetic analyses and otolith microchemistry might enhance the ability to define a fish population by identifying genetically distinct groups and assessing connectivity both among and within populations. During the summers of 2010 and 2011, I collected fin tissue samples from 30 Arctic grayling individuals from each of 6 geographic sites on the Alaska's North Slope. Employing the program *Structure*, I used 7 highly variable nuclear microsatellite markers specific to Arctic grayling to determine genetic differentiation among local populations. Results from *Structure*, log probability of the data and Delta K, identified populations from my sample sites as three distinct genetic clusters. Additionally, the use of otolith microchemistry within my study area will provide information on critical habitat locations both within and between populations. Water samples collected during 2010, indicate a strong underlying geologic chemical gradient within my study area, necessary for effective use of otolith microchemistry techniques and analyses. Identifying critical habitat locations and essential pathways for connectivity using genetics and otolith microchemistry will provide managers with effective means of evaluating threats to populations in relation to landscape level changes, such as road construction and climate change, thus helping to ensure conservation of Arctic grayling populations and genetic structure in a changing aquatic landscape.

Student

SPECIAL SESSION: Understanding Fish Movement

A Traditional Tagging Study Provides Long-range Movement Information for Lingcod, *Ophiodon elongates,* in Southeast Alaska

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Traditional external tagging studies provide a relatively inexpensive way to obtain movement information over a large temporal and spatial scale and may supplement more expensive, data-intensive tagging studies. The Alaska Department of Fish and Game (ADF&G) has tagged 9,175 lingcod opportunistically with dart tags from 1996 to 2011 in Southeast Alaska with 460 recoveries during this time. This traditional large scale study complements an acoustic tracking study conducted at the Pinnacles Marine Reserve off Kruzof Island in Southeast Alaska where tagged lingcod were observed to have high site fidelity despite frequent forays outside the reserve. Most tagged lingcod moved out of the range of acoustic receivers (> 2 km) every few days before returning, with 10% of tagged fish remaining out of range for weeks or months (Starr et al. 2004). The ADF&G dart tagging data also indicate lingcod have high site fidelity: the majority of Southeast tagged lingcod remained within 5 km of release site. However, 34% of dart tagged lingcod were recaptured >10 km and 7% > 60 km from release site with recapture distances up to 778 km from release location. An ANCOVA model indicated that sex, fish length at release, and days at liberty were significant predictors of the net distance travelled by dart-tagged lingcod. A greater proportion of mid-to-large-sized females travelled farther than 5 km from their release location than small females or males. These differences in movements by sex and size class may be due to reproductive activities.

SPECIAL SESSION: Understanding Fish Movement

Net Squared Displacement (NSD): A Renaissance Statistic for Movement Ecology

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Analysis methods for fish movements often focus on kernel density estimates that describe the distribution of animals in space, but not time. We will introduce a movement statistic that explicitly incorporates both time and space and provides information on fundamental properties of movement trajectories at multiple scales. Net squared displacement (NSD) is the squared-distance between the origin and a specific subsequent location in a movement trajectory. Traditionally, the NSD statistic has been an important component of random walk analysis methods, as it displays a linear relationship with time for random movement. However, recently it has been used to describe other movement patterns, such as directed and non-dispersive, as well. Thus this statistic can now be used to distinguish and describe ecological processes such as home range behavior, dispersal, and migration extent and timing in addition to random movement. In addition, the NSD statistic can be used to determine "characteristic scales" of spatial and temporal autocorrelation in movement data for different behavioral modes (e.g., migration vs. foraging) or movement through different types of habitats. Further, because analysis methods that use NSD do not require location information to be collected at equal intervals and results provide inference on dispersal, we believe that this will be a very valuable movement analysis approach for fisheries researchers. We will demonstrate the *exciting* potential of methods that use the NSD statistic using examples from both human and Pacific halibut movement trajectories.

Student

SPECIAL SESSION: Understanding Fish Movement

Spatial Models with Movement: Report from a Workshop on Walleye Pollock in the Bering Sea

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A 4-day workshop was held in Seattle WA to examine spatial structure and dynamics of the walleye pollock population in the Bering Sea and to examine spatial models developed around the world used in stock assessment and management. Over 35 scientists from around the world synthesized relevant information on spatial models generally and walleye pollock specifically. One major finding of the workshop was that innovative and useful spatial models have recently been developed with great potential to help understand spatial and temporal fish distributions. The workshop noted that many different types of tagging data and acoustic loggers now exist, which may be useful to quantify movement rates of pollock, which would be helpful in developing spatial-explicit assessment models. Even without movement data, developing stock assessment models with spatial survey data may be sufficient. Making spatially explicit recommendations for catch levels should be approached cautiously, especially for mobile stocks, because parameter estimates are more uncertain and may be confounded. The synthesis of information led to a draft conceptual model for Bering Sea pollock. Workshop participants agreed that more work along these lines would be useful.

SPECIAL SESSION: Crab Fisheries, Biology, and Ecology

Standardization of CPUE Data from the Aleutian Islands Golden King Crab Fishery

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The Aleutian Islands golden king crab stock provides one of the most valuable fisheries in Alaska. This stock is managed under Tier 5 (average catch as the limit and target reference points) in the Fisheries Management Plan. Lack of annual surveys and biological parameters hinders exact assessment of annual biomass. A length based stock assessment model using catch and catch-per-unit-effort (CPUE) data is under development. The CPUE standardization is important to improve model results in data poor situations. Our presentation focuses on developing a standardization method based on generalized linear model (GLM) for estimating yearly CPUE indexes for observer and retained catch data. We used the observer data for 1990/91-2010/11 and retained catch data for 1985/86-2010/11 in the analysis. We considered a number of factor and numerical explanatory variables (fishing year, fishing month, fishing area, vessel, captain, soak-time, depth, and gear) for the GLM. We also used the generalized additive model (GAM) to compare results with that of GLM for observer data. The standardized CPUE index estimates were slightly lower than the non standardized trends during the post rationalization period.

SPECIAL SESSION: Crab Fisheries, Biology, and Ecology

Ghost Fishing in the Southeastern Alaska Commercial Dungeness Crab Fishery

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Entrapment of crabs by derelict crab pots (also known as ghost fishing) can be a significant consequence of commercial fishing. The prevalence of lost commercial pots and ghost fishing entrapments was estimated for the commercial Dungeness crab *Cancer magister* fishery in southeastern Alaska during the 2009 and 2010 summer closures of the commercial season (16 August−30 September). Teams of divers retrieved a random subsample of the derelict crab pots located using side-scan SONAR. We retrieved 123 derelict crab pots containing 215 entrapped Dungeness crabs. Densities of derelict crab pots varied from 1.50 to 26.06 per km^2, while densities of entrapped Dungeness crabs ranged from 0 to 54.5 per km^2, depending on the site surveyed. Derelict crab pots were discovered to effectively ghost fish for at least 7 years, indicating long-term cumulative impacts on Dungeness crab populations. The number of derelict crab pots and entrapped Dungeness crabs at each of the surveyed sites was highly correlated with the number of fishermen, pot lifts, and annual harvest in numbers, allowing for the extrapolation to a regionwide estimate of crab entrapment and derelict crab pot abundance. Overall, our findings show instantaneous entrapment of less than 1% of the annual commercial crab harvest with a cumulative annual loss of less than 3% of annual regional commercial crab harvest.

SPECIAL SESSION: Crab Fisheries, Biology, and Ecology

Population Structure and Trophic Positioning of Snow Crabs, *Chionoecetes opilio,* in the Alaskan Arctic

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This ongoing study seeks to provide information on snow crab population structure and trophic positioning in the Beaufort and Chukchi Seas. Male and female snow crabs were collected with a beam trawl in the Chukchi and Beaufort Seas from 2009 to 2012. Abundance, biomass, sex ratio, size-frequency distribution, and fecundity were determined. Muscle tissue was collected to compare trophic level of snow crabs in different geographic regions and at various depths using stable isotope analysis. Snow crab populations in high Arctic waters occurred in higher abundances in the Chukchi than in the Beaufort Sea and at larger body sizes in the Beaufort than the Chukchi Sea. Crabs of commercial size were found strictly at depths deeper than 80 m in the Beaufort Sea. Food webs in the Beaufort Sea did not differ in length (four trophic levels) between geographic and depth regions when based on primary consumers as the baseline. Range of nitrogen isotopic values ($\delta^{15}N$) of Beaufort Sea snow crabs was narrow (14.5-15.2‰) and they occupied an intermediate position in the food web across the US Beaufort shelf. Female fecundity in the Chukchi Sea varied with body size and the average number was similar to that estimated 15 years ago for the NE Chukchi (mean ~19,000 eggs per clutch). Improved knowledge on population structure and trophic ecology will assist in the development of better monitoring and management tools.

SPECIAL SESSION: Crab Fisheries, Biology, and Ecology

Eastern Bering Sea Snow Crab Growth – A Lab Perspective

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Juvenile male and female snow crab were collected from the eastern Bering Sea (EBS) during summer and/or fall stock assessment surveys in 2007–2011. Crab were transported to Kodiak, held in flow-through seawater tanks chilled to ~ 3°C, and fed *ad libitim* twice weekly until the occurrence of molting, death, or visible symptoms of possible infection with bitter crab disease. Despite high mortality rates (91 %) due to a long duration of holding until crab molted (average 220 days) and high incidence of bitter crab disease in some years, growth measurements were obtained for 23 male and 83 female snow crab. Molting occurred between late January and early May, with the majority of molting taking place in February (53%) and March (42%). Regression analysis of pre-molt size vs post-molt size revealed significantly reduced growth during the terminal molt to morphometric maturity for female crab relative to a molt to another juvenile stage ($P<0.001$). In contrast, there was no difference in growth between these molt events for male crab ($P=0.425$). Additionally, regression analysis revealed female crab had significantly greater growth than male crab during juvenile molts for the size range that overlapped between the sexes ($P=0.002$), though this difference was slight. As opportunity allowed, female crab that molted to maturity were paired with adult or adolescent male snow crab. Pending completion of analysis, the results of this mating study may also be presented. Comparison of our data with studies that employed a shorter duration of holding until crab molted revealed a laboratory holding effect that reduced molt increments by ~8 %. While our study may not be useful for describing absolute growth of EBS snow crab, the trends observed at the terminal molt and between sexes provide useful information for fully characterizing growth in this stock.

SPECIAL SESSION: Crab Fisheries, Biology, and Ecology

Contribution of fecundity and embryo quality to variability in reproductive potential of eastern Bering Sea snow crab

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The incorporation of reproductive potential in the development of biological reference points is a pressing fishery management need for eastern Bering Sea (EBS) snow crab, *Chionoecetes opilio,* which have lower fecundity-at-size than conspecifics from Canada and Japan. Harvest of EBS snow crab hovers near historic minimums, and yet this is one of the most valuable crab fisheries in the US. We collected female EBS snow crab over four years (2007-2010) to investigate seasonal and interannual variation in reproductive potential as a function of female shell condition (a proxy for age). Mean model-adjusted fecundity was highest for primiparous and young multiparous females and declined with advancing female shell condition; patterns supported by long-term variation in independent observations of clutch size. Higher embryo quality, assessed by embryo carbon content (% C) and mean embryo weight, was associated with higher fecundity. Low female sperm reserves were associated with decreased fecundity. Seasonal comparison of size-fecundity relationships indicated that embryo loss during brooding was minimal. Both environmental factors and mating dynamics likely explain reduced reproductive potential of EBS snow crab.

SPECIAL SESSION: Aquatic Invasive Species Threats to Alaska's Fisheries and Aquatic Resources

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

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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, Stormy Lake on the Kenai Peninsula, and Eyak Lake in Cordova. This presentation will describe the habitat requirements, identifying characteristics, and invasive traits of Elodea. We also summarize modes of introduction and documented impact on aquatic resources where it has spread outside its native range. Finally, we describe methods effective in the control and possible eradication of Elodea, initial efforts that have been taken to control the species in Alaska, and the need for a rapid response to prevent further spread.

SPECIAL SESSION: Aquatic Invasive Species Threats to Alaska's Fisheries and Aquatic Resources

Control and Eradication Efforts for Invasive Northern Pike (*Esox lucius*) in Southcentral Alaska

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Northern pike (*Esox lucius*) are not native to Southcentral Alaska. Illegal introductions of northern pike began in the Upper Susitna drainage in the late 1950s. Subsequent expansion coupled with continued illegal introductions over the decades have resulted in the widespread distribution of northern pike from the Matanuska-Susitna Valley to the Kenai Peninsula. Northern pike are highly piscivorous. As such, they are reducing ecologically and economically valuable populations of salmon and resident species throughout Southcentral and are one of the greatest invasive species threats to the region. In efforts to control populations of invasive northern pike, the Alaska Department of Fish and Game, Division of Sport Fish, has taken an adaptive management approach. Protocols chosen for northern pike control in a given water body are dependent on its unique conditions. Over the last decade, northern pike removal efforts have ranged from small-scale gillnetting operations to complete eradication using rotenone. Recently, ADF&G began an intensive, annual, large-scale northern pike removal project in Alexander Creek, a tributary to the Susitna where some of the worst fishery losses have been observed, and has conducted a rotenone treatment of Stormy Lake on the Kenai Peninsula in a fully preventative attempt to keep northern pike from invading the pristine Swanson River drainage. Additionally, ADF&G is conducting research on northern pike movement patterns, diet, and the application of eDNA in detecting their populations. All control, eradication, and research projects are directed by an Invasive Northern Pike Management Plan and prioritized through a strategic planning process.

SPECIAL SESSION: Aquatic Invasive Species Threats to Alaska's Fisheries and Aquatic Resources

Potential Fishery Impacts to Alaska from a Marine Invasive Species: The colonial tunicate *Didemnum vexillum*

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The discovery and confirmation of the presence of the marine invasive colonial tunicate *Didemnum vexillum* (Dvex) in Whiting Harbor, Sitka, Alaska in June, 2010, has raised concern for the potential impacts of marine invasive species to fishery resources in Alaska. This organism, thought to be native to Japan, has infested portions of Europe, New Zealand and both the east and west coasts of North America. In New England, Dvex has infested 60-80% of 240 square kilometers in the fishing grounds of Georges Banks. In New Zealand, Dvex damaged the green mussel aquaculture industry by directly smothering mussels and fouling gear. Potential impacts to groundfish, scallops, oysters, mussels, herring and eelgrass may include: direct mortality or decreased survival due to smothering, loss of prey to smothering, loss of biological diversity and three dimensional habitat on the seafloor, impaired survival and development of eggs and larvae due to acidic condition of the tunic, loss of nutritional value if ingested and exposure to bacterial toxins from tunic that inhibit settlement and growth. Positive effects of Dvex to some species have also been described to include protection of benthic worms and crabs from predation, increased prey resources for winter flounder, and improved water clarity for eelgrass from filter feeding. Impacts to Alaska may be similar to those in other regions with the addition of the potential for damage to herring, geoducks and urchins. This topic is ripe for research in support of management decision making.

SPECIAL SESSION: Aquatic Invasive Species Threats to Alaska's Fisheries and Aquatic Resources

Effects of Riparian Invasives on Prey Resources for Juvenile Coho Salmon in Southcentral Alaskan Streams

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Invasive species are a concern worldwide, yet have had little impact in Alaska. Because riparian ecosystems link terrestrial and aquatic ecosystems, invasive riparian species have the potential to effect both terrestrial and aquatic organisms. We examined the effects of two different invasive riparian organisms on invertebrate prey resources for juvenile coho salmon in southcentral Alaskan streams. In the first study we compared an invasive riparian tree, European bird cherry (*Prunus padus*), to native riparian tree species. We found that European bird cherry contributed a significantly lower biomass of terrestrial prey to streams, but did not affect prey consumption by juvenile coho salmon. In the second study we evaluated the effects of an invasive insect herbivore, the green alder sawfly (*Monsoma pulveratum*), which is defoliating native riparian thin-leaf alder. We found that green alder sawfly defoliation did not affect terrestrial prey resources for coho salmon and instead acted as a supplemental prey source mid-summer. These mixed results suggest that not all invasive riparian species are negatively impacting aquatic ecosystems. Collectively, these data will help us better understand the effect of invasive riparian species on aquatic ecosystems in Alaska.

Student

SPECIAL SESSION: Aquatic Invasive Species Threats to Alaska's Fisheries and Aquatic Resources

An Overview of Sampling for Marine Non –Indigenous Species in Alaska, a Citizen Science Approach to Monitoring for Early Detection of Invasions, and a New Potential Threat Resulting from the Japan Tsunami.

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Invasion from marine non-indigenous species is a significant threat to native populations as well as the marine resources. In Alaska, invasive species is becoming a concern as a result of increases in shipping, mariculture, and range extensions of some species. Monitoring is being conducted by several agencies and groups in Alaska but funds to support the effort is very limiting. This presentation will give an overview of the sampling in Alaska, the species of immediate concern, and a citizen science approach using cruise ship eco-tourism in Southeast Alaska that has greatly improved the chances of early detection of non-indigenous crab at a minimum cost. We will also discuss the latest marine invasive threat to Alaska resulting from the recent Japan Tsunami Debris that is moving toward the Pacific Coast of North America.

SPECIAL SESSION: Aquatic Invasive Species Threats to Alaska's Fisheries and Aquatic Resources

A Multi-taxa Survey for Aquatic Invasive Species in Selected Rivers of Kodiak Island, Alaska

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The Kodiak Archipelago, including Kodiak National Wildlife Refuge, supports outstanding salmon fisheries. These fisheries provide subsistence to local residents, sustain a regionally important commercial fishery, and attract recreational anglers from around the world. The continued conservation of salmon, their habitat, and associated values requires surveillance of rivers frequented by public to assess whether aquatic invasive species have been introduced. If any of these species were discovered, cooperative management actions could be developed and implemented to prevent their spread and thereby minimize their potential impacts. These goals are consistent with the purposes of Kodiak NWR and the survey specifically addresses an objective in the Refuge's Conservation Plan (USFWS 2007). In summer 2012, we surveyed for New Zealand mud snail (Potamopyrgus antipodarum), Didymo alga (Didymosphenia geminata), and the whirling disease pathogen (Myxobolus cerebralis) in three river systems (Buskin, Karluk, Lower Uganik) that receive extensive recreational sport fishing use. The mud snail and whirling disease were chosen because of their increased prevalence in rivers of the western U.S., the suitability of some Kodiak river systems to support the organisms, and the extensive use of Kodiak's rivers by anglers based in the western U.S. Didymo was chosen because, following establishment and spread, it can smother river beds, which has occurred in some U.S. and international locales such as New Zealand. In this presentation I will describe preliminary results, address survey design considerations, and recommend future actions.

SPECIAL SESSION: Aquatic Invasive Species Threats to Alaska's Fisheries and Aquatic Resources

Invasive Species Management Programs in Alaska – A Survey of Statewide Expenditures: 2007-2011

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Invasive species are associated with the loss of biodiversity world-wide. Even though Alaska had remained relatively unaffected by non-native species for most of the 20th century, the recent influx of non-native plants shows that Alaska is not immune to the issue. With the problem in its infancy, Alaska can take advantage of cost-effective management given appropriate coordination, which to this date has not been established. This research collected data on statewide expenditures for invasive species programs between 2007 and 2011. Funding increased from $4.7 million in 2007 to $6.9 million in 2010, partly due to the American Reinvestment and Recovery Act. As in many other U.S. states, the main sources of funding (84%) were federal, with the remainder originating with non-profits (9%) and state and local governments (7%). Anticipated future cuts in federal spending suggest the state ought to take more ownership on the issue. The bulk of funding is targeted towards terrestrial plants and animals (79%), although funds have increased for marine and freshwater organisms over the past five years. During this period, the species with the largest expense included eradication of Norway rats from an Aleutian island ($5 million), eradication of Northern pike from salmon habitat in Southcentral Alaska ($2.7 million) and eradication of European rabbits affecting bird populations in the Aleutians ($0.8 million). Research (24%) and monitoring and eradication (both 20%) attract the most funding. The study also found increased employment, payroll, and volunteer effort which may suggest the invasive species issue in Alaska may show slightly increased public awareness.

SPECIAL SESSION: Aquatic Invasive Species Threats to Alaska's Fisheries and Aquatic Resources

Invasive Species Outreach Tools and Resources for Fisheries Professionals

Katrina Mueller

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Invasive species, like plants in the genus Elodea, are poised to cause serious, irreversible harm to fish, aquatic habitats, and recreational opportunities in Alaska if allowed to spread unchecked. Fisheries professionals have a key role to play in Alaska's fight against invasives. Field crews are in a particularly great position to detect new invasions and spread awareness to the public. There are a number of resources available to help fisheries professionals increase their own awareness about key invasives in Alaska and help spread the word to anglers, boaters, float plane operators, and other fisheries stakeholders while in the field or at public events. This talk provides an overview of the need and some specific ideas for field crews and supervisors to consider related to public outreach opportunities.

SPECIAL SESSION: Challenges and Opportunities in a Transdisciplinary World: Working at the Intersection of Social and Natural Sciences in Fisheries

Interpreting Local Ecological Knowledge for Data-Poor Fisheries in Puget Sound

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Fishery assessment and management relies on historical information about abundance, distribution, and demographic rates of harvested species. In data-poor systems, local ecological knowledge can be a valuable source of place-based information about species for which regular monitoring of catch or abundance has not occurred. Information from interviews with resource users has been increasingly used in combination with contemporary fisheries data to identify temporal changes in population structure, reconstruct historical abundance trends of fish and invertebrates, and facilitate ecological modeling of past systems. To address information needs for management of data-poor species in Puget Sound, Washington, I developed time series of relative abundance for 22 marine species over the last 70 years from interviews with resource users and evaluated whether variation in respondents' perceptions of population change was related to their age and experience in the marine environment. In this talk, I will use examples from my work in Puget Sound to highlight important considerations for natural scientists seeking to use interview methods to collect fisheries data. Among these is the development of interview approaches that address ecological information needs (i.e., provide quantifiable responses), are designed with an understanding of interview methodology, and facilitate good communication between interviewer and respondents. I found that a key challenge was to achieve rigor in multiple disciplines while addressing the expectations of diverse audiences, including fisheries ecologists, social scientists, and the interview respondents themselves.

SPECIAL SESSION: Challenges and Opportunities in a Transdisciplinary World: Working at the Intersection of Social and Natural Sciences in Fisheries

Cultural Consensus Analysis in Climate Change Studies

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Western science is currently in a race to develop a wide range of tools, approaches, and baseline points that can be used to recognize, measure, and understand the myriad effects of climate change, and develop mitigation or adaptive strategies to cope with the environmental and social consequences of those changes. This paper will evaluate Cultural Consensus Theory (CCT) as one such approach used to measure the distribution of cultural knowledge and to identify areas of agreement about climate change effects and the frequency of particular observations. Cultural consensus analysis provides an efficient and measureable way to characterize shared ideas across a large population or between populations, while analyzing those populations or sub-populations based on various shared or dissimilar attributes. However, the focus on quantitative metrics of cultural knowledge or "competency" within a largely qualitative framework of ethnographic inquiry offers some challenges to traditional models of anthropological fieldwork, especially in terms of ambiguous responses, how questions are structured, and the nature of shared knowledge bases. This paper will draw on examples from fieldwork in two related research projects from northwest Alaska and interior Alaska looking at local observations of climate change in fisheries contexts.

SPECIAL SESSION: Challenges and Opportunities in a Transdisciplinary World: Working at the Intersection of Social and Natural Sciences in Fisheries

Wild, Natural, Sustainable? Linking Social and Ecological Approaches to More Comprehensively Understand the Sustainability of Alaska's Commercial Fisheries

Philip A. Loring

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Alaska's commercial fisheries have a widely marketed reputation for sustainability. Yet, the on-the-ground reality for many of Alaska's coastal fishing communities does not mirror the image of vibrant and thriving fishing communities touted by the Alaska Seafood Marketing Institute and others. Salmon, halibut, and other commercial fisheries in the state are no doubt economically productive, providing as they do nearly 50% of the US's wild landings. However, these same fisheries are not without conflict, and as the 2012 king salmon failures across the state so recently reminded us, neither are they outside the realm of concern. Getting to the heart of the sustainability of our fisheries requires a perspective broadened past biological stock assessment on the one hand and economic assessment on the other. A fuller picture of Alaska's commercial fisheries comes into view through an interdisciplinary lens, one that helps us better understand the motivations and dynamics of human behavior, and that brings issues such as food security and social justice into focus as outcomes that are part and parcel to the sustainability of these fisheries.

SPECIAL SESSION: Challenges and Opportunities in a Transdisciplinary World: Working at the Intersection of Social and Natural Sciences in Fisheries

Sustainable Fisheries: How Externalities Impact Urban Fishery Management

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An economic theory of externalities and Ostrom's principle of benefits and costs equivalence is used to address the inter-agency tension that reduces the sustainability of a social–ecological system (SES). We examine environmental management challenges by analyzing who benefits and who pays for a man-made, common-pool fishery on Ship Creek in Anchorage, Alaska, and how this cost structure acts as a barrier to sustainability. The economic benefits of the fishery have been estimated and published, but the costs paid to mitigate the fishery's biophysical effects on the SES are undocumented. We focus on quantifying the fishery's externalities, which are paid for by public infrastructure providers who do not receive benefits from the fishery and therefore exhibit social distrust and a lack of cooperation. This information is used in conjunction with a property rights regime of the SES to construct a new cost-sharing framework that provides decision makers with an economic incentive to increase the sustainability of the fishery.

SPECIAL SESSION: Challenges and Opportunities in a Transdisciplinary World: Working at the Intersection of Social and Natural Sciences in Fisheries

Managing Harvest Risk with Catch-pooling Cooperatives

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Catch-pooling cooperatives are a strategy for fishermen to manage variability which can be organized independently of a central management agency. In this presentation, we examine the statistical properties of equal-share catch-pooling cooperatives, and tested their potential to mitigate harvest risk (the chance of a bad season outcome) using data from two Bering Sea crab fisheries prior to rationalization. The results suggest that small cooperatives of crabbers could have reduced vessel-level catch risk by as much as 40% in the red king crab fishery, but would have been ineffective in the snow crab fishery. Analytical examination of catch variances under cooperatives explains the discrepancy between the two fisheries and demonstrates that variability reduction depends on the degree of correlation amongst participants' catches. In the best-case scenario, catch-pooling cooperatives can diversify away all season to season variation resulting from individuals' luck and skill, leaving only variation in fishery-wide harvest. This work resulted from interdisciplinary collaboration between fisheries scientists and social scientists; we will conclude the presentation with some reflections on how to foster successful interdisciplinary socioecological research in fisheries science, highlighting some benefits and obstacles.

SPECIAL SESSION: Challenges and Opportunities in a Transdisciplinary World: Working at the Intersection of Social and Natural Sciences in Fisheries

Whale Interactions with Alaskan Longline Fisheries: The Good, the Bad and the Ugly in Transdisciplinary Research

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Whale depredation occurs when whales remove fish from longline gear, damage fish and/or fishing gear. In Alaska, killer whales depredate primarily on sablefish (*Anoplopoma fimbria*) and Pacific halibut (*Hippoglossus stenolepis*) in the Bering Sea, Aleutian Islands and Western Gulf of Alaska. Killer whale depredation results in significant catch reductions, increased fishery operating costs and can reduce the accuracy of fish abundance indices. These interactions also have negative consequences for the whales in increased risk of entanglement, vessel strikes and altered foraging strategies. The goal of this study is to quantify direct costs to the fisheries in catch rate reductions as a result of killer whale depredation. This interdisciplinary study synthesizes National Marine Fisheries Service (NMFS) longline survey data (1998-2011) with findings from written questionnaires and vessel data collection forms distributed to longline fishermen. Killer whales were present on average 7-34% of all sets (mean=21%), and the percentage of sets depredated by killer whales increased in the Aleutian Islands and Western Gulf. Depredating killer whales reduced sablefish catch by 47-76% and halibut catch by 33-67%. Significant challenges arise when merging interdisciplinary results of this nature including identifying representative sampling frames, managing different data types and accounting for fishermen perception and bias. Despite these challenges, this synthesis of fishermen's ecological knowledge and vessel data collection in conjunction with NMFS longline survey data analyses has the potential to fill in a significant gap in marine mammal-fisheries interactions research and will inform future interdisciplinary studies in Alaska and other regions.

Student

SPECIAL SESSION: Challenges and Opportunities in a Transdisciplinary World: Working at the Intersection of Social and Natural Sciences in Fisheries

Using Local and Traditional Knowledge to Better Understand Sea Otter Recolonization: Perspectives from the Extension World

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Growing sea otter populations in Southern Southeast Alaska are increasingly impacting commercial and subsistence fisheries in that region. Commercial and subsistence users are making decisions today about the future of the resources they depend upon with little information on how the population has grown, or how it might continue to grow. Our project seeks to combine local knowledge with existing sea otter population surveys, foraging research, and tagging studies to help fill those information gaps. During the summer of 2012, we conducted semi-directed interviews with residents, hunters, subsistence users, and commercial fishermen to gather information on the historic distribution and movement of sea otters. We are continuing to conduct interviews and are incorporating this local knowledge with other studies to provide a more complete timeline of sea otter occupation and expansion. This process has revealed both challenges with and solutions for working at the intersection of natural science, social science, and extension.

SPECIAL SESSION: Challenges and Opportunities in a Transdisciplinary World: Working at the Intersection of Social and Natural Sciences in Fisheries

Strengthening Communities and Improving Fisheries Management through Public Engagement in Alaska's Copper River Watershed

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Multiple variables influence the economic and cultural integrity of resource-dependent communities thereby increasing the challenges in managing an area's natural resources. Social science research documents that the resilience of communities and the local natural resources are strengthened by active public engagement in science, analysis, and decision-making at relevant scales. There are, however, obstacles and challenges that stand in the way of meaningful public engagement and the incorporation of local knowledge into resource management. These obstacles and challenges are furthered by the varying perspectives, or views, of the resource based on different cultural models and different temporal and spatial scales used by each group to assess the status of the resource. Through experiential analysis, this paper explores a number of projects that successfully integrate the public into fisheries management at multiple scales in Alaska's Copper River watershed. The projects discussed in this paper focus on harvest monitoring, stock status and trends, local and traditional knowledge, and models for collaborative resource management. The aim of this paper is to highlight aspects of successful interdisciplinary projects, explore the challenges and barriers to successful public engagement, and further the integration of interdisciplinary processes in Alaska's fisheries management.

SPECIAL SESSION: Physical, Biological, and Human Factors Affecting Fishes on the North Slope of Alaska

Shifting Balance of Lake Ice Regimes across the Alaskan Arctic Coastal Plain and Implications for Future Fish Habitat

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The balance of thermokarst lakes with bedfast- and floating-ice regimes across Arctic lowlands regulates many ecosystem functions including heat and water storage, permafrost thaw, and over-wintering aquatic habitat. Using a time-series of late-winter synthetic aperture radar (SAR) imagery to distinguish lake ice regimes in two regions of the Arctic Coastal Plain of northern Alaska from 2003-2011, we found that 18% of the lakes had intermittent ice regimes, varying between bedfast-ice and floating-ice conditions. Comparing this dataset with a radar-based lake classification from 1980 showed that 16% of the bedfast-ice lakes had shifted to floating-ice regimes. A simulated lake ice thinning trend of 1.5 cm/yr since 1978 is believed to be the primary factor driving this form of lake change. For individual lakes near the depth threshold of maximum ice thickness, a sustained shift towards floating-ice conditions should lead to colonization by more diverse resident fish communities and corresponding availability of forage resources for migratory fish species. Understanding the more exact role of changes in lake ice on the diverse habitat mosaics created by abundant lakes and wetlands across the Arctic Coastal Plain will require close integration between physical and biological scientists concerned with Arctic ecosystem responses to climate change. Efforts are currently underway in the Fish Creek watershed, where this shifting balance of lake ice regimes appears most rapid, to understand the role of lakes in stream hydrology, ecology, and fish habitat.

SPECIAL SESSION: Physical, Biological, and Human Factors Affecting Fishes on the North Slope of Alaska

Using Multiple Survey Methods to Examine Detection Probabilities of Arctic Fishes in Lakes on the North Slope, AK

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Studies examining the spatial patterns of species occurrence and distribution often fail to account for false absences in field sampling. Detection probability can be affected by the species considered, the sampling method used, and features of the habitat. If a species is detected imperfectly, as it is in many cases, then information on species distributions will be incomplete and the naïve estimates of occupancy biased. This bias can affect how we relate species distributional traits with habitat features and, in turn, can affect management actions. Here, we investigate the sampling efficiencies of five different gear types (fyke net, beach seine, gill net, minnow traps, dip net) for six fish species (Broad Whitefish, Least Cisco, Arctic Grayling, Ninespine Stickleback, Alaska Blackfish, Slimy Sculpin) in lakes on the North Slope, AK. Overall, we found detection varied greatly among methods. For example, detection probabilities for a single method, the fyke net, ranged from 0.815 (SE = 0.049) for Least Cisco to 0.038 (SE = 0.012) for Slimy Sculpin. Similarly, for a given species, detection probabilities of different gear types varied drastically. For example, Ninespine Stickleback had a detection probability of 0.766 (SE = 0.035) when sampled wtih fyke nets but only 0.117 (SE = 0.017) when sampled with minnow traps sunk at depth. Detection probabilities were also affected by site specific variables such as depth of the lake, year, day from the beginning of the season and whether the lake was connected to the stream network. Survey specific variables, such as depth of the sinking minnow traps or fyke net position, did not greatly affect detection probabilities of the respective gears. With the exception of dip nets, each gear type provided the highest detection probability of at least one species considered here. This suggests that a multi-method approach may be most effective when attempting to sample the entire fish community of North Slope lakes. Our

results will be useful for designing optimal sampling and monitoring protocol of fish distributions in a sparsely sampled region where climate change and industry development will necessitate further field studies.

SPECIAL SESSION: Physical, Biological, and Human Factors Affecting Fishes on the North Slope of Alaska

Fish and Invertebrate Assemblages in Ponds and Lakes on the Arctic Coastal Plain, Alaska

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Food web structure in Arctic lakes is influenced in part by fish community composition, which, in turn, is controlled by landscape scale processes; therefore the landscape can indirectly control lake trophic structure. From a hydrologic perspective, the movement limitations or overwintering abilities of fishes may strongly influence their distribution on the landscape. As the North Slope climate warms, and surface water hydrology changes, it follows that lake food web structure will change. To gain a further understanding of abiotic and biotic controls on food web structure in a changing climate, we are investigating Arctic freshwater food webs in ponds and lakes in the Chipp River Drainage, North Slope, Alaska. Current conditions have allowed a suite of water body types to develop; ponds and lakes range from completely isolated to those with permanent stream connections. Deep (> 2 m), well-connected lakes contained more fish species, including whitefish *Coregonus spp*. By contrast, deep, isolated lakes typically contained one fish species, ninespine stickleback *Pungitius pungitius*. Ponds, which were shallow compared to lakes (< 1 m), either contained ninespine stickleback or were fishless. Those with fish were connected weakly, typically via wetlands, to other water bodies, while fishless ponds lacked permanent surface water connection. The aquatic invertebrate communities among these water body types is currently being assessed, but field observations indicated that invertebrate size and perhaps abundance was much lower in lakes were whitefish occurred compared to water bodies with stickleback or no fish.

Student

SPECIAL SESSION: Physical, Biological, and Human Factors Affecting Fishes on the North Slope of Alaska

Seasonal Movement Patterns of Arctic Grayling (*Thymallus arcticus*) in a Small Beaded Stream on the Arctic Coastal Plain, Alaska

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National Petroleum Reserve (NPRA) on Alaska's North Slope supports abundant populations of migratory Arctic grayling (*Thymallus arcticus*). Grayling spend up to nine months in deep-water overwintering habitats, until spring ice breakup permits access to shallow, productive habitats used for spawning and foraging. The timing and extent of these movements during the short Arctic summer are not well understood, but are an important consideration as oil and gas development occurs in the NPRA. For example, road construction has the potential to block or restrict fish passage, and water drawn from local sources may affect passage and critical habitat. The objective of this study-in-progress is to track Arctic grayling movements and seasonal habitat use within Crea Creek, a small beaded stream in the Fish Creek watershed. From June through August fish were captured via fyke nets and equipped with PIT tags. An array of ten stationary stream-width antennas was deployed within the 3-km study reach to detect passing fish, and a mobile PIT tag wand survey was conducted along the entire stream length every two days. Preliminary analysis of the PIT tag data reveals frequent movements within the system during the summer months, and size-class specific habitat use. Further analysis of the more than 100,000 fish relocation records is likely to reveal correlations between environmental variables and movements, and population level migration trends applicable to many similar streams across the Arctic Coastal Plain.

Student

SPECIAL SESSION: Physical, Biological, and Human Factors Affecting Fishes on the North Slope of Alaska

Feeding Ecology of Arctic Grayling (*Thymallus arcticus*) in a Small Beaded Stream on the Arctic Coastal Plain, Alaska

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Increasing oil and gas development and climate warming pose potential threats to ecological processes in aquatic ecosystems on the Arctic Coastal Plain (ACP). The ACP is comprised of a water-dominated landscape consisting of complex networks of interconnected lakes and small streams. The small size of these streams makes them potentially very susceptible to impacts from land use and climate change. These understudied, yet abundant waterways provide habitat for multiple species of fish, with Arctic grayling being the most common and widespread. The objectives of this study were to measure abundance of terrestrial and aquatic invertebrate prey for Arctic grayling, and measure prey intake by these fish, from June through August. We estimated terrestrial invertebrate prey inputs to streams with differing riparian plant species, invertebrate drift along the stream profile representing lake vs. stream sources of food, and grayling diets in June, July, and August. Preliminary results suggest large differences in terrestrial invertebrate prey inputs among different riparian vegetation types and that aquatic invertebrates are more important food items to Arctic grayling than are terrestrial prey. Arctic grayling are not commonly known to be piscivorous, although we consistently found large amounts of ninespine stickleback (*Pungitius pungitius*) in their guts, especially larger grayling, suggesting that these fish rely heavily on piscivory. To evaluate how potential habitat changes may affect Arctic grayling we must first understand the basic ecology of these aquatic habitats and of the fishes that inhabit them.

Student

SPECIAL SESSION: Physical, Biological, and Human Factors Affecting Fishes on the North Slope of Alaska

FISHSCAPE: Changing Seasonality Of Arctic Rivers Disrupts Key Landscape Trophic Linkage Between Stream And Lake Ecosystems

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Arctic grayling (*Thymallus arcticus*) is an important circumpolar species that provides a model system for understanding the impacts of changing seasonality on arctic ecosystem function. Grayling serve as food for other biota, and act as top-down controls in stream ecosystems. Arctic grayling prefer to spend their summers in rivers and small streams but to avoid freezing they move into deep-water areas, including large lakes to overwinter. To assess how shifting seasonality of Arctic river hydrology may disrupt key trophic linkages within and between lakes and streams on the North Slope of the Brooks Mountain Range, Alaska, we have undertaken work on grayling and lake trout population and food web dynamics. We use Passive Integrated Transponder (PIT) tags coupled with stream-width antenna units to monitor grayling movement across Arctic tundra watersheds during the summer, and into overwintering habitat in the fall. Results suggest that day length may prime grayling migration, but flooding events are likely the cue used to initiate migration in to overwintering lakes. A prolonged drought event in late summer delayed migration, increased mortalities and decreased fish condition, resulted in fewer, less robust grayling migrating into overwintering lakes. Stream and lake stable isotopes indicate that lake trout rely on seasonal inputs of stream nutrients transported via Arctic grayling for growth. Thus, changes in the seasonality of river hydrology may have reverberations throughout Arctic watersheds. Improved understanding of these processes will advance our general understanding of the role of animals in ecosystem dynamics, life-history evolution and ecosystem management.

SPESIAL SESSION: Nutrients and Food Webs in Lake and Stream Ecosystems

Marine Nutrients and Nutrient Supplements: Ecological Effects in Streams

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The past 15 years has brought a plethora of information on how anadromous fishes affect biota and food webs in recipient watersheds, with most of those studies centered in western North America on Pacific salmon (*Oncorhynchus* spp.). Marine-derived nutrients (MDN) from salmon have been traced in tissues of a multitude of land-based plant and animal species, and documented to increase food web productivity in oligotrophic systems. Streambed disturbance from redd building also plays a role, often times dramatically reducing densities of stream benthos under certain circumstances. Food webs and biota respond variably to MDN, depending upon geographic region and site conditions. Based on the assertion that MDN increases productivity, nutrient augmentation products have more recently been developed and to some extent tested that are intended to help mitigate for the loss of MDN in systems with reduced salmon returns. Past studies and some current nutrient mitigation projects are underway that suggest these nutrient supplements do increase productivity in some settings. Both nitrogen and phosphorus can affect productivity, and more recent evidence suggests the high-quality forms of carbon-based compounds in carcasses and some marketed nutrient-augmentation products also drive productivity responses. However, we caution that at best nutrient augmentation should be used as short-term tools for temporarily boosting basal food resources, in oligotrophic streams. We recommend that managers proceed with extreme caution when considering applying nutrient amendments to aquatic systems, having a good understanding of the extent to which salmon nutrients have declined in a given watershed, and the degree of oligotrophy, and that they have a well-informed application and monitoring plan in place before moving ahead with nutrient augmentations.

SPESIAL SESSION: Nutrients and Food Webs in Lake and Stream Ecosystems

A Review of Lake Fertilization as a Fisheries Enhancement Tool in Alaska.

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Lake fertilization was a common tool to enhance salmon production in Alaska beginning in the mid-1980's. The Alaska Department of Fish and Game Division of Fisheries Restoration, Enhancement and Development (FRED) implemented many lake fertilization programs that included an intensive monitoring of basic lacustrine ecosystem functions. Lake fertilization is intended to increase the forage base for juvenile salmon and thereby increase growth and ultimately survival. During that time the FRED limnology program was investigating lakes statewide to develop a limnological data archive. Key variables related to productivity evaluations were basic nutrients (nitrogen, phosphorus and other trace elements), primary production pigments (chlorophyll *a* and phaeophyton), secondary production (zooplankton) and ultimately tertiary production (fish). This led FRED to develop the commonly used Limnology Field and Laboratory Manual which guided the Lake Enrichment and Lake Stocking Programs. A Lake Fertilization Policy was also developed to guide these activities and has become the 'go-to' operating procedures adopted for many lake fertilization projects in AK and beyond. As many as 16 lake fertilization projects were operated simultaneously in the 1980's and were spread across coastal Alaska. The projects met with mixed success with some operated for short periods and others that continue today.

SPESIAL SESSION: Nutrients and Food Webs in Lake and Stream Ecosystems

Impacts of Salmon Spawner Density and Stream Productivity on the Ecology of Stream-dwelling Fishes in Southwestern Alaska

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Each year, millions of Pacific salmon return to freshwater ecosystems throughout the Northern Pacific Rim generating massive resource fluxes of nutrients and energy. While there is a growing appreciation that stream-dwelling salmonids benefit from the resource subsidy spawning salmon provide, there remains limited empirical data on how these impacts are mediated by the magnitude of the pulse, the *in situ* productivity of the recipient system, and the ability of consumers to capitalize on the resources. We assessed the growth and foraging response of two species of coexisting resident fishes to extreme inter-annual variation in the density of spawning sockeye salmon (*Oncorhynchus nerka*) in two streams that vary in productivity in southwestern Alaska. Over 10 years and across a greater than 10-fold variation in sockeye salmon density, both rainbow trout (*O. mykiss*) and Arctic grayling (*Thymallus arcticus*) exhibited a similar, but mechanistically different, non-linear saturating growth response to changes in salmon density. This growth response was driven by both an increase in salmon egg consumption and a decrease in dietary overlap among the two species. Additionally, the relative change in growth from low to high salmon densities was different between streams and depended on *in situ* stream productivity. Therefore, our study provides strong evidence that understanding of both the foraging ecology of consumers and the *in situ* productivity of recipient ecosystems, which together regulate the ecological consequences of changes in resource subsidies, is required for successful implementation of ecosystem-based management in systems dependent on pulsed resource subsidies.

Student

SPESIAL SESSION: Nutrients and Food Webs in Lake and Stream Ecosystems

Marine-nutrient assimilation in rearing coho and Chinook salmon in the Unalakleet River

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Marine-derived nutrients (MDN) imported to freshwater ecosystems by migrating adult salmon can affect growth and survival of rearing juvenile salmon. These marine subsidies provided by several species of salmon can affect other salmon species. However, linking MDN levels to freshwater productivity of salmon at the population level has proven difficult. To examine MDN assimilation in rearing populations of salmon, $\delta^{15}N$ and $\delta^{13}C$ in juvenile coho and Chinook salmon tissues in the Unalakleet River (Alaska) were examined throughout the watershed at various periods during their freshwater residency. Migrating Chinook and coho salmon smolt were sampled from two sub-drainages in the watershed, and rearing salmon were sampled at 10 sites before and after adult chum, pink and Chinook salmon spawned. A subset of sites was also sampled in mid-winter (March) before pink and chum salmon fry emerged from the gravel. Caudal fin clips from coho and Chinook salmon were used to assess stable isotope signatures, and diet samples were taken to evaluate marine food sources. Results from 2011 revealed significant within site variability, with seasonal spikes of MDN present at several reaches in the drainage. Smolt stable isotope samples suggested substantial predation on salmon fry by coho and Chinook. These data demonstrate utilization of MDN (from multiple salmon species) by coho and Chinook salmon. Ongoing work through 2013 will aim to further elucidate the influence of MDN on coho and Chinook salmon productivity and condition, at the watershed scale.

SPESIAL SESSION: Nutrients and Food Webs in Lake and Stream Ecosystems

Applications of Limnological Data in Western Alaska: Maximizing Production Through Understanding Food Web Dynamics

Heather Finkle and Darin C. Ruhl

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Salmonids are highly susceptible to mortality as juveniles rearing in freshwater. An understanding of factors that influence juvenile salmonid survival is vital to maximizing their adult production. Throughout the Kodiak archipelago and the Alaska Peninsula, we have collected limnological data from over 20 lakes within the last decade in an effort to understand how trophic interactions in lakes influence salmonid production. Through the examination of physical, nutrient, and zooplankton data relative to escapement, smolt outmigration, or stocking levels, we have been able to identify limitations in the rearing habitat of juvenile sockeye salmon as evidenced, for example, by low zooplankton biomasses or warm temperatures compared to smolt condition or total outmigration estimates. As a result of understanding how these trophic levels are linked and affect each other, we have also been able to develop simple linear regression and habitat-based models as tools for indicating preferred rearing conditions for juvenile sockeye salmon and generating stocking recommendations. We have found that while the mechanics of trophic interactions function similarly across lakes, their manifestation is influenced by their specific environment.

SPESIAL SESSION: Nutrients and Food Webs in Lake and Stream Ecosystems

Data and Literature Review of Factors Affecting the Declines in Sockeye Salmon Productivity in Chilkat and Chilkoot Lakes, Alaska.

David W. Roscoe and Dana C. Schmidt

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The Chilkat and Chilkoot River watersheds are the two largest producers of sockeye salmon (*Oncorhynchus nerka*) in the Lynn Canal area of southeast Alaska but returns of these populations have generally declined since the 1980s. We reviewed existing data and literature to assess trends in the limnology of Chilkat and Chilkoot lakes, including water chemistry, primary productivity, zooplankton, and sockeye salmon abundance. Possible factors contributing to the declines in the abundance of sockeye salmon were identified and ranked in terms of likelihood based trends in the Chilkat/Chilkoot data, and comparative studies from other regions. Levels of nutrients did not show a consistent trend (increase or decrease) in either lake between the late 1980s and 2002. In Chilkat Lake, changes in community composition and declines in the abundance of zooplankton may have been caused by top-down effects of stocking large numbers of hatchery fry, and were followed by a subsequent decline in the number of juvenile sockeye produced per spawner. Declines in juvenile sockeye salmon abundance in Chilkoot Lake in the late 1980s also corresponded with declines in nutrients and zooplankton. Trends in the productivity of Chilkat and Chilkoot sockeye salmon were similar to those observed in other populations on the Pacific coast, including several in southeast Alaska, and may be related to persistent changes in oceanographic conditions that occurred over the same time period. The degree to which other factors such as glacial silt and stickleback influenced productivity was uncertain due to limited data.

CONTRIBUTED SESSION: Fish and Aquatic Ecology

Effects of Flow on Chinook Salmon Recruitment in Two Interior Alaskan Rivers: Population-level Evidence and Habitat-related Mechanisms

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Chena and Salcha Rivers, two adjacent tributaries of the Tanana River, are the only streams on the U.S. side of the Yukon drainage for which we have long (>15-year) run reconstructions for Chinook salmon. Both systems show major variation in Chinook salmon recruitment beyond what can be explained by a dependence on spawner density alone. We used a retrospective stock-recruitment analysis to investigate whether known variability in the river habitat (including temperature and many metrics of the flow regime) could explain much of the variability in recruitment. For the Chena River, we also directly studied several factors related to salmon productivity, including primary production, invertebrate densities, and Chinook salmon growth, diets, and feeding behavior. Our stock-recruitment analysis revealed that low-to-medium flow years are strongly, positively associated with salmon recruitment, probably because of a sustained, positive effect of such flows on production throughout the summer, and not because of negative impacts of floods or flow during a brief, critical period. Furthermore, this effect appears to help explain the decline in recruitment in the Chena River over the past decade. Our ecological investigations support the interpretation of this statistical signal as evidence for a causal relationship, rather than a spurious correlation.

CONTRIBUTED SESSION: Fish and Aquatic Ecology

The Role of Contrasting Estuarine Environments as Rearing Habitats for Juvenile Coho Salmon

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We examined the use of estuaries by juvenile coho salmon *Oncorhynchus kisutch* using microchemistry and microstructure analyses of sagittal otoliths. Our objectives were two-fold: 1) to determine if juvenile coho salmon were rearing in estuarine habitats; and 2) to characterize and compare patterns of expression of life history traits in juvenile coho salmon (size, age, condition, duration, and timing of estuarine occupancy) occupying two estuary environments that contrasted in size and habitat complexity. Traits significantly differed between coho salmon using estuaries and those that did not: estuary residents were larger with greater body condition and weights than non-residents. Coho salmon averaged 24 days of estuarine habitat use during summer season use in a snow-melt, spring-fed estuary and 39 days in a glacial-fed estuary, with definitive patterns of overwintering in estuarine and/or nearshore environments. Coho salmon using the glacial estuary were composed of younger age classes with generally smaller but more variable sizes, weights, and condition in each age class. Differences in patterns of use were also observed; fish in the glacial estuary entered later and resided longer during the summer, whereas a larger proportion of older fish were captured exhibiting overwintering patterns in the snow-melt, spring fed estuary. Our findings highlight the potential of estuaries as important alternative rearing and overwintering habitats and suggest that conditions within estuaries may provide supplemental habitats for those individuals the move out of upstream freshwater rearing areas due to habitat loss and/or density dependent processes.

Student

CONTRIBUTED SESSION: Fish and Aquatic Ecology

Resident and Anadromous Fish Distribution and Density of Nushagak and Kvichak Headwater Streams

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In order to characterize baseline fisheries habitat prior to development in a region of mining claims, fish presence/absence surveys were conducted in headwater streams of the Nushagak and Kvichak Rivers including the Koktuli River, Talarik Rivers, Chulitna Creek, Sixmile Lake, and the Newhalen River from 2008-2010. Additionally, work was conducted in August and September 2010 in tributaries to the North Fork (n=3) and South Fork (n=3) Koktuli rivers, and Upper Talarik (n=3), Kaskanak (n=1), and Stuyahok (n=1) creeks to quantify densities of anadromous and resident fishes. Two-pass electrofishing was conducted using mark-recapture methodology for all taxa present in sufficient abundance to generate estimates. Presence/absence surveys documented salmon in 75% of headwater stream sites surveyed, and non-salmon fish species in 96% of headwater stream site surveys. Sculpin (*Cottus* sp.) occurred at highest densities, followed by coho salmon (*Oncorhynchus kisutch*), Dolly Varden (*Salvelinus malma*), and rainbow trout (*O. mykiss*), respectively. Data are compared to fish density data reported from other streams in Bristol Bay and around the North Pacific Rim. The study underscores the importance of headwater streams as essential rearing habitat and the lack of data for two of the world's most productive salmon ecosystems. The work additionally provides some legal protection to 149 kilometers (92.5 miles) of newly documented salmon streams.

CONTRIBUTED SESSION: Fish and Aquatic Ecology

Species ID for Free: Identifying Non-Target Species During Mixed Stock Assessment

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The Alaska Department of Fish and Game Gene Conservation Laboratory (GCL) uses species-specific analyses to describe population structure and estimate stock compositions in fishery mixtures. GCL has also established a species-identification protocol to identify species for samples of Pacific and Atlantic salmon where species is unclear. However, when non-target species are sampled in the field, they are detected as a wrong-species samples in the species-specific analysis, but the species-identification protocol is needed to identify the species of the sample. Analyzing samples with both methods is expensive and time-consuming. We performed experiments analyzing all 5 Pacific and Atlantic salmon through 3 species-specific analyses (sockeye, chum, and Chinook salmon) and examined the resulting scatter plots for species-specific patterns. Sockeye, chum, pink, coho, Atlantic and Chinook salmon exhibited patterns across all species-specific marker panels, allowing us to accurately identify non-target species using these panels, thereby eliminating the cost and time of performing a separate species-identification protocol. This gleaned information may prove useful to project managers by providing feedback on the species-identification errors in the field. Accurate species identification in the field results in higher numbers of correct-species samples run and therefore better allele frequency estimates for population structure and tighter confidence intervals for stock-composition estimates.

CONTRIBUTED SESSION: Fish and Aquatic Ecology

A Decade of Stock Identification Reveals the Patchwork of Contributors to Southeast Alaska Chinook Fisheries

Sara Gilk-Baumer and William D. Templin

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Chinook salmon from a mixture of stocks are commercially harvested in Southeast Alaska troll fisheries, including salmon originating from Alaska, British Columbia, and the Pacific Northwest. Information used to manage these fisheries under the Pacific Salmon Treaty come from various sources including coded-wire tags and escapements. Reliance on stock composition estimates from these data is problematic as coded-wire tags are not applied to all stocks contributing to the fishery and estimates of escapement or terminal run size are often not available or are poorly determined. The Alaska Department of Fish and Game has used mixed stock analysis to estimate the stock composition of Chinook salmon harvests in Southeast Alaska troll fisheries since 1999, first based on allozyme markers and more recently on microsatellite loci developed for use in Pacific Salmon Treaty fisheries. Results indicate considerable temporal and spatial variation in the composition of troll harvests within years, but consistent patterns of composition across years. In addition to providing estimates of the annual stock composition of Chinook salmon harvested troll fisheries, the genetic-based stock composition work in Southeast Alaska can provide an important component of the data needed to provide innovative estimates of terminal returns and escapement for driver stocks in the fisheries.

CONTRIBUTED SESSION: Fish and Aquatic Ecology

Scales of Escapement: Using Genetic Data to Assess Stock-specific Run Timing

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Pacific salmon commercial harvests in Alaska are typically managed using preseason forecasts and inseason escapement information to reach established escapement goals. In some cases, the escapement goals apply to multiple distinct returns of salmon that are regulated using distinct management strategies. In the Chignik watershed, on the Alaska Peninsula, two returns of sockeye salmon (early-run and late-run) have historically been separated by a July 4th run separation date. This date was determined using scale pattern analyses. These two returns are made up of populations that, when aggregated by return, also lend themselves to genetic stock identification (GSI). We genetically analyzed samples from three years to test if the July 4th run separation date is accurate and constant among years. Additionally, we analyzed the escapement samples to the finest possible resolution under current GSI methodology to look for other trends in return timing in the three year study. We found that when genetic stock proportions were applied to escapement abundance, the genetic data was generally consistent with the scale pattern analyses. Additionally, we found that the genetic estimates could be further divided to include four stock groups within the Chignik watershed. This ability to separate stocks allowed us to see that Chignik Lake late-spawning fish returned later in each year than the Chignik Lake earlier spawning fish. Also, Chignik River spawners tended to return later than all other stocks. Statistical models are being developed to incorporate genetic data with overall stock-specific escapement abundance, commercial fishery harvest, and catchability throughout each fishing season. The results from these analyses may be used to fine-tune pre-season management strategies and inform in-season management actions and is an excellent example of how genetic data can be used in conjunction with more traditional management methods.

CONTRIBUTED SESSION: Fish and Aquatic Ecology

Mitochondrial Clade Distributions in Threespine Stickleback Populations Across the North Pacific Basin

Emily A. Lescak[1,2], Robert W. Marcotte[1], Daniel J. Prince[2], Jeffrey J. Colgren[2], Mark C. Currey[3], Leah A. Kenney[2], William A. Cresko[3], Frank A. von Hippel[2], and J. Andres Lopez[1]

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Extant populations of threespine stickleback (*Gasterosteus aculeatus*) include descendants of two mitochondrial lineages (clades) that diverged approximately one million years ago. We examined the clade distributions in populations spanning the western Pacific, near the geographic origin of the Japanese clade, and the eastern Pacific, where the Euro North American clade predominates. By sampling populations from the Kuril Islands, Aleutian Island Chain, Kenai Peninsula, Prince William Sound, the Gulf of Alaska, and Oregon, we document changes in clade proportions across the Pacific Basin to identify areas of admixture and apparent clade boundaries. Clade identity is determined by restriction fragment length polymorphism analysis of a region of the cytochrome B gene. The western boundary of the Euro North American clade appears to be Attu Island in the Aleutian Chain; the frequency of this clade increases from west to east along the Aleutians and predominates in Prince William Sound and the Gulf of Alaska. Populations from Oregon are fixed for the Euro North American clade, indicating that Alaska and British Columbia are the apparent eastern boundary of the Japanese clade. Fine-scale sampling in Alaskan regions of admixture reveals a great deal of inter-population heterogeneity in clade proportions. Such admixture zones present an opportunity to study patterns of introgression that arise when genomes that have adapted to different environments for extensive periods subsequently come into secondary contact.

Student

CONTRIBUTED SESSION: Fish and Aquatic Ecology

The Evolution of Physiological Color Change in Marine Sculpins

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Sculpins (Scorpaeniformes: Cottoidei) are a diverse group of fishes found primarily in the North Pacific. The ability of some marine sculpins to rapidly change color to either break up their body's outline or match their background has been reported anecdotally by scientists and laypersons, as well as documented, characterized, and quantified in a laboratory setting (Buser and Lopez, unpublished data). The purpose of this study was to investigate the phylogenetic distribution of physiological color change in marine sculpins. A broad sampling of cottoids was assembled and DNA was amplified at two protein-coding nuclear genes (SVEP and ptchd1), one nuclear intron (EPIC locus 177E4), and one mitochondrial gene (COI). Sequences for each species were assembled and a phylogeny was inferred for each locus. The ability to undergo physiological color change, as evidenced by experimental data, photographic documentation, and/or anecdotal account, was noted for each species and ancestral traits were estimated using parsimony. The results of this study suggest that the ability to undergo physiological color change is widespread amongst marine sculpins and likely developed very early on in the cottoid lineage.

Student

SPECIAL SESSION: Bering Cisco Research in Response to a New Commercial Fishery

An Introduction to Bering Cisco *Coregonus laurettae* Biology and Geographic Distribution

Randy J. Brown

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Bering cisco *Coregonus laurettae* is an anadromous coregonid species that was first described by Bean in 1881, but was formally distinguished from Arctic cisco *C. autumnalis* in 1966. Despite ample records of its broad coastal distribution, our understanding of Bering cisco life history and the migration patterns of populations has been poor until recently. The 2005 initiation of a commercial coregonid fishery in the Yukon River delta, focused primarily on Bering cisco, has stimulated a wide range of scientific study including: reviews of the literature to better describe saltwater and freshwater distribution; biological investigations in freshwater to determine maturity, spawning readiness, and age; genetics studies of relationships between closely related species and among Bering cisco populations; morphometric and meristic analyses to examine phenotypic variation, otolith chemistry and radio telemetry investigations designed to identify the geographic distribution of populations in marine and freshwater environments respectively; and more. You will hear presentations in all of these disciplines during this session. In this introductory presentation I will discuss historical sampling data from coastal environments indicating that Bering cisco are endemic to Alaska, and the sampling and biological evidence from freshwater environments for the three spawning populations known to exist in the Yukon, Kuskokwim, and Susitna River drainages.

SPECIAL SESSION: Bering Cisco Research in Response to a New Commercial Fishery

An overview of the lower Yukon River commercial whitefish fishery, 2005-2012

Larry DuBois

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Various whitefish *Coregonus spp*. have historically been harvested by subsistence fishermen from lower Yukon River communities in September and October, and relatively high levels of Bering cisco *C. laurettae* and least cisco *C. sardinella* continue to be harvested by residents of these communities. Since 2005 the Alaska Department of Fish and Game has allowed an experimental freshwater commercial fishery targeting whitefish in the lower Yukon River delta area. In recent years, this fishery has targeted Bering cisco and least cisco with a typical annual harvest limit of 10,000 lbs; most of the harvest is composed of Bering cisco. The cisco harvest is processed into high-end smoked fish products and market demand has increased pressure to allow for higher harvest limits. Changes in this burgeoning fishery's management, target species, harvest reporting, and sampling programs will be discussed along with research needs and concerns for future fishery development.

SPECIAL SESSION: Bering Cisco Research in Response to a New Commercial Fishery

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

Robert W. Marcotte and J. Andrés López

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The evolutionary history of Bering cisco *Coregonus laurettae* is closely linked with its sibling species Arctic cisco *C. autumnalis*. Understanding their relationship is complicated by minor morphological differences and the relatively high hybridization potential of coregonid species. Therefore quantifying the genetic similarities within and between these species will lead to a better understanding of the temporal and environmental factors that led to speciation. We used genetic data from multiple loci to estimate ancestral and contemporary levels of gene flow. Specifically, we investigated the manner in which glacial history, patterns of drainage connectivity, and migratory behaviors shaped the history of Bering cisco and Arctic cisco lineages. To resolve these questions, we examined DNA sequence data from the introns of multiple nuclear genes as well as the mitochondrial control region. These genes were found to have a wide range of sequence divergence and phylogenic structure. The observed levels of divergence suggest that speciation occurred during the middle Pleistocene.

SPECIAL SESSION: Bering Cisco Research in Response to a New Commercial Fishery

Phenotypic Variation among Adult Bering Cisco from the Yukon, Kuskokwim, and Susitna River Drainages in Alaska

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The Yukon, Kuskokwim and Susitna rivers are home to spawning aggregations of *Coregonus laurettae* (Bering cisco) that show varying degrees of genetic differentiation. This differentiation is indicative of limited mixing between populations from the different drainages. We examined phenotypic variation between adult individuals of *Coregonus laurettae* sampled from those three spawning drainages to test for the presence and determine the degree of morphological differentiation between these geographically and genetically defined subdivisions of the species. Our sample comprised a total of 102 individuals from which we obtained 32 morphological measurements and 11 meristic counts. We identified statistically significant, although not diagnostic, differences in the number of vertebrae and gill rakers between the sample from the Susitna and those of the two Bering Sea drainages. Congruent with the evidence from genetics and with expectations based on geography and life history, the Susitna river population is most distinct among the three known *Coregonus laurettae* spawning drainages. We detected no significant phenotypic differences between the samples from the Yukon and Kuskokwim rivers.

SPECIAL SESSION: Bering Cisco Research in Response to a New Commercial Fishery

Estimating Stock Composition of Yukon Delta Bering Cisco Harvest using Strontium Isotopes in Otoliths

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Bering cisco *Coregonus laurettae* is an anadromous coregonid species endemic to Alaska. Currently only three spawning populations are known: in the Yukon, Kuskokwim, and Susitna rivers. A commercial fishery has developed in the lower Yukon River delta where Bering cisco is the targeted species. Processor requests for a larger harvest allocation indicate a desire for future fishery expansion. Bering cisco from both the Kuskokwim and Yukon River stocks are believed to be harvested in the fishery due to coastal currents. In order to monitor harvested populations appropriately, and prevent overharvest on an important subsistence resource, it is necessary to determine the stock composition of the fishery. This project aims to determine Bering cisco stock composition in the lower Yukon River delta commercial fishery. We aim to accomplish this using otolith and water chemistry, including strontium isotope composition. To date, we have analyzed the strontium isotope composition from 75 otoliths from the three known spawning rivers (Yukon *n=31*, Kuskokwim *n*=30, and Susitna *n*=14). These data show a significantly different $^{87}Sr/^{86}Sr$ signature between the Yukon and Kuskokwim groups, and between the Yukon and Susitna groups. Our next objective is to analyze otoliths we have collected from the commercial fishery to determine stock composition of the fishery.

SPECIAL SESSION: Bering Cisco Research in Response to a New Commercial Fishery

Location, Migration Timing, and Description of Kuskokwim River Bering Cisco Spawning Origins

J. Michael Thalhauser[1], LaDonn Robbins[1], Randy J. Brown[2], and Ken Harper[3]

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A relatively new commercial fishery for Bering cisco has been established in the Yukon River delta. Because the coastal distribution of rearing Bering cisco is thought to be influenced by marine currents, Kuskokwim River fish are probably included in the commercial harvest. Coregonid fishes, including Bering cisco, play an important role in the subsistence activities of Kuskokwim River residents, so the Kuskokwim Native Association (KNA), in partnership with the U.S. Fish and Wildlife Service, is working to identify and describe migration patterns and spawning origins of Kuskokwim River Bering cisco with a combination of habitat sampling and radio telemetry. In 2010, KNA led a sampling expedition into the South Fork Kuskokwim River and identified the lower extent of a spawning aggregation of Bering cisco, verifying the tributary as a spawning destination within the Kuskokwim River drainage. A radio telemetry study of pre-spawning Bering cisco in 2012 was designed to delineate the spawning distribution of Bering cisco in the South Fork Kuskokwim River and to determine if any other spawning sites exist in the Kuskokwim River drainage. Preliminary results from this study will be presented following our late fall aerial surveys. KNA aims to keep Kuskokwim River residents involved in research efforts through comprehensive education and outreach programs as well as through a program of hiring local technicians to work on the projects.

SPECIAL SESSION: Alaska Seafood Processing, Quality, and Marketing: Challenges and Advances

Refined Liquid Smoke: a Potential Antilisterial Additive to Cold-Smoked Sockeye Salmon (*Oncorhynchus nerka*)

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Listeria monocytogenes, the causative agent of listeriosis can contaminate cold-smoked salmon (CSS) and make it a high-risk ready-to-eat food product. Due to the lack of a critical control point in the cold-smoking process, a post-process elimination is essential to ensure product safety. The goal of this research was to improve safety of vacuum-packaged CSS supplemented with commercially refined liquid smoke (LS). The CSS strips (60 g, 3 × 12 cm, width × length) were surface-coated with 600 µl of the LS (AM-3 or AM-10) or deionized water (control). The strips were inoculated with *L. innocua* (surrogates for *L. monocytogenes*) at 3.5 log colony-forming units (CFU)/g, vacuum-packaged, and stored at 4°C. The control group showed a 0.8 log CFU/g reduction of *L. innocua* over 45 days of storage compared to the listericidal effect by either LS with a 2-log reduction by day 14, and no growth up to 35 days of storage. For the sensory test, AM-3 was selected for its slightly stronger listericidal activity. In a simple difference sensory test, 180 untrained panelists evaluated one of four combinations of treated and/or control CSS. Results showed the overall sensorial quality of CSS was not influenced by the addition of the LS. More than 80% of the panelists who evaluated the control samples perceived the samples as different. This indicated a natural variability existed in the product that prevailed over the possible sensorial impacts of LS application. We recommend refined LS as a suitable antilisterial supplement to CSS.

SPECIAL SESSION: Alaska Seafood Processing, Quality, and Marketing: Challenges and Advances

Paralytic Shellfish Toxin and Commercial Shellfish: Development Toward Reduced Cost Testing

Julie Matweyou

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Paralytic Shellfish Toxin (PST) remains an obstacle to existing commercial shellfish fisheries and growth in the industry, as well as to safe recreational and subsistence harvest. Currently all commercially harvested shellfish are subject to Alaska Department of Environmental Conservation (ADEC) testing or restrictive harvest protocol. The regulatory limit of PST is 80 µg/100g shellfish but values as high as 20,000 µg/100 g have been recorded in the state, specifically in Kodiak. Based on toxin history in this region, commercial bivalve aquaculture efforts have failed and commercial crab and scallop fisheries necessitate processing. Because industry carries the burden of testing, cost has been prohibitive for start up operations and development of new markets. Advances in toxin detection may reduce the cost of testing. Enzyme-Linked Immunosorbent Assay (ELISA) for Domoic Acid has been successful and preliminary research from the ADEC indicates the Abraxis Saxitoxin ELISA for PST is promising and can reduce toxin testing from $125 to $15 per sample. The dramatic cost reduction and relative simplicity of the Abraxis ELISA could provide an affordable means for site evaluation for aquaculture and extensive monitoring of commercial product.

SPECIAL SESSION: Alaska Seafood Processing, Quality, and Marketing: Challenges and Advances

Shellfish Aquaculture in Alaska: Progress Toward Developing a New Industry for Coastal Communities

Raymond RaLonde

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Shellfish aquaculture in Alaska initially started in the early 1900's growing Pacific oysters (*Crassostrea gigas*) from seed imported from Japan with the harvest being sold as shucked meats. Faltering in 1968, the industry re-started in the late 1970's from a handful of intrepid farmers located near the community of Wrangell in southeast Alaska, this time selling whole live oysters to the high end raw consumption market. Nearly 40 years later, the industry now has 72 permitted farms located in southeast Alaska, Prince William Sound, and Kachemak Bay farming four bivalve species. During this expansion period, substantial regulatory improvements, research and development, farming experience, and active community support has greatly improved the prospect of successful farms and the industry is now acclaimed as an enterprise that can provide a new industry for economically struggling coastal communities. To support the shellfish farming industry, the Alaska Sea Grant Marine Advisory Program (MAP) has an aquaculture program that provides applied research, education, and outreach to the industry. The newly developed OceansAlaska program in Ketchikan is actively conducting research, and is collaborating with MAP and the University of Alaska Southeast to develop a major center for shellfish aquaculture training. The industry added another major supporter in 2012 when the state legislature authorized $6.5 million to encourage further development. This presentation provides details on the current challenges and opportunities for this growing industry.

SPECIAL SESSION: Alaska Seafood Processing, Quality, and Marketing: Challenges and Advances

The Food Safety Modernization Act: The Next HACCP?

Chuck A. Crapo

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The Food Safety and Modernization Act (FSMA) was signed into law in January 2011. This was the most expansive change in food laws since 1938 and will have a big impact on all food processing operations in the US and especially with imported foods. The regulations for the act have yet to be published in the Federal Register, but are expected within the next two months. How will these regulations affect the Alaska seafood industry? Provisions of the law and expected regulations will be discussed.

SPECIAL SESSION: Alaska Seafood Processing, Quality, and Marketing: Challenges and Advances

Producing Edible Cod (*Gadus Macrocephalus*) Liver Oil with Short-Path Distillation

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In Alaska large quantities of fishery byproducts are used for production of fish oil. A majority of fish oil produced is crude and typically used as an animal feed ingredient. It is necessary to purify crude fish oil so product meets specifications for human use. The research goal was to use short-path distillation (SPD) to purify oil rendered from cod livers having the lowest (lipids<30% w/w; March) and highest (lipids>50% w/w; December) lipid content within a one-year harvest season. Plate-frozen liver blocks obtained from Alaska Leader Fisheries (Kodiak) in Dec. 2011 and Mar. 2012 were comminuted, and oils rendered multiple times until a quantity of 1.5 L of oil was obtained. Rendering was conducted under nitrogen atmosphere and oils obtained by centrifugation. Oils were distilled using a bench-top 2" wiped-film SPD (Pope Scientific). Purification of liver oils with SPD resulted in significant ($P<0.05$) decreases in trace levels of water, free fatty acid values, peroxide values, and *p*-Anisidine values. Crude and SPD-purified cod liver oils had similar ($P>0.05$) fatty acid profiles; accordingly, SPD did not affect the contents of nutritionally important long chain omega-3 fatty acids. Purified oils met edible fish oil specifications and can be used for nutraceuticals applications.

SPECIAL SESSION: Fish, Food Security, and Health: Supporting Local Communities through Supporting Local Fisheries

Fish, Fisheries, and a Human Health Approach to Understanding Food Security

Phil Loring[1] and Andrea Bersamin[2]

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Multiple climatic and socioeconomic drivers have come in recent years to interfere with the ability of Alaska's communities to achieve food security with locally available food resources. While commercially available foods provide one measure of food security for the majority of Alaskans, the availability and quality of these foods is subject to the vagaries and vulnerabilities of a global food system: access is dependent on one's ability to pay; more importantly, perhaps these foods often do not fulfill many of the roles that country foods have played in these communities and cultures. In this talk, we provide a framework for understanding food security as a place-based process, one that links sociocultural, ecological, psychological, and biomedical aspects of individual and community health through ecologically sustainable and socially just outcomes. We use the Alaska case to illustrate that if food security is to be understood as a matter of human health, then our definitions of and designs for food security must recognize food's multifaceted and often regionally nuanced role in creating positive health outcomes.

SPECIAL SESSION: Fish, Food Security, and Health: Supporting Local Communities through Supporting Local Fisheries

Food Security in the Kenai Peninsula of Alaska: What Role for Locally Caught Seafood?

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In fall of 2011 we distributed a survey to 1500 randomly selected homes on the Kenai Peninsula in Southcentral Alaska to evaluate local food security with a specific focus on access to locally caught seafood. Both Cook Inlet and the KP watershed are well known and highly valued as habitat for multiple valued fish species including halibut, Pacific cod, and all five species of Pacific salmon, and many residents both on the Peninsula and from the nearby Greater Anchorage metro area are known to rely heavily on these fisheries for personal use, subsistence, sport, and commercial reasons. In this talk, we present some of the findings of our survey, which revealed a surprisingly high prevalence of food insecurity in the region. While participation in local fisheries is shown as contributing to food security for many households, others report having little or no access to locally caught seafood. The details of these finding are discussed as they relate to other socioeconomic and cultural details. We conclude with a discussion of how these findings relate to both environmental justice, and debates over the management and sustainability of local fisheries.

SPECIAL SESSION: Fish, Food Security, and Health: Supporting Local Communities through Supporting Local Fisheries

Fisheries-to-Schools: a Model for Promoting Food Security in Alaska Native Communities

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The National School Lunch Program (NSLP) emerged, in part, as a response to the need to improve food security among school children. The USDA defines food security as "access by all people at all times to enough food for an active, healthy life." Conceptualization of food security in Alaska Native communities-- also known as "traditional food security"-- goes beyond food access to encompass the rich socio-cultural history of Alaska Natives, and the state's unique geography and food resources. As currently implemented the NSLP is poorly contextualized and may not support traditional dietary patterns, which in many Alaska Native communities are the underpinning of diet quality and food security. The NSLP may therefore inadvertently serve to widen the disconnect that exists between school children and their local food system, which provides high quality, culturally important foods. The Fisheries-to-School program is a community-based participatory research project designed to increase food security and improve diet quality in Alaska Native communities while simultaneously strengthening local and regional markets for sustainably harvested fish by reconnecting school children with their local food system. In this presentation we will describe the process by which the Fisheries-to-Schools program was developed. We will also discuss its potential to increase food security, improve health, and support a more sustainable food system in one of the most disadvantaged regions in the nation while creating viability in local economies.

SPECIAL SESSION: Fish, Food Security, and Health: Supporting Local Communities through Supporting Local Fisheries

The Triple Bottom Line – Fostering Community and Conservation Benefits in Gulf of Alaska Fisheries

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Commercial fisheries are an essential economic, social and cultural component of many of Alaska's communities. However, fishery management regimes can have dramatic impacts on the ability of fishing communities to engage in their historic practices, and can impact the availability of traditional food sources as well. Ensuring healthy community-based fisheries in today's economic and political environment requires innovative political and economic strategies to protect and build these important components of healthy communities. In this paper we provide an overview of recent and potential impacts on fishing communities from fishery management decisions, focusing on catch share or IFQ programs. We also highlight two recent efforts towards stimulating viable community-based fishing opportunities in and around Kodiak Island. The first project is in partnership with the Alaska Jig Association and funded by a grant from the National Fish and Wildlife Foundation's Fisheries Innovation Fund. This collaborative project aims to transform the local jig fishery into a high-value enterprise by working with the fleet on best careful handling practices, value adding, direct marketing and appreciation in the market for strong conservation performance and social benefits of buying from small boat, community-based fishermen. The second project is AMCC's *Catch of the Season* program, a yearly Community Supported Fishery which features Kodiak Tanner crab and links Kodiak and Anchorage seafood consumers directly to our network of conservation minded, independent family fishermen. In closing we discuss paths forward for ensuring the ongoing health of our fishing communities.

SPECIAL SESSION: Fish, Food Security, and Health: Supporting Local Communities through Supporting Local Fisheries

Paralytic Shellfish Poison (PSP) in Dungeness Crabs (*Metacarcinus magister*): Results of a Study in Northern Lynn Canal and the Complexities Involved with Monitoring and Developing Strategies to Protect Human Health

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Paralytic shellfish poison (PSP) has been a pervasive problem in the Alaskan shellfish harvesting and processing sectors. Primarily affecting bivalve shellfisheries and shellfish farming operations, these industries must comply with burdensome and expensive regulations to protect human health. Alaska has no program to monitor personal use and subsistence harvesters, and illnesses and fatalities continue with consumption of untested shellfish. In 2010, for the first time in recorded history, a fatality of a Haines, Alaska resident occurred with consumption of Dungeness crab viscera, often termed "crab butter." Following the fatal incident, a collaborative investigation that included Chilkat Environmental, Alaska Department of Fish and Game, Aleutian Pribilof Island Association, the Alaska Sea Grant Marine Advisory Program and the Northwest Fisheries Science Center during the summers of 2010 and 2011, PSP testing was conducted on Dungeness crab and blue mussels (*Mytilus trossulus*), the likely food source for crabs. Results revealed dangerous PSP toxin levels of 5,034 µg/100g in mussels and 1,055 µg/100 g in crab butter. This presentation will describe the outcomes of the study, the complex process of monitoring for PSP in crab populations, and the implications associated with potential regulations to protect human health.

SPECIAL SESSION: Freshwater Fish Habitat Modeling

Modeling Juvenile Salmonid Distributions in Headwater Streams of the Kenai Lowlands Using Catchment Topography and Wetland Geomorphology

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Conservation and management of headwater streams amid rapid global change require an understanding of the spatial and environmental factors that drive ecosystem processes and species distributions. Using a hierarchical analytical framework we have modeled the effects of catchment-scale topography and wetlands geomorphic classes on stream physical habitat, chemistry, and macroinvertebrate and fish communities in headwater streams across the Kenai Lowlands, Southcentral Alaska, USA. We identified 135 macronivertebrate taxa, 122 of which were aquatic insects, of which 79 were dipterans. We collected only 6 species of fish, but juvenile coho salmon and Dolly Varden were collected in 27 and 48 of the 53 streams, and reached densities of >500 and 1300/km, respectively. Flow-weighted slope, an indicator of water residence time and gradient, was the best catchment-scale correlate of macroinvertebrate and fish community structure, and its effect was mediated by wetlands geomorphic classes and numerous water chemistry, substrate composition, and channel geomorphology variables measured at the reach scale. Many macronivertebrate taxa showed high fidelity to different levels of topographic gradient. Juvenile salmonids were segregated among streams by both species and age classes. Predictive modeling indicated that all of the 547 km of headwater streams in the study area might serve as potential habitat for at least 1 species and age class of salmonids. Our study should assist in development of catchment management tools for identifying and prioritizing conservation efforts in the region, and may serve as a framework for other studies concerning biodiversity and focal species conservation in headwater streams.

SPECIAL SESSION: Freshwater Fish Habitat Modeling

Using Multispectral Aerial Imagery and GIS-based Approaches to Quantify Juvenile Salmon Rearing Habitat and Develop Salmon Habitat Models: A Case Study

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Monitoring the quality and quantity of freshwater rearing habitat for Pacific salmon *Oncorhynchus* spp. is essential for monitoring stocks of these species as abundance and distribution are tightly coupled with habitat parameters. Because field-based habitat monitoring in remote areas can be expensive, time-consuming, and/or subjective, innovative methods are desired. The objectives of this study were (1) to develop methods for using multispectral aerial imagery to classify juvenile rearing habitat and determine the accuracy of these methods and (2) to use these methods to quantify and map juvenile salmon habitat characteristics in two study areas in the Kulukak River, Alaska. I demonstrated that a decision-based fusion approach using images acquired in the visible, near-infrared, and thermal-infrared regions classified habitat classes important for juvenile salmon with accuracies of 82.5% and 67.5% in the respective study areas. In addition, I quantified and mapped habitat variables often used in juvenile salmon studies on several scales and created habitat-suitability maps for coho salmon *O. kisutch*, demonstrating the utility of these methods for spatially explicit habitat modeling in addition to the relative value of these two study areas. This study demonstrates that airborne images, coupled with field-based habitat and fish abundance surveys, can be used to determine the quality and quantity of juvenile Pacific salmon rearing habitat in small streams and thus decision support in fisheries management.

SPECIAL SESSION: Freshwater Fish Habitat Modeling

Intrinsic Potential Habitat Modeling for Chinook Salmon in the Copper River Watershed, Alaska

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Ecosystem management requires information on habitat condition across large scales; however, in Alaska comprehensive environmental surveys are often impractical and expensive to carry out. Intrinsic Potential (IP) models provide a means to identify at a large scale those portions of the landscape that can provide essential habitat for various fish species. These models are derived from watershed patterns and processes that operate at broad temporal scales and are not readily affected by human activities. IP modeling has been used to estimate historic distributions of coho (*Oncorhynchus kisutch*) and Chinook (*O. tshawystcha*) salmon in Oregon and northern California to prioritize areas for salmonid conservation and restoration efforts, and in the Pacific Northwest, Japan and Taiwan to assess potential land management impacts on salmon populations. We have developed an IP model for Chinook rearing habitat throughout the Copper River watershed in southcentral Alaska, utilizing existing digital elevation models (DEMs), expert opinion, and field surveys. Our model uses only three variables: flow, gradient and glacial influence. The model performs quite well, and is independently corroborated by existing radio telemetry data for Chinook. This model will eventually help resource managers map critical habitat for salmon throughout the Copper watershed, will help direct field research to appropriate stream reaches, and will assist managers in prioritizing restoration actions, such as culvert replacement. This type of modeling is broadly applicable and will also inform future research into the ecological impacts of climate change in Alaskan river systems.

SPECIAL SESSION: Freshwater Fish Habitat Modeling

Potential Impacts of Climate Change on Freshwater Ecosystems in Alaska: Modeling Coho Salmon Life-cycles in the Chuitna Watershed

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Climate change is predicted to cause dramatic changes to hydrologic processes in many parts of Alaska, but quantifying how these impacts will influence specific watersheds and aquatic species requires using a combination of models, expert knowledge, and empirical data. Here we use a series of linked models of climate, hydrology, and salmon habitat within a coho salmon (*Oncorhynchus kisutch*) population model to assess how changes in climate could affect the survival and productivity of coho in the Chuitna watershed, Alaska. To model salmon populations we used current knowledge of coho life history, empirical data from local studies and functional relationships within a spatially explicit population model where the multistage Beverton-Holt model determines the number of individuals surviving to the next life stage. Using a 3-dimensional hydrology model (MikeSHE/Mike 11) developed for the watershed and future emission scenarios from the intergovernmental panel on climate change (IPCC) we then simulated the future hydrology at the end of the century period 2080-2100.The hydrologic outputs along with stream characteristics were then inserted within our salmon model to predict how salmon populations will respond to future conditions. Results show that future populations are projected to experience more variability in survival and productivity across all life-stages. The greatest impact is projected for life-stages most sensitive to changes in seasonal streamflow patterns. This approach offers a unique opportunity to use existing information within a flexible modeling framework to understand which life stages are most sensitive to climate change and help determine where future research is needed.

SPECIAL SESSION: Freshwater Fish Habitat Modeling

Modeling Anchor River Chinook Salmon Population Dynamics and the Potential Effects of Climate Change

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We used RIPPLE, a physically based population model, to assess factors controlling Chinook salmon population size in the Anchor River under current and potential future climate conditions. For each freshwater and estuarine life stage, the model estimates reach-specific carrying capacities using predicted physical variables such as channel morphology and substrate size, in conjunction with field measured maximum densities of each life stage for different slope and drainage area combinations (e.g. 1-3% and 10-50 km^2) and habitat types (e.g. pool, riffle, run). RIPPLE then uses these reach-specific carrying capacities in a multistage stock-production model to predict distribution and abundance of each life stage. An average annual escapement of 8,000 was predicted by the model, close to the actual average of 7,000. The model predicts that factors currently controlling population size are summer juvenile carrying capacity, winter mortality, and ocean survival. Although predicted distribution of spawning habitat is patchy because many reaches are too coarse for spawning, total spawning habitat was plentiful, enough for an escapement of 140,000, and emerging fry far exceed summer carrying capacity. Fall and winter carrying capacity, functions of high flow refuge habitat and ice conditions, respectively, were also far in excess of summer carrying capacity. Climate change scenarios modeled included increased fall flooding, earlier spring snowmelt, lower flows and higher temperatures in the summer, and warmer water temperatures and reduced stream ice in the winter. Of these scenarios, the model predicts that higher summer temperatures and lower flows were most likely to adversely affect the Chinook population.

SPECIAL SESSION: Freshwater Fish Habitat Modeling

An Integrated Hydrologic Modeling Approach to Improve Habitat Mapping and Ecological Risk Assessment for Wild Salmon in Alaska

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Understanding hydrologic processes that are complex both temporally and spatially is a central challenge to advance the mapping and modeling of ecological systems that support salmon. Quantitative tools for modeling such dynamics have advanced rapidly in recent years, and are increasingly useful to estimate potential effects of human activities or other factors on ecologically important attributes of freshwater systems such as the magnitude, timing and duration of instream flow, groundwater and water quality. We developed an integrated surface water-groundwater hydrologic model to evaluate scenarios of risk from large-scale mining in the Nushagak / Kvichak headwaters and estimate potential alteration of stream flow and water quality under a range of mining conditions. We will present preliminary findings, and discuss challenges and potential uses of this tool for mapping and modeling of salmon habitat in Alaska.

POSTER SESSION ABSTRACTS

Connections Across Many Scales: the Western Alaska Salmon Stock Identification Project (WASSIP)

Alaska Department of Fish and Game

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Uncertainty about the magnitude, frequency, location, and timing of the nonlocal harvest of sockeye *Oncorhynchus nerka* and chum *O. keta* salmon in Western Alaska fisheries was the impetus for the Western Alaska Salmon Stock Identification Project (WASSIP). The project was designed to use genetic data in mixed stock analysis to reduce this uncertainty. WASSIP is consensus driven with 11 signatories to a Memorandum of Understanding representing fishing, Alaska Native, and government interests who serve as the Advisory Panel. In addition, a 4-member Technical Committee provides technical guidance and oversight. Samples were taken from sockeye and chum salmon caught in most commercial and subsistence salmon fisheries in marine and estuarine areas from Chignik through to Kotzebue Sound (approximately 4,000 kilometers) where catches occurred from 2006-2009. In total, 325,781 catch samples were collected and 156,376 were selected for analysis. Genetic baselines composed of 39,205 sockeye and 32,817 chum salmon were assembled and used to determine the contribution of 24 sockeye and 9 chum salmon stocks to the harvests included in WASSIP analyses. Harvest rates were estimated from these contributions and stock-specific estimates of escapement. This study will improve our understanding of stock productivity, help inform management and regulatory actions, and shed light on the migratory pathways of these two species in the nearshore marine waters of western Alaska. This poster describes the member organizations and the major components of the WASSIP process.

POSTER SESSION ABSTRACTS

Did Flatfish Evolve More than Once?

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All extant species of flatfish (order Pleuronectiformes) are thought to be descendants of a single common ancestor, and therefore to be a monophyletic group. The assumption of flatfish monophyly is based largely on the bilateral asymmetry associated with ocular migration characteristic of flatfish. Molecular phylogenies have been inconclusive on the monophyly of pleuronectiforms. Support for the monophyly of the order has varied based on the taxa sampled and markers used. However, the genus *Psettodes* has not been included in Pleuronectiformes in many recent studies. The non-monophyly of Pleuronectiformes in phylogenies is often considered to be a result of insufficient information or an artifact of phylogenetic inference, such as biased base composition or long branch attraction. In this study, we address the question of pleuronectiform monophyly with a broad set of markers and methods designed to limit the influence of phylogenetic artifacts. We examined six variable protein coding nuclear genes: RAG1, rhodopsin, EGR1, EGR2B, EGR3, and MLL. EGR1, EGR2B, EGR3, and MLL were selected specifically for acanthomorph (spiny-rayed fish) phylogenetics. A thorough sampling of flatfish and potential relatives is used to increase accuracy. We test each gene for base composition homogeneity across taxa to determine if gene or genome wide biases exist in the dataset. Several different treatments of data are used in phylogenetic inference. Results of this analysis are most consistent with a polyphyletic Pleuronectiformes. We compare our findings to morphological evidence and discuss the compatibility of our molecular hypothesis with morphological data.

Student

POSTER SESSION ABSTRACTS

Early Marine Growth Patterns of Situk River Steelhead, *Oncorhynchus mykiss*.

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Steelhead trout, *Oncorhynchus mykiss*, are a highly valued sport fish that has suffered severe declines across the southern portion of their range. Alaskan populations are generally considered stable, but a lack of stock specific data and the small size of many populations render them susceptible to overharvest and natural environmental variability. A retrospective analysis of steelhead scale samples from the Situk River will investigate possible correlations between juvenile critical period growth and potentially influential marine and freshwater environmental conditions. A preliminary Situk steelhead abundance model describes the significance of harvest, local sea-surface temperature, and El Nino Southern Oscillation (adj. r^2=0.62, P<0.01, n=23) in describing past variability for this population. This analysis will seek to understand how variability in Gulf of Alaska productivity due to climate forcing may potentially impact vulnerable Alaskan steelhead, and may also inform recovery of depleted stocks in Oregon, Washington, and California.

Student

POSTER SESSION ABSTRACTS

The Kodiak Ocean Science Discovery Program – Bridging the Gap Between Working Scientists and Classroom Science

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The cooperation between the Kodiak Laboratory of the National Marine Fisheries Service, Kodiak Borough Assembly, Kodiak Island Borough School District and Kodiak College supports the Kodiak Ocean Science Discovery Program (KOSDP) by promoting locally based Ocean Science and Marine Stewardship through a combination of formal and informal education. A curriculum based core program provides age appropriate ocean science lab units for grades 3-8. Additional informal education modules offer a variety of public outreach, art, and in-depth after school programs as well as special units for six remote k-12 village schools in the district. During annual visits to the KOSDP, all Kodiak public school students gain exposure to hands-on Marine Science lessons in a state-of-the art laboratory with access to a seawater research facility and public touch tank, while scientists and volunteers share their ocean knowledge and passion with the students. Topics for grades 3 through 5 include the marine food web, keystone species, and introduction to scientific experimentation. Grades 6 through 8 explore the chemistry and biological effects of ocean acidification, and the ocean's role in energy and matter cycling. Application of scientific techniques, a field trip to a working fisheries management facility and exposure to local scientists and fisheries managers create interactive learning experiences, which are reinforced through different units every year until high school. The high school curriculum is enhanced through KOSDP opportunities for Marine Science classes, guest speakers, an Ocean Science Bowl team, and internship opportunities. The KOSDP is a gateway of Marine Science education in Kodiak.

POSTER SESSION ABSTRACTS

Shallow-water Residency and Limited Dispersal of Atlantic Halibut in the Gulf of Maine

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Atlantic halibut (*Hippoglossus hippoglossus*), once abundant in the Gulf of Maine (GOM) off the New England coast, were overfished until the stock collapsed in the 1940s and, since that time, have not been fished commercially in the region. Lack of a directed fishery for the species has hindered research about its movement, life history and habitat use and little is known about its current population structure in U.S. waters. In 2007, researchers from the Maine Department of Marine Resources conducted a three-year tagging study using electronic tags to record environmental data for up to one year while attached to individual fish. Preliminary data indicate that GOM halibut may not leave nearshore summer feeding grounds, as was once thought, to spawn in the deeper waters of the continental shelf.

Student

POSTER SESSION ABSTRACTS

Characteristics of Atlantic Halibut *Hippoglossus hippoglossus* in Norwegian Fjords Revealed by Pop-up Satellite Archival Transmitting (PSAT) Tags

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Seasonal movements and basic life history behaviour of Atlantic halibut *Hippoglossus hippoglossus* were examined in a fjord on the south-western coast of Norway. In this preliminary study of the species using Pop-up Satellite Archival Transmitting (PSAT) tags, individual fish were tagged with electronic archival tags that collected temperature, depth and ambient light data for up to 10 months. During winter, individual fish occupied water deeper than 900 m for more than 2 months. Their vertical movements during this period could be up to 520 m during a 12-hour period. During spring and summer, the fish moved into shallower water, ranging from 50 m to 600 m and their short-term vertical movements were less extensive than during winter. Although it was expected that the fish would exit the fjord during summer, all but one remained in the fjord for the duration of the experiment. PSAT tags provided unprecedented insight into the seasonal behaviour and environmental conditions experienced by individual fish. Because Atlantic halibut catch rates are extremely low in the region and these tags are fisheries-independent, they are an efficient method of investigating the basic life history of halibut in Norwegian waters.

Student

POSTER SESSION ABSTRACTS

Stream Temperature Response to Variable Glacier Coverage in Coastal Watersheds of Southeast Alaska

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We measured stream temperature continuously during the 2011 summer runoff season (May through October) in nine watersheds of southeast Alaska that provide spawning habitat for Pacific salmon. The nine watersheds have glacier coverage ranging from 0 to 63%. Our goal was to determine how air temperature and watershed land cover, particularly glacier coverage, influence stream temperature across the seasonal hydrograph. Multiple linear regression identified mean watershed elevation (related to glacier extent) and watershed lake coverage (%) as the strongest landscape controls on mean monthly stream temperature, with the weakest (May) and strongest (July) models explaining 86% and 97% of the temperature variability, respectively. Mean weekly stream temperature was significantly correlated with mean weekly air temperature in seven streams; however, the relationships were weak to non-significant in the streams influenced by glacial runoff. Streams with >30% glacier coverage showed decreasing stream temperatures with rising summer air temperatures, while those with <30% glacier coverage exhibited summertime warming. Glaciers also had a cooling effect on monthly mean stream temperature during the summer (July through September) equivalent to a decrease of 1.1°C for each 10% increase in glacier coverage. The maximum weekly average temperature (MWAT, an index of thermal suitability for salmon) in the six glacial streams was substantially below the lower threshold for optimum salmon growth. This finding suggests that while glaciers are important for moderating summer stream temperatures, future reductions in glacier runoff may actually improve the thermal suitability of some streams in northern southeast Alaska for salmon.

POSTER SESSION ABSTRACTS

Stakeholder Participation in the Polish Commercial Fishing Fleet

Elizabeth Figus

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Baltic Sea fisheries are currently governed by the European Union Common Fisheries Policy (EU CFP) through a number of multi-level, interwoven schemes. A key part of the EU CFP is the *ecosystem approach to fisheries (EAF)*. EAF calls for a focus on the human dimensions of fisheries ecosystems. In line with this approach, the EU CFP calls for increased participation by stakeholders at regional and local levels. In Poland, this goal is pursued through the creation of new arenas, such as Fisheries Local Action Groups (FLAGs), stakeholder forums (such as the WWF hosted „Round Table" meetings), and fish Producer Organizations (POs). My work analyzes the creation of these stakeholder arenas from the perspective of Small-Scale Polish Fishers. I was especially interested in determining whether the participation of Small-Scale Fishers—traditionally a group with a low level of Successful Stakeholder Participation (SP)—changed, and how. Fieldwork included two months of bilingual interviewing and visits to 46 communities along the Polish coastline. I spoke with Fishers, scientists, environmental activists, and community members in order to create a comprehensive outline of the current Polish fishing fleet. I found that a lack of transparency and efficiency in the EU CFP system prevents the voices of Small-Scale Fishers as Stakeholders from being heard in effective ways. New stakeholder arenas have been unsuccessful in creating space for new participants and instead perpetuate old hierarchies of agency in the policy system.

Student

POSTER SESSION ABSTRACTS

Effects of *Ichthyophonus* on Spawning Chinook Salmon in the Yukon River Drainage

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In recent years, Chinook salmon (*Oncorhynchus tshawytscha)* in the Yukon River have declined sharply due to unknown reasons. However, several environmental or human-induced factors are likely contributing, including changing host-parasite dynamics. *Ichthyophonus*, a protozoan parasite, adversely affects stamina of adult salmon during their spawning migration. To understand the physiological effects of *Ichthyophonus* on spawning adults, we compared blood parameters and plasma cortisol, proximate composition of muscle and eggs, as well as milt counts between *Ichthyophonus*-infected and uninfected fish. During summer f 2010-2012, spawning adults (*n*=51, 33, and 43, respectively) were collected from the Salcha River, a Yukon River tributary. *Ichthyophonus* prevalence was low, with 8%, 6%, and 2% of adults being infected from 2010-2012, respectively. We found no differences in proximate composition of adult salmon muscle or eggs among collection years or infection status. We found no significant differences in blood parameters between *Ichthyophonus*-status or sampling year, except in 2010 where creatine kinase was significantly higher in *Ichthyophonus*-positive compared to *Ichthyophonus*-negative salmon. There were no significant differences in plasma cortisol between *Ichthyophonus*-positive and *Ichthyophonus*-negative salmon in 2010, results for additional years are pending. Milt counts were also not significantly different among sampling years or *Ichthyophonus*-status. While overall sample sizes were small and *Ichthyophonus* prevalence was low during the sampling years, our results indicate that infection with the parasite does not appear to alter physiological condition of adult salmon on the spawning grounds.

Student

POSTER SESSION ABSTRACTS

Analysis of Benthic Communities on Alaskan Weathervane Scallop Beds

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We are beginning work on a multivariate statistical analysis of benthic communities in areas targeted by Alaska's commercial weathervane scallop (*Patinopecten caurinus*) fishery and in nearby areas where no scallop fishing occurs. Weathervane scallops co-inhabit areas with commercially valuable fish species such as walleye pollock (*Theragra chalcogramma*), Pacific cod (*Gadus macrocephalus*), yellowfin sole (*Limanda aspera*), and northern rock sole (*Lepidopsetta polyxstra*). Few observations are available on essential fish habitat (EFH) and the benthic communities that support the productivity of these commercially important species. These species are incidentally caught in the scallop fishery and sampled by onboard observers, who have routinely collected bycatch data from scallop fishing vessels since 1993. Using observer bycatch data from commercial scallop dredges, as well as CamSled image data from video surveys conducted by the Alaska Department of Fish and Game, we will estimate: (1) spatial patterns in community composition on weathervane scallop beds in the Gulf of Alaska, Bering Sea and Aleutian Islands, reflective of species interactions (e.g., predation, competition) and relationships to environmental factors (e.g., depth, substrate type, currents, temperature), and (2) interannual changes in species composition that may be related to climate forcing (e.g., temperature variability) and anthropogenic effects (e.g., dredge and trawl fishing intensity). We will also incorporate CamSled observations to measure the impacts of fishing on benthic habitat, comparing areas open and closed to fishing off of Kodiak Island, AK. Results from this study will provide information to fishery managers on benthic community composition and associated habitat to improve EFH definitions for federally managed species of groundfish, scallops and crabs. Benthic community compositions on scallop beds may also serve as useful indices of climate change in Alaska.

Student

POSTER SESSION ABSTRACTS

In-stream Habitat Restoration on the Sitkoh River, Southeast Alaska – Lessons in Partnerships, Implementation, and Effectiveness Monitoring

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The restoration of salmon habitat degraded from past logging practices is a priority for many communities in Southeast Alaska that depend upon salmon for their cultural and economic well-being. Restoration projects can be more successful when multiple partners pool their resources. These resources can include funding, public outreach, technical assistance, and advocacy, to name a few. With funding from the Alaska Sustainable Salmon Fund, the Sitkoh River Restoration Project successfully partnered the US Forest Service, the Sitka Conservation Society, and Trout Unlimited in an effort to restore 1800 feet of stream that diverted from its native channel to an adjacent logging road. We learned many lessons of how to implement a public-private partnership. By sharing these lessons with a wider audience, we endeavor to increase the capacity of other entities to engage in habitat restoration projects. We will also discuss the methods and we will use, and challenges, to effectively monitor the outcomes of this project.

POSTER SESSION ABSTRACTS

Spatial Variation in Abundance and Condition of Juvenile Chum Salmon (*Oncorhynchus keta*) in Response to Marine Factors in Southeast Alaska

Michael Kohan[1*], Megan McPhee[1], Joe Orsi[2], Franz Mueter[1] and Phil Mundy[2]

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Chum salmon (*Oncorhynchus keta*) are an important resource in Southeast Alaska, but little is known about the mechanisms affecting the critical early life stages in nearshore and coastal marine environments and how these mechanisms influence survival. By identifying biophysical indicators that affect physiological status of seaward migrating juvenile chum salmon, this project will provide valuable ecosystem metrics to help refine chum fishery management actions for hatchery and wild chum salmon as well as other salmon species in Southeast Alaska. Two projects, the Gulf of Alaska Integrated Research Project (GOAIERP) and the Southeast Alaska Coastal Monitoring Project (SECM), collect juvenile chum salmon and biophysical data from offshore and inshore stations in Southeast Alaska, respectively. Stations sampled correspond to a major migratory pathway juvenile chum salmon utilize each summer from the northern region of Southeast Alaska out to the Gulf of Alaska. These projects provide spatially explicit data during juvenile chum salmon early marine residency making it possible to assess the spatial variation in abundance and condition for chum stocks in northern Southeast Alaska. The proposed work will examine the early marine residency of juvenile chum salmon in nearshore and coastal marine environments of northern Southeast Alaska. This graduate study is partially supported by the University of Alaska Fairbanks, the Alaska Sustainable Salmon Fund, and three regional aquaculture associations in Southeast Alaska: Douglas Island Pink & Chum, Inc., the Northern Southeast Regional Aquaculture Association, Inc., and the Southern Southeast Regional Aquaculture Association, Inc.

Student

POSTER SESSION ABSTRACTS

Changes in an Arctic Grayling Fishery Following the Introduction of a Non-native Aquatic Weed, *Elodea nuttallii*, Altered Flow Regimes and Changes in Management Policy.

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Chena Slough is historically one of the most productive arctic grayling (*Thymallus arcticus*) streams in North America. Since the mid-1990's there has been concern about deteriorating grayling habitat. In 1997 grayling habitat was mapped, and habitat loss under different management scenarios was projected by the United States Army Corp of Engineers. Concurrently, the Alaska Department of Fish and Game stocked the slough with grayling and instituted harvest restrictions in an attempt to revitalize the declining population. In the intervening years, stream restoration efforts have attempted to restore a more natural flow regime by replacing undersized culverts. In 2010, the non-native aquatic weed *Elodea nuttallii* was discovered in Chena Slough. A detailed literature review revealed that the plant was likely introduced to the slough in the past ten years and rapidly expanded to occupy large sections of the slough. In 2011, grayling habitat in Chena Slough was re-mapped, and. the current and historic habitat maps were compared to evaluate changes in grayling habitat structure. We found substantial reductions in both grayling rearing (29%) and spawning habitat (30%) despite efforts to restore the stream. In addition, grayling catch has fallen significantly over the same time period. These changes appear to be related to an increase in aquatic macrophytes within Chena Slough, primarily *E. nuttallii,* which occupies 47% of the lower 17 km of the stream. This study emphasizes the importance of collecting data prior to starting long-term restoration projects, the need for periodic evaluations of progress, and how non-native species can unexpectedly create major set-backs for restoration efforts.

POSTER SESSION ABSTRACTS

Evidence of Stabilizing Selection on the MDH1 Gene Regulatory Region in Alaskan Cisco Species

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A single nucleotide polymorphism (SNP -286) within the regulatory region of the MDH1 gene has been linked to sympatric selection in whitefish species pairs. We examined this regulatory region in the Alaskan cisco species: *Coregonus autumnalis* (n=35), *C. laurettae* (n=29), and *C. sardinella* (n=22). We hypothesized that variation within each species would be low, as genetic drift would reduce the intermediate allele frequencies over time. Contrary to this hypothesis we discovered that SNP -286 is highly variable within *C. autumnalis* and *C. laurettae*, with heterozygous frequencies above or near 50%. Within *C. sardinella* it demonstrated a different pattern of alleles. SNP -286 is also the only one of 72 SNPs observed to be variable within all whitefish species in the study. The high frequency of heterozygosity in two divergent species, even across population structure, is an indicator of strong stabilizing selection at this locus. This poster is an example of research by Alaskan high school students, as a part of the Rural Alaska Honors Institute (RAHI) program, and the Alaska Biomedical Partnership for the Research and Education Pipeline (BioPREP).

Student

POSTER SESSION ABSTRACTS

Spatial and Temporal Variability in the Trophic Roles of Chukchi Sea Fishes

Jennifer M. Marsh and Franz J. Mueter

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With declining sea-ice extent, and longer open-water seasons, there is an increasing interest in shipping, oil exploration and commercial fishing in the Arctic. Anticipated natural and anthropogenic changes are expected to alter the ecosystem of the Chukchi Sea, including its fish communities. As a component of the Arctic Ecosystem Integrated Study, this project presents a unique opportunity to collect baseline C and N stable isotope data to assess the ontogenetic, spatial and temporal variability of the trophic roles (trophic level and diet source) of key fish species in the Chukchi Sea in a relatively pristine system and in the absence of a commercial fishery. Unlike diet analysis, stable isotope analysis integrates only food items assimilated by consumers, accurately representing a transfer of energy between trophic levels and integrates diet over a longer time-scale. During August and September of 2012 and 2013, 16 fish species and 4 baseline invertebrate species will be collected from surface, midwater and bottom (only 2012) trawls within the Chukchi Sea. We will outline our project goals, provide a general overview of the Chukchi Sea food web, and present preliminary data on the length and spatial distributions of the samples collected in the 2012 field season.

Student

POSTER SESSION ABSTRACTS

Evaluation of Fish By-Product and Plant Protein-Based Diets on Juvenile Least Cisco Hatchery Performance

Patricia L. McCall[1], Stacy L. Vega[1], Trent M. Sutton[1], Rick Barrows[2], Peter Bechtel [3], and Scott T. Smiley[4]

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Juvenile least cisco *Coregonus sardinella* were cultured over a five-week laboratory experiment to evaluate the effects of six diets formulated with varying amounts of fish and plant protein and lipid on hatchery-production attributes. Control milt meal, control salmon oil, Zeigler LB (floating pellet), and Zeigler SB (slow-sinking pellet) feeds all contained fish meal protein with plant lipids, while milt meal and salmon oil feeds contained plant protein substituted for fish meal and fish oil, respectively. Although juvenile least cisco had similar initial sizes ranging from 58.5 to 61.5 mm in total length and 1.4 to 1.7 g in weight, significantly greater weight gain was observed for fish fed the control milt meal (5.2 g) than those fed Zeigler SB (3.2 g) even though both diets contained fish meal protein and plant lipids. No other diets were different in terms of weight gain. Survival rate, although high for all diet types, was significantly higher for fish fed the control milt meal (97.5%), salmon oil (98.8%), control salmon oil (97.5%), and Zeigler LB (100%) than fish fed Zeigler SB (91.3%). No difference in survival rate was detected between milt meal and the remaining diets. Specific growth rates in length and weight, and mean Fulton condition factor did not differ significantly among diet types. Based on these results, we recommend utilizing fish by-product and/or plant materials as the protein and lipid sources for rearing juvenile least cisco in intensive culture environments as they yielded superior or similar hatchery-production attributes as traditional commercial diets.

Student

POSTER SESSION ABSTRACTS

An In-Season Run Timing Prediction Model for Yukon River Chinook Salmon

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The Yukon River Chinook salmon *Oncorhynchus tshawytscha* fishery is considered a gauntlet fishery, where salmon are harvested throughout the main stem of the river and its tributaries. Historically, fishing effort in both subsistence and commercial fisheries has been controlled through time and area closures as well as gear restrictions. Due to this indirect method of controlling catch, it is crucial for fisheries managers to be able to predict both the timing and abundance of salmon throughout the river and during the entire migratory season. This research aims to assist managers by providing a set of models to (1) predict the most likely date of the start of the run and (2) produce in-season estimates of run timing and abundance at various locations along the river. These models will be incorporated into a tool which will be made available to managers as well as interested members of the public.

Student

POSTER SESSION ABSTRACTS

Exploring Factors Affecting Chinook Salmon Abundance in the Togiak River, Alaska

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Chinook salmon are a valuable resource for subsistence, sport, and commercial harvests in the Togiak River. Recently, abundance of this species has declined for unknown reasons. Concurrently, traditional ecological knowledge suggests that the spawning distribution of Chinook salmon has shifted from tributaries to the main stem. We hypothesize that the decline in abundance and shift in spawning distribution may be related to an interaction between changing environmental conditions and genetic differentiation between main stem and tributary spawning fish. In light of this hypothesis, to begin to understand the factors influencing spawning site selection and relative abundance of Chinook salmon in the Togiak River, we will: (1) compare habitat characteristics of Chinook salmon spawning and non-spawning areas by analyzing historical and current satellite and high resolution digital imagery for changing environmental conditions and (2) investigate genetic differences between Chinook salmon spawning in the main stem and those spawning in tributaries by analyzing single nucleotide polymorphisms (SNPs).

POSTER SESSION ABSTRACTS

Assessing Salmon Populations on the Copper River Using Remote RFID Streambed Readers

Vija Pelekis

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Management of Copper River salmon is complex due to inter-annual variation in the size and timing of stocks, fisheries that target a mixture of species and intra-specific stocks, and difficulties in estimating abundance due to the physical characteristics of the drainage. This year, the Native Village of Eyak initiated a pilot study to assess the feasibility of using remote RFID streambed readers on select tributaries of the Copper River for long-term monitoring of spawning distribution and stock-specific run timing. This project was designed run concurrently with our Chinook Escapement Monitoring project using fish marked with TBA-PIT tags. Streambed readers were installed July 21, 2012 on the Gulkana River and technicians remained onsite to verify that all tagged fish were received by streambed readers. During the pilot phase of the study, the main objectives are to verify that streambed readers can withstand extreme river conditions and that all tagged fish are detected. If feasible, RFID streambed readers could be installed in other major spawning tributaries on the Copper River. A study of this sort would greatly contribute to understanding long-term spatial and temporal population trends, including the possible effects global climate change.

POSTER SESSION ABSTRACTS

Impact of Arctic Climate Warming on Juvenile Salmon Abundance and Condition in the Northeastern Bering and Chukchi Seas

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The Arctic is warming at an unprecedented rate. Associated with rising temperatures are decreases in thickness and coverage of summer snow and ice. These changes in temperature and summer sea-ice extent are resulting in a notable shift in the northeastern Bering Sea and Chukchi Sea (NEBS/CS) systems from Arctic to more subarctic conditions. Consequently, increases in the abundance of juvenile chum (*Oncorhynchus keta)* and pink salmon (*O. gorbuscha)* have been observed. To date, there is little information on salmon distribution in the Arctic. This project will focus on the ability of the NEBS/CS regions to support juvenile pink and chum salmon growth by measuring insulin growth factor-I (IGF-I) levels, energy content, and analyzing diet. IGF-I is a growth hormone that stimulates muscle and cartilage growth and is an accurate measure of relative growth rate in many teleost species. In addition to data collected during the scheduled 2012 and 2013 surveys, this project will use diet and energetic data collected by the Bering-Aleutian Salmon International Surveys (BASIS) to allow for a comparison to be made between warm (2001-2005) and cold (2006-Present) regimes. With increasing utilization of the Arctic for summer feeding grounds by juvenile salmon, it is important to describe Arctic regions to determine whether these habitats are conducive to early developmental growth and condition of salmon species. Understanding the relationships between diet, growth, and temperature are necessary and will benefit fisheries managing salmon returns and assist in adaptation of fishery management to increasing climate variability.

Student

POSTER SESSION ABSTRACTS

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

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Mercury (Hg) is a pervasive environmental contaminant that is known to bioaccumulate within individuals and biomagnify up trophic webs. Three primary sources of Hg exist in freshwater ecosystems at northern latitudes: (1) geological sources that contribute background levels, (2) atmospheric deposition of anthropogenic Hg, and (3) marine-derived Hg transfer via ocean currents and migrating biovectors. This research utilizes the stable isotopes of carbon (^{13}C) and nitrogen (^{15}N) to interpret trophic dynamics of Hg accumulation in freshwater species from Jo-Jo Lake, located in Southwest Alaska. This lake lacks anadromous sockeye salmon (*Oncorhynchus nerka*) as the principal regional source of marine-derived Hg. We addressed our objective by: (1) determining how the bioaccumulation of Hg varies intraspecifically between two trophically polymorphic populations of nonanadromous sockeye salmon (kokanee) and (2) comparing Hg concentrations interspecifically in predominant species of both benthic and limnetic trophic webs. Despite the lack of marine-derived Hg, total Hg (wet weight) concentrations in 2% of kokanee and 100% of northern pike were above the EPA consumption guideline of 0.3ppm. Generalized linear modeling of natural log transformed values of total Hg concentration was used to determine that body size, trophic position (as calculated from stable isotope values), and age were strongly positively correlated Hg concentrations across species. Intraspecifically, however, we found no difference in total Hg concentrations between the kokanee morphs ($W=198$, $p=0.71$), despite the morphs differences in diet, body size, and trophic position.

Student

POSTER SESSION ABSTRACTS

Winter Movement Patterns and Habitat Use of Kotzebue Region Inconnu

Nicholas Smith[1], Trent Sutton[1], Christian Zimmerman[2], Raymond Hander[3], Christine Moran[4], Alex Whiting[5]

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Inconnu *Stenodus leucichthys* are a large, long-lived piscivorous whitefish species 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. Currently, winter habitat use and fish movements have not been defined due to sampling constraints. The specific objectives of this study were to: (1) identify the late fall and winter distribution of inconnu in the Selawik and Kobuk Rivers; and (2) assess the importance of water depth, temperature, and salinity as determinates of winter habitat use of Kotzebue region inconnu. Data-collection methods consisted of surgically implanting acoustic telemetry tags in 80 fish from each river in 2010 and 2011, and deploying a fixed array of 20 Vemco VR2W acoustic receiving stations affixed with archival tags throughout Selawik Lake and Hotham Inlet. Results to date indicate that Selawik and Kobuk river inconnu display a high degree of spatial overlap during the wintering period and, therefore, exhibit similar patterns of temperature and salinity use in the wintering areas of Selawik Lake and Hotham Inlet. With these results, future management plans must focus on maintaining the viability of the smaller Selawik stock.

POSTER SESSION ABSTRACTS

Long-Term Variability in Growth and Freshwater Age of Juvenile Sockeye Salmon in Lake Clark, Alaska

Jennifer L. Wiley and Christian E. Zimmerman

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Sockeye salmon (*Oncorhynchus nerka)* support a valuable subsistence and commercial fishery in the Bristol Bay watershed and are an important resource within Lake Clark National Park and Preserve. Depending on nutrient availability, juvenile sockeye salmon typically spend 1-2 years in freshwater nursery environments, but recent research has suggested a higher number of Lake Clark sockeye salmon are spending only one year in freshwater before migrating to sea. Using archived otoliths collected from between 1970 and 2011, we compared freshwater growth and age between two time periods: brood years 1970-77 and 2004-2007 (capture years, 1975-1978, 1982; 2010-2011, respectively). Age-2 smolts numerically dominated in the 1970's and age-1 smolts numerically dominated in the 2000's. Freshwater growth to age-1 was significantly higher in the 2000's. Further work is needed to assess the role of environmental factors, such as temperature and water clarity, in controlling juvenile sockeye salmon growth and age structure within Lake Clark.

Alaska Chapter of the American Fisheries Society
39th Annual Business Meeting Agenda
24 October 2012
Kodiak Convention Center, Kodiak, Alaska

1. Call to Order – Trent Sutton (President)

2. Determination of a Quorum

3. Approval of Agenda

4. Approval of minutes from the 2011 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
iv.	Electronic Communication	Vacant
v.	Environmental Concerns	Cecil Rich
vi.	Finance	Ray Hander
vii.	Fisheries Communication and Education	Katrina Mueller/Cheryl Anderson
viii.	Membership	Phil Loring
ix.	Molly Ahlgren Scholarship	Ray Hander
x.	Newsletter	Bill Bechtol
xi.	Past Presidents	Audra Brase
xii.	Program	Mark Wipfli
xiii.	Resolutions and Bylaws	Hamachan Hamazaki
xiv.	Student Sub-units	Thomas Farrugia
xv.	Wally Noerenberg Award	Ted Otis reporting for Ken Gates

6. Outgoing President's Address – Trent Sutton

7. Old Business

8. New Business

a. AFS Western Division report (Mary Buckman)

b. Update to Vice President election

c. 2017 AFS meeting bid - Anchorage

d. 25-yr membership pins

e. Reappointment of all committee chairs

9. Open forum

10. Adjourn

Alaska Chapter of the American Fisheries Society
38th Annual Business Meeting Notes
17 November 2011
Alyeska Resort, Girdwood, Alaska

1. The meeting was called to order at 5:18 p.m. by President Audra Brase.

2. A quorum was established.

3. The agenda was presented and approved without change by unanimous decision.

4. The minutes of the 2010 Alaska Chapter AFS Business Meeting were approved without change.

5. Reports

a. **Treasurer's Report:** Treasurer Lee Ann Gardner handed out a financial summary for the chapter via a supplementary document. A revised version will include final numbers from $1,000- $1,500 per year received as royalties from Fishes of Alaska. Gross revenues are reported at this meeting, as in past meetings. Donations reported are from this meeting alone. The Ahlgren family donations for the Molly Ahlgren Scholarship Fund from the past fiscal year are not included.

b. **Committee Reports**

i. **Awards:** Theresa Tanner reported that the Awards Committee received three nominations each for the Meritorious Service Award and the Alaska Chapter Service Award. No nominations were submitted for the Almost Darwin Award. The five committee members selected *Ray Hander* for the Alaska Chapter Service Award. For the first time in Chapter history, the Meritorious Service Award was shared amongst a group of four individuals: *Charles Krueger, Christian Zimmerman, Karen Gillis and Joseph Spaeder*. All five recipients were present at the annual meeting in Girdwood to receive their awards.

In 2011, 23 students presented papers and 13 students presented posters. The student presentations were evaluated by 24 Chapter members who volunteered to serve as judges. The two best paper and one best poster award recipients selected from the presentations at the AFS Annual Meeting in Girdwood, Alaska were:

Best Student Paper:

- *Parker Bradley*, "Characterizing the Juvenile Fish Community in Large Glacial Rivers in Alaska"
- *Jason Neuswanger*, "The Importance of Drifting Debris for Drift-Feeding Juvenile Chinook Salmon"

Best Student Poster:

- *Robert Marcotte*, "Determining Population Relationships for Two sister Species of Coregonus: Arctic and Bering Cisco (*C. autumnalis* and *C. laurettae*)"

ii. **Continuing Education:** Emily Lescak presented the CE report due to Tammy's absence. Four workshops were planned in association with the annual meeting, and three workshops were successfully held on November 14-15. Thirty-five students enrolled in the three workshops which focused on technical topics: sonar use for fisheries escapement, otolith microanalyses, and ecological statistical modeling. A follow-up survey was developed for participants to gather opinions about what worked and didn't work as well as suggestions and ideas for future workshops.

Amanda Rosenberger proposed to continue to try to provide opportunities for students to attend professional development seminars. She noted that students are reluctant to pay up front given the uncertain results of the seminars. She suggested that there be little to no charge for students to attend. President Brase noted that a low cost might suggest low quality. Thomas Farrugia agreed with Amanda. A brief synopsis of the purpose and content of the seminar was given by Amanda. It was pointed out that meetings could be moved to concurrent or later times during regular meeting days, rather than on days preceding the meeting dates. Lee Ann suggested that students who volunteer and have their travel and fees waived should have compulsory attendance to professional development seminars.

iii. **Cultural Diversity:** Trent Sutton presented Sara Gilk-Baumer's report. Ten applicants applied for the award and three individuals had their travel funded: Leslie Jensen (Talkeetna), Theresa Floyd (Fairbanks), and Rachel DeWilde (Fairbanks). Rachel is a sophomore at the University of Alaska Fairbanks working towards a B.S. in Biology, Leslie is a recent graduate from the University of Washington and is an intern at the Aquatic Restoration and Research Institute, and Theresa is a Master's student at the University of Alaska Fairbanks. The winners will be announced at the banquet.

iv. **Electronic Communication:** Allen Bingham reported that during the past year, the Chapter's web site underwent a transition from the "old" to the "new". One of Audra Brase's goals as Chapter President was to upgrade the Alaska Chapter website. This past spring she began soliciting input from the Chapter's Executive Committee (Excomm) and various Chapter members as to what they would like to see in a new design. Audra researched other AFS Chapter's website designs, as well as talk to three different website contractors. Sundog Media was hired in July to design a new site, including adding electronic registration/bill pay for the Chapter Meeting and converting us over to a user friendly and modern platform (Wordpress). An initial design was presented and approved by the Excomm in August. Lee Ann Gardner took the lead in getting the electronic payment/registration system set up through Plug'n Pay Technologies, Inc. Through the fall Audra continued to work with the Sundog Media contactors adding and editing content and learning Wordpress. Audra and Allen Bingham worked with Farasha Euker, the Parent AFS webmaster, to get the new Chapter website set up on their servers. Farasha suggested that the Chapter invest in a

new domain name to optimize search engine queries and to gain simplicity for end users. The domain name ***afs-alaska.org*** was purchased through DreamHost for 3 years. The Chapter took "ownership" of the new website on September 30. The new web-site it still a work in progress in regards to older content (for example past Chapter newsletters will be added in the upcoming months).

In the past, the Student Subunit web site was maintained as a portion of our site. Currently, information about each of the campus groups for the Student Subunit is provided on our new web site, but we do not have plans for maintaining the student subunit web sites, we will however provide a link to any web site for each campus group as they become developed.

As has been the case for the last four 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 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 2011 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 I filter-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 2010-October 2011) a total of 97 email messages (down slightly from 108 last year) were sent to our membership.

Allen will be bowing out of being the Electronic Communications Committee chair person effective the end of this meeting (2011 in Girdwood). In light of my upcoming departure as chair, the following summarizes the three major areas of what I have done as chair that will need to be taken over soon: (1) webmaster; (2) chapter membership data base manager; and (3) maintain and moderate the Chapter's email listserver. In regards to the webmaster, since Audra has (as noted above) has taken over as webmaster, and she has agreed to continue in that role. Duties (2) and (3) are more or less tied into each other … and (2) is the more time consuming and complex activity. I currently use a combination of MSExcel workbooks and some SAS code I developed to manage the data base. The functions of the SAS code were fashioned after a compiled

RBase program that was written by my predecessor "ages ago" to accomplish the same functions. I wrote the SAS code because the RBase program stopped working during one of the many operating system upgrades over the years. Long-story short it would be good to get either someone conversant in SAS and with access to a SAS license to take over this duty --- or someone with good database skills in some other data base package (e.g., MS SQL, ACCESS, etc.) who has the time to re-write the code in the language of their choice. Allen can continue to function in this capacity for at least the first 6-9 months of 2012.

v. **Environmental Concerns:** Cecil Rich reported that there were no issues brought to the committee for consideration in 2011 by members or by external organizations or agencies.

vi. **Finance:** Ray Hander reported that the FAOC met quarterly in 2011 with the Chapter's Wedbush Morgan Securities (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 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.

All October 2011 endowment balances are less their 2011 award disbursements. The Chapter's WMS investment portfolio for endowments has gained approximately $5,940 in dividends and interest (D&I) earned since 30 October 2010. The Cultural Diversity Fund (CDF) increase is from $809 D&I earned. The Wally Noerenberg Fund (WNF) decrease is from the award payout for 2011 but had a D&I earning of $999. The Molly Ahlgren Scholarship Fund (MASF) gain is from a combination of contributions and $4,141 D&I earned. The $10,000 contribution is a minimum estimate of FY 11 contributions to the MASF.

Chapter Investment Fund A (Fund A) lost value since October 2010 but only due to recent withdrawals for 2011 meeting expenses. Previous gains were through $4,905 in D&I earned, 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 (MMC) and 1st National Bank Alaska cash accounts (CA) fluctuate annually during August through December due to annual meeting and continuing education expenses and income. The decrease in Total general funds is from meeting income deposited to date. The MMC account during the remainder of the year holds approximated $7,000–$10,000 to conduct regular Chapter

business. 2011 is the first year for offering online sales for the Chapter. The online sales process required a traditional bank account for deposits. The CA houses petty cash and online income such as meeting registration and continuing education. Online sales from the CA are transferred to Fund A or the MMC while leaving a balance of approximately $2,500 for petty cash. In past years, the MMC account received monies from registration, continuing education, etc., hence the discrepancy seen in Table 1.

At present, the chapter is experiencing modest positive investment returns (approximately 4.7%) while maintaining a moderately conservative investment portfolio. Realized portfolio gains are due to the Chapter's portfolio asset allocation leaning heavily towards bonds that continue paying modest returns while market volatility continues. Overall, the chapter's investments are in bonds (87%), stocks (8%), 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.

vii. **Fisheries Communication and Education:** Trent Sutton presented the committee report. Laurel Devaney is stepping down from the committee, Katrina Mueller, Fisheries Education Coordinator with the US fish & Wildlife Service Regional office in Anchorage, will be replacing Laurel as the co-chair effective immediately. Katrina brings energy, a wealth of experience, and many new ideas to the committee.

The Communication and Education Committee held a meeting of interested AFS members at the annual meeting in Girdwood. Tim Stallard, with the Municipality of Anchorage, gave a presentation of a recent "Weed Smackdown" which removed thousands of pounds of choke cherry from riparian areas in Anchorage. AFS members attending the meeting also brain-stormed ideas for future activities.

viii. **Membership:** Mark Wipfli reported that the number of total members for 2011 is up substantially from previous years, by about 30%. As of September 2011, the chapter has 425 paid memberships, with most of the increases coming from student memberships (110 total for this year), with other increases in regular memberships (232 total for this year), life members (35 total for this year), and young professionals (36 total for this year). This is especially encouraging and will likely continue through next and subsequent years.

ix. **Molly Ahlgren Scholarship:** Ray Hander reported that the Molly Ahlgren Scholarship Committee updated the application so there was greater clarity of the criteria for persons eligible to apply by basing the criteria on accrued credits for a junior class status. The application was sent out on 30 August 2011 to various distribution outlets such as financial aid offices, scholarship coordinators, and professors at the University of Alaska and Alaska Pacific University, as well as the Chapter web site. In 2011, the committee met and selected a winner and a first and second alternate of the 2011

award. The committee has made a recommendation on a scholarship winner to the Executive Committee and it was approved. Items to be completed after the ceremonial award is given are disbursement of funds to the award winner's university in time for their upcoming term and a letter to the Ahlgren family reporting on the 2011 award.

x. **Newsletter:** Bill Bechtol reported that he would like to receive more articles from members. The newsletter comes out once a quarter. Bering Sea Fishrman's association, life according to shellfish, so you want to be a scientific diver, marine debris: more than meets the eye or sensor were the main articles over this past year. Each issue includes about 75 hard copies that are mailed out, which are also mailed out to libraries, etc. Email distributions range from 380-450 recipients per newsletter. The total cost of producing the newsletter is $1,500 a year. Historically, the cost was ~$2,000 per year and has gone down due to fewer mailings. The deadline for submission is the 10th of the month prior to the quarterly issue.

xi. **Past Presidents:** Lisa Stuby reported that the Past President's luncheon went well and that there were eight participants. This is generally a fairly relaxed event where past and present Alaska Chapter presidents get together and discuss pertinent topics and later give recommendations to the Alaska Chapter membership during the annual Business Meeting. One topic that we discussed was attracting future candidates for vice president. It has been noted that for many years we have had one candidate running for officer positions like vice president, secretary, etc. Per past discussions, it was noted that there is a belief that it is important that candidates do not get discouraged when they run and lose, and having one candidate has been a way to avoid this. However, in the future, if there is more than one candidate, that would be okay as well as there is nothing wrong with a little competition. Running for Vice President is a 4-year commitment. The first year isn't too busy as one becomes a Vice President as the only responsibility is the Membership Committee. The following year steps up to President Elect and the individual is in charge of that year's Alaska Chapter meeting, which is a significant amount of work. The following year, the officer becomes the President and will chair the Executive Committee, preside at all meetings, represent the Alaska Chapter to the Western Division and Parent Society, and write a quarterly "President's Corner" for the *Oncorhynchus*. The Alaska Chapter President will also travel to either a Western Division or National AFS meeting. Finally, after gaining three years of wisdom, the officer becomes the Past President. The Past President is responsible for updating the Alaska Chapter Procedure Manual and, if needed, the Chapter Bylaws. Overall, the Past President is the source of "wisdom" to the rest of the ExCom. One thing that was brought up was that a good time to approach potential, future candidates is at the Alaska Chapter meetings after field seasons have wrapped up and the holidays loom. For the past several years, the chapter has had Presidents from Fairbanks with many from ADFG and UAF. While this is great, it would be nice to have some candidates representing other parts of the state like Southeast Alaska, other agencies, NGOs, etc. It is good to have diversity in the Executive Committee.

Also discussed at the meeting was the topic of what has become the custom of cycling the annual AK Chapter meetings from the Interior (Fairbanks), South Central, and

Southeast Alaska and whether or not it has to be this way. Mark Wipfli is considering having next year's meeting in Kodiak and overall this is doable because we do not have to have this meeting in the Interior according to our bylaws. One advantage that Lisa brought up in having it in Fairbanks would be the proximity to a large number of undergraduate and graduate students who would be able to easily attend. However, students attending the University of Alaska in Kodiak would be thrilled if next year's meeting were held in Kodiak.

Past President participants at the luncheon who served as Alaska Chapter Presidents over 10 years ago: Bill Bechtol served during 1999-2000; Bill Hauser served from 1992-1993; and Bill Heard served from 1982-1983. These men commented that the Alaska Chapter meetings have grown in participation over the years and subsequently the conferences have become "bigger." It is great to see so many students participating and giving talks and poster presentations. However, student travel, socials, etc. costs the Alaska Chapter money and at some point with a still weak economy and relatively small returns on Chapter investments compared to previous years, we may need to put a spending cap on student travel, etc. One good suggestion was for the Alaska Chapter needs to better look for sponsors. Apparently at this year's Parent Society meeting in Seattle, the socials, etc. had major sponsors from industry that were advertised at the socials. It might be good for future meetings to have a member of the local arrangements committee with some expertise and industry contacts to lead a fundraising team.

The chapter's election for Vice President and Secretary is proceeding along well. There are two wonderful and enthusiastic candidates in Philip Loring for Vice President and Nicky Szarzi for Secretary. November 18th was the final day for me to receive ballots.

Lisa noted that it has been a pleasure to serve the chapter the past four years from Vice to Past President. The whole experience has been immensely rewarding.

xii. **Program:** President Elect Trent Sutton reported that there were three Continuing Education workshops at this year's annual meeting and that they all went well. There were also two plenary speakers which gave an overview of the meeting's theme. Originally, there were three plenary speakers, but one individual dropped out during the week preceding the meeting. There were 10 different paper sessions in this meeting and a total of 86 oral presentations given by both professionals and students. A total of 32 presentations were given on Wednesday, 43 on Thursday, and 11 are slated for Friday. For the poster session on Wednesday evening, there were 21 posters. Overall, the poster social went well and was well attended. There were three social at the meeting: the Welcome Social (Tuesday), the Poster Social (Wednesday), and the Banquet (right after the Business Meeting). Hobo Jim will provide the entertainment and should be a good entertainer. Andy Seitz will be the auctioneer and will have a number of students help him with the live auction. Trent is grateful to all of the people who have helped plan the meeting, in particular the Program Committee: Andy Seitz, Thomas Farrugia, and Jason

Stolarski. The Best Student Paper and Poster Awards ceremony will be held Friday morning and will herald the end of the meeting.

xiii. **Resolutions and Bylaws:** Hamachan Hamazaki reported that for the period from November 4, 2010, to November 15, 2011, the Chapter bylaws were revised and were approved by the membership on November 4, 2010. The chapter procedure manual was revised and published in May 2011.

xiv. **Student Subunits:** Emily Lescak reported that 47 students attended the meeting and that 33 of these students gave a presentations. The Fairbanks student subunit increased membership, particularly of undergraduates. They also appointed a social coordinator and have a website and facebook page. Four student members attended the national meeting in Seattle in September. The Juneau group had two successful thesis defenses and this student subunit has adopted a section of road. The Anchorage subunit is back after long hiatus and three of their student members attended the national meeting. Thomas Farrugia will replace Emily as chair of this committee. Emily has done a very good job and was thanked by various members. It was pointed out that Thomas will have big shoes to fill.

xv. **Wally Noerenberg Award:** Ken Gates reported that the 2011 WNA committee consisted of Hal Geiger, Bill Wilson, and Scott Maclean, whose three-year term ends at the 2011 Girdwood Meeting. Bill Bechtol was randomly selected and has agreed to take Scott Maclean's position on the committee beginning at the 2011 Girdwood meeting.

This year, the committee received five WNA nominations prior to the new January 31 deadline. Unlike past years, this is the most nominations ever received in one year since the awards inception. Due to the high volume of nominations and quality of the nominees, the WNA committee selected two recipients for the 2011 WNA, Mr. William R. Heard and Dr. John H. Helle. This was a unique situation for the WNA committee. The procedures manual does not address multiple recipients in one calendar year, therefore, before moving forward the WNA committee recommendation was voted on by the Executive committee during the July meeting. The executive committee voted unanimously to support the WNA committee's recommendation.

The remaining question for the WNA committee and executive committee is what to do with the remaining three nomination packets. The WNA committee discussed this in great length and has unanimously agreed and recommends that the remaining three nominees be automatically considered for future awards.

6. **Outgoing President's Address** – President Audra Brase stated that she has learned a lot about the ins and outs of the chapter workings during her time as President and is thankful for the experience. She would like to encourage people not to hang up if she calls them to offer them a position as Vice President.

7. Old Business: None

8. New Business

a. AFS Western Division report: The next Western Division of AFS meeting will be held in Jackson Hole, Wyoming, in March 2012. The Division is pushing to host a Division-level meeting in Mexico in the future.

b. Update to Vice President and Secretary elections: Lisa Stuby reported that all is going well and that Phil Loring has been nominated for Vice President and that Nikki Szarzi has been nominated for Secretary.

c. 25 yr Membership Pins: Trent Sutton will introduce and present the new inductees at the banquet.

d. **Reappointment of all committee chairs:** As listed per the Alaska Chapter bylaws, Trent Sutton reappointed all of the committee chairs, with the notable changes of Allen Bingham stepping down from Electronic Communications Committee, Laurel Devaney being replaced by Katrina Mueller on the Fisheries Communication and Education Committee, Phil Loring replacing Mark Wipfli as chair of the Membership Committee, Mark replacing Trent Sutton as chair of the Program Committee, Audra Brase replacing Lisa Stuby as chair of the Past President's Committee, And Thomas Farrugia replacing Emily Lescak as chair of the Student Subunit's Committee.

9. Open forum: Due to unforeseen circumstances (the plaque was damaged in a flood), Trent Sutton could not present outgoing President Audra Brase with a plaque. However, the plaque would be sent to Audra at a later date.

The annual meeting in 2012 will be organized by Mark Wipfli. According to tradition, the meeting would be in Fairbanks. Mark suggested Kodiak as an alternative to Fairbanks. Spreading the meeting around would better serve the members in Mark's opinion. The meeting in 1999 was the last year it was held in Kodiak, and that meeting was considered to be highly successful. Mark has gotten 99% positive feedback to the idea. Kodiak people are also in favor of the location. The logistics should be good as well.

Comments provided from the membership regarding holding the annual meeting in Kodiak:

1) Make sure a good local arrangements person is in place;

2) Lots of good opportunities for unique tours;

3) Kodiak has a strong fisheries community and good facilities;

4) Thomas Farrugia worried about attracting as many students to go to Kodiak. He also thinks that Denali would be a good opportunity for an alternative to interior meeting place. However, it was pointed out that the facilities are closed during the off season- negotiations would need to take place early on;

5) Weather could be an issue, the meeting would need to take place in early to mid-October in order to lessen negative weather possibilities;

6) A large marine presence in terms of focus could happen, assuming that the meeting time does not conflict with other meetings;

7) The Girdwood meeting cost $10,000 in student travel. Kodiak would necessitate air travel by all attendees. Mark pointed out that there is a ferry and that air travel would be comparable to traveling to southeast locations for Anchorage and Interior groups;

8) The week of the 15th of October is suggested as a potential meeting time;

9) Making sure that the meeting times coincide with a ferry schedule should be ensured.

10. Adjourn: Adjournment of the meeting was motioned by Ted, seconded, and adjourned at 6:42 p.m.

Notes