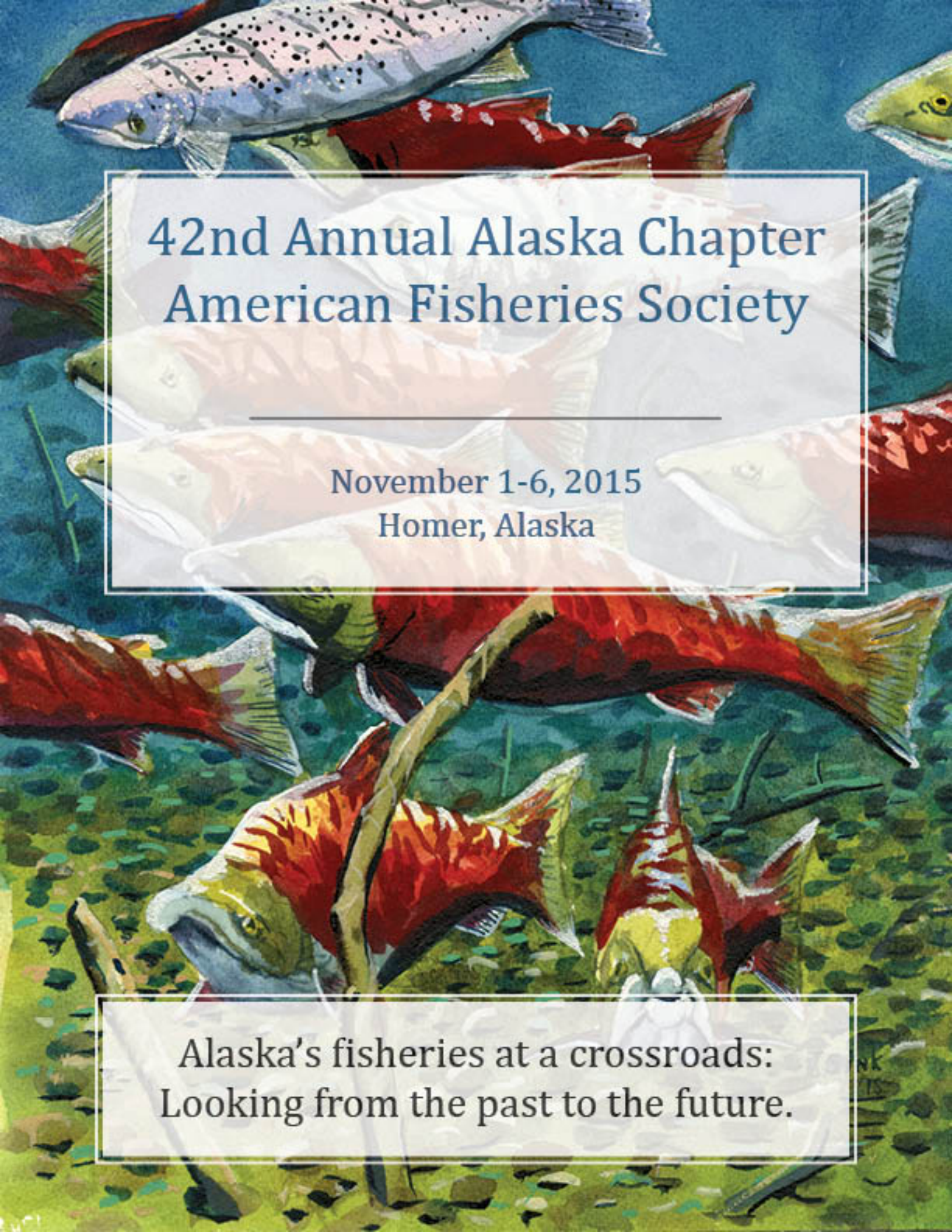

42nd Annual Alaska Chapter American Fisheries Society

November 1-6, 2015
Homer, Alaska

Alaska's fisheries at a crossroads: Looking from the past to the future.

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.afs-alaska.org/*

Cover Art: *Party time on the Kenai* by Bruce R. Sink

Artist Biographical Sketch:

Bruce Sink studied art at Columbus College of Art and Design. He holds a Bachelor of Arts degree from Otterbein College. Bruce has worked in several mediums and has chosen to concentrate his studies on watercolor and egg tempera. His subject's concentration is on the world around him and includes landscapes, wildlife, and people. Bruce focuses his work on control of light, color, texture, viewpoint and composition to create dramatic, but pleasing images. His goal is to take the viewer beyond simple images and create feelings that tell stories.

He has a passion for nature and is an avid outdoorsman. He has traveled throughout the world and has been to the Arctic Circle on several adventures. Bruce has taught watercolor painting for several decades and has judged many art competitions and exhibits. Bruce is a member of the national watercolor society and a signature member of the Arizona Watercolor Association. He is a nationally recognized watercolor painter. He was in the National Watercolor Society's all member show in 2011.

Bruce has participated and won several juried exhibitions including the Central Ohio Watercolor Society, the Ohio State Fair, the Artreach Hawaii exhibit, and the Westerville Arts Festival. Gallery exhibits include the Carousel Gallery, Nationwide Gallery, and the Columbus museum of Art Collector's gallery. His works are in several public and private collections. Bruce has lived in many parts of the United States including Arizona, Alaska, Maryland, New York, Ohio and Texas. He now makes his home in Arizona and Alaska.

Alaska Chapter of the American Fisheries Society

2015 Alaska Chapter Executive Committee
Phil Loring, Past President
Jennifer Stahl, President
Mary Beth Loewen, President Elect
Aaron Martin, Vice President
Nicky Szarzi, Secretary
Lee Ann Gardner, Treasurer
Morgan Sparks, Student Unit President

-

2015 Chapter Committees:
Awards - vacant
Continuing Education - Co-Chairs: Sara Miller and Katie Palof
Cultural Diversity Committee - Chair: Sara Gilk-Baumer
members: Lauren Divine and Lisa Fox
Electronic Communications Committee – Chair: Bert Lewis
Webmaster : Audra Brase, L**ist-Serve Manager: Hamachan Hamazaki**
Environmental Concerns Committee – Chair: Nicky Szarzi
Financial Assets Oversight Committee – Chair: Ray Hander
members: Lee Ann Gardner, Tim Joyce
Fisheries and Environmental Education Committee – Chair: Katrina Mueller
Molly Ahlgren Scholarship Award Committee – Chair: Ray Hander
members: Lee Ann Gardner, Tim Joyce, Brenda Norcross, Hall Geiger, Carol Kerkvliet
Resolutions and Bylaws Committee – Chair: Toshihide "Hamachan" Hamazaki
members: Lisa Stuby, Bill Bechtol
Wally Noerenberg Award Committee- Chair: Ken Gates

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42nd annual meeting of the American Fisheries Society, Alaska Chapter
Hosted by Alaska Maritime National Wildlife Refuge at
Alaska Islands and Ocean Visitor Center
November 1-6, 2015

"Alaska's Fisheries at a Crossroads: From the Past Looking to the Future"

Program Committee
Mary Beth Loewen, Alaska Department of Fish and Game
Sarah Laske, University of Alaska Fairbanks
Aaron Martin, U.S. Fish and Wildlife Service
Nicole Misarti, University of Alaska Fairbanks
Natalie Monacci, University of Alaska Fairbanks
Peter Westley, University of Alaska Fairbanks
-
Local Arrangements Committee
Bill Bechtol, Bechtol Research/University of Alaska Fairbanks
Stacey Buckelew, Axiom Data Science
Carol Kerkvliet, Alaska Department of Fish and Game
Sue Mauger, Cook InletKeeper
Ted Otis, Alaska Department of Fish and Game
Elisa Russ, Alaska Department of Fish and Game
Nicky Szarzi
-
Meeting Sponsors
Alaska Maritime National Wildlife Refuge
Alaska Seafood Marketing Institute
Cook InletKeeper
Kintama Research
RWJ Consulting
St. Hubert Research Group
-
Tuesday Welcome Reception Social Hosts
Cook InletKeeper, Pratt Museum
-
Registration
Lee Ann Gardner, RWJ Consulting
Nicky Szarzi
AK-AFS Student Subunits (UAF, UAA, UAS)
-
Audio/Visual Support
AK-AFS Student Subunits (UAF, UAA, UAS)
-
Alaska Native Fish Shirt Design
Karen Lybrand

2015 Plenary Speakers

Jim Lichatowich
Alder Fork Consulting

-

Stephanie Schmidt
Alaska Department of Fish and Game

-

Jim Magdanz
University Alaska Fairbanks and Alaska Department of Fish and Game

Special thanks to those individuals who offered their knowledge, time, and expertise in planning and organizing the 2015 Chapter meeting

Meeting Sessions, Chairs and Co-Chairs

1. **Advances in Fisheries Science and Technology:** Mike Byerly**,** Alaska Department of Fish and Game
2. **Flatfish Biology**: Julie Nielsen, University of Alaska Fairbanks & Andy Seitz, University of Alaska Fairbanks
3. **Wild Alaska Salmon - A Unifying Force for Connecting Alaskan Lives:** Erin Harrington, Alaska Salmon Project & Peter Westley, University of Alaska Fairbanks
4. **Using Education and Communication to Improve Fisheries Management and Conservation:** Laurel Devaney, U.S. Fish and Wildlife Service **&** Katrina Mueller, U.S. Fish and Wildlife Service
5. **Juvenile fish movement and habitat:** Jonathan Gerken**,** U.S. Fish and Wildlife Service & Mary Beth Loewen, Alaska Department of Fish and Game
6. **North Slope fish populations, habitat, and fisheries**: Jeff Adams, U.S. Fish and Wildlife Service & Matthew Whitman**,** Bureau of Land Management
7. **Arctic Marine Ecology:** Vanessa von Biela**,** U.S. Geological Survey
8. **Quantitative approaches to future fisheries problems**: Milo Adkison, University of Alaska Fairbanks
9. **Contributed Papers**: Jeff Falke, University of Alaska Fairbanks
10. **Ecosystem-based management in Alaska's Fisheries: opportunities and challenges**: Daniel Schindler**,** University of Washington & Timothy Walsworth, University of Washington
11. **Volunteer Opportunities in Fisheries:** Joe Sullivan
12. **Probing long-term datasets to detect shifts in shellfish productivity**: Carol Kerkvliet, Alaska Department of Fish and Game
13. **Speed Talks**: Mike Daigneault, Alaska Department of Fish and Game
14. **Ecology, Life History, and Population Dynamics of Fishes in Estuarine and Nearshore Marine Habitats:** Katie Howard, Alaska Department of Fish and Game
15. **Invasive Species**: Lisa Ka'aihue, Cook Inlet Regional Aquaculture Association & Andy Wizik, Cook Inlet Regional Aquaculture Association
16. **Sustainability and Well-being in Alaska Fisheries**: Philip Loring, University of Saskatchewan & Danielle Ringer, University Alaska Fairbanks
17. **Weak Stock Salmon Management :** Bill Bechtol, Bechtol Research
18. **Freshwater Habitat**: Megan Marie, Alaska Department of Fish and Game
19. **Poster Session**: Andy Seitz, University of Alaska Fairbanks & Michael Courtney, University of Alaska Fairbanks

Carbon offsets available at:
https://www.youcaring.com/carbon-offset-2015-AK-AFS

Continuing Education Coordinators
Sara Miller, Alaska Department of Fish and Game
Katie Palof, Alaska Department of Fish and Game

Continuing Education Instructors

Fisheries Management Techniques Lab
Instructor Joel Markis, University Alaska Southeast

Fisheries Pathology Lab
Instructor Jim Seeland, University Alaska Southeast

Water Egress Training
Instructors: Jim Wittkop
Patrick Snow
Kevin Fox

-

Poster Session Organizers
Andy Seitz, University Alaska Fairbanks
Michael Courtney, University Alaska Fairbanks

-

Student Presentation Judging Coordinator
Aaron Martin, U.S. Fish and Wildlife Service

-

Banquet Entertainment
Brentwood "Hig" Higman and Erin McKittrick, Groundtruth Trekking, presentation
The Strangs, music

-

Banquet Auction
Curtis Jackson, auctioneer

-

A Special THANKS to the Organizations and Individuals that Donated Live Auction Items:

Bruce Sink
Desiree Hagen
Ashore Water Taxi
Tall Tale Charters
Mako Water Taxi
Bay Excursions
Brooks Alaskan Adventures and F/V Huntress
Rainbow Connection
Gary Lyon
Jim Brashear
Cycle Logical
Ulmers Drug and Hardware

Land's End Resort
Best Western Bidarka Inn
Ocean Shores Motel
Halcyon Bed & Breakfast
Majestic View Bed & Breakfast
Kate Loewen
Paul Dungan Pottery
Homer Brewing Company
Down to Earth Pottery
Lisa Wood Pottery
Wintercreek Jewelry
Aurora gems

Biographies of Plenary Speakers

JIM LICHATOWICH

TITLE: Some Lessons Learned from 46 Years with Salmon at the Crossroads

U. S. Marine Corps 1959 – 1963
Oregon State University BS and MS degrees in Fisheries Science

Jim Lichatowich has worked on Pacific salmon issues as a researcher, manager, and fisheries consultant for 44 years. He specializes in the history of salmon management and the life history and status of salmon and steelhead populations and the development of restoration plans. Jim was formerly the Chief of Fisheries Research and Assistant Chief of Fisheries for the State of Oregon. He served ten years on the Independent Scientific Advisory Board for the Columbia River salmon restoration program and two years on the Independent Scientific Review Panel. He served four years on the State of Oregon's Independent Multidisciplinary Science Team. He has served on seven other independent scientific review panels dealing with salmon and water problems in the Sacramento River, California and salmon management on the Skeena River in British Columbia.
He is the author of two award winning-books, Salmon without Rivers: A History of the Pacific Salmon Crisis and Salmon People and Place: A Biologist's Search for Salmon Recovery.

Biographies of Plenary Speakers

STEPHANIE SCHMIDT

TITLE: Balancing Conservation of a Declining Resource and the Cultures That Depend On It

Dr. Schmidt received her PhD in Limnology and Marine Science from University of Wisconsin-Madison, where she studied how 100 years of nonnative species introductions altered the Great Lakes fishery food web. She initially began a career in academia and taught in the Environmental Studies and Biology departments at St. Olaf College in Minnesota for three years, where she developed and ran a National Science Foundation Summer Research Experience for Undergraduates program for Native American and tribal college students. However, a strong interest in applied fisheries and Native resource issues led Dr. Schmidt to look to Alaska for a change in her career path. She started her new career with the Alaska Department of Fish and Game as the Summer Season Fishery Research Biologist on the Yukon River in 2012. She oversaw all research and assessment related to Yukon River Chinook salmon and summer chum salmon. In 2014, Dr. Schmidt became the Summer Season Fishery Management Biologist on the Yukon River for the State. She travels throughout the Yukon River drainage, working with local stakeholders to help facilitate an open dialogue about fisheries management. She serves on the Joint Technical Committee for the U.S.-Canada Yukon River Panel. Dr. Schmidt is originally from Wisconsin and grew up fishing and hunting with her family. She is an enrolled member of the Brotherton Indian Tribe of Wisconsin and is also of Menominee Indian descent.

Biographies of Plenary Speakers

JIM MAGDANZ

TITLE: The Persistence of Subsistence: Wild Food Harvests in Rural Alaska, 1982-2012

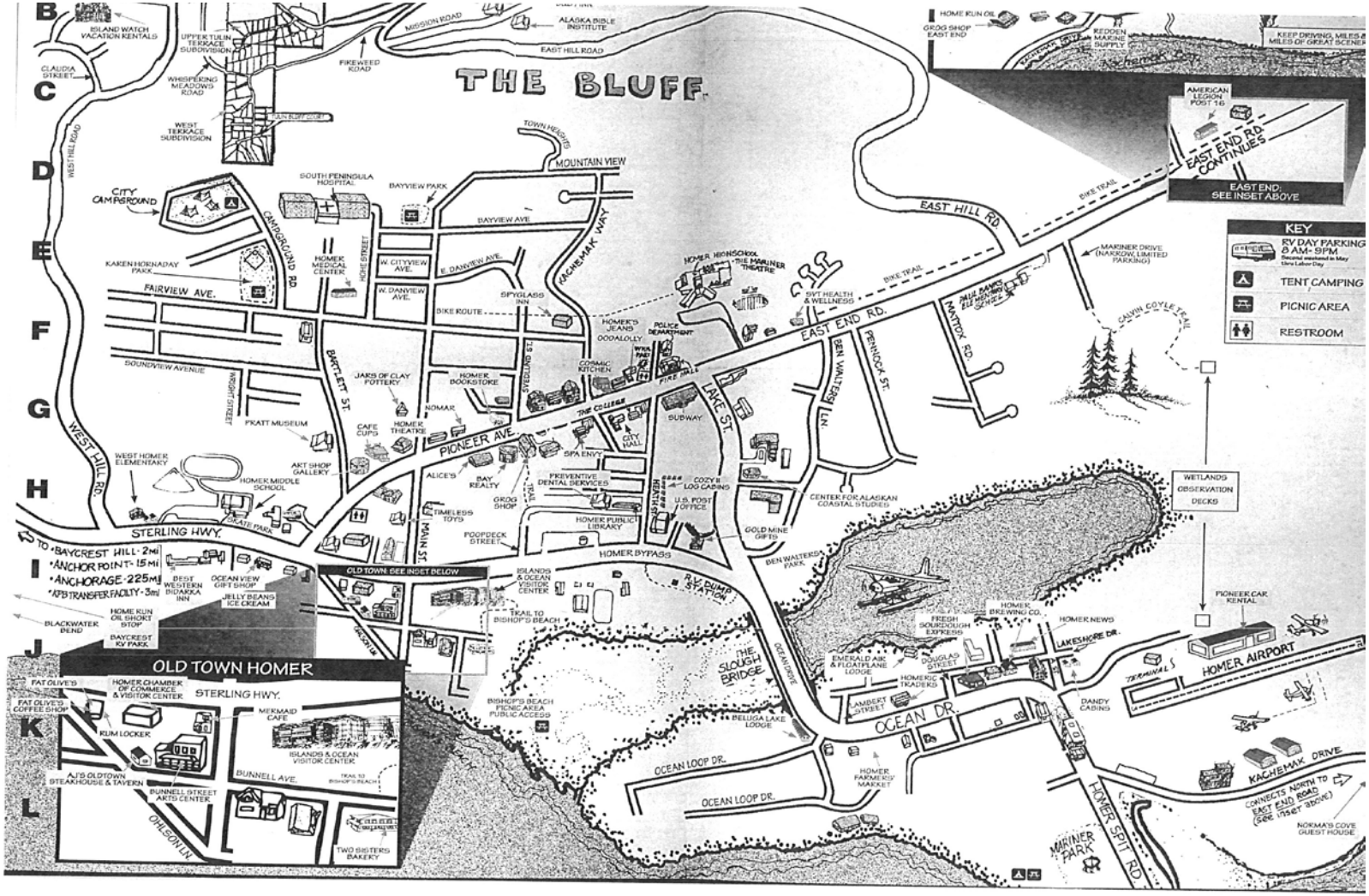
BIOGRAPHY: Jim Magdanz worked for ADF&G's Division of Subsistence from 1981 to 2012. He was responsible for conducting social science research in northwest Alaska, living initially in Nome and later in Kotzebue. Jim retired from ADF&G in September 2012, and enrolled in a PhD program in natural resources at the University of Alaska Fairbanks. In 2013, he was a visiting graduate student at the University of Washington in Seattle, where he studied statistical network analysis. He also was a student at the Santa Fe Institute's Complex Systems Summer School, where he helped model failures in interbank loan networks and write a paper recently published in *PLOS One*.

As part of his thesis research, Jim is conducting a longitudinal analysis of subsistence data collected by the Division of Subsistence in more than 400 Alaska communities from 1982 through 2012. His thesis also will include analyses of food security and subsistence food networks in rural Alaska, topics that he helped introduce to the Division of Subsistence. Jim continues to work part time for ADF&G as a graduate student intern.

At-a-glance schedule for 2015 conference, AK Chapter AFS

Day/Date	Time Period	Large Conference Room	Seminar Room	Lab Classroom	AIOVC Lobby	off-site
Sun/Nov 1	9:00-5:00					**Continuing Education - Fisheries Management Techniques**
Mon/Nov 2	morning		**Continuing Education - Egress training**	**Continuing Education -Fish Pathology**	Registration pick up banquet tickets	**Continuing Education - Fisheries Management Techniques and Egress Training**
	afternoon					
	late afternoon					
Tue/Nov 3	morning			**Continuing Education -Fish Pathology**	Registration pick up banquet tickets vendor setup	**Continuing Education - Fisheries Management Techniques**
	afternoon					**Learn-to-Curl**
	late afternoon					
	evening					**Welcoming social, 2nd annual fish film festival**
Wed/Nov 4	Plenary Speaker	**Plenary speaker - Jim Lichatowich**			Registration pick up banquet tickets	
	early morning	Advances in Fisheries Science and Technology	Wild Alaska Salmon	Juvenile Fish Ecology		
	morning	Advances in Fisheries Science and Technology	Wild Alaska Salmon	Juvenile Fish Ecology		
	lunch time	Lunch on own	Past Presidents Lunch	NPRB Seminar lunch with JoAnn Mellish (for pre-registrants)	vendor displays	
	early afternoon	Advances in Fisheries Science and Technology	Wild Alaska Salmon	North Slope Fish Populations, habtitat and Fisheries		
	afternoon	Flatfish Biology	Using Education and Communication	Arctic Marine Ecology		
	early evening	Women in Fisheries	*committee meetings as necessary*	*committee meetings as necessary*		
	evening	Poster Session			Poster Session	**Networking social, AJ's Steakhouse, sponsored by Cook InletKeeper**
Thurs/Nov 5	Plenary Speaker	**Plenary speaker - Stephanie Schmidt**			Registration pick up banquet tickets	
	early morning	Quantitative Approaches to Fisheries Science	Ecosystem-based Management	Probing long-term shifts in shellfish productivity		
	morning	Quantitative Approaches to Fisheries Science	Ecosystem-based Management	Probing long-term shifts in shellfish productivity		
	lunch time	Business Meeting (Large Conference Room) or lunch on own			vendor displays	
	early afternoon	Quantitative Approaches to Fisheries Science	Ecosystem-based Management	Speed Talks		
	afternoon	Contributed Papers	Volunteer Opportunities in Fisheries	**Continuing Education - Website Development (14:00-16:00)**	meet here for shuttles to banquet	**5K fun run/walk/migrate**
	early evening					
	evening					**Awards banquet at Land's End Resort; guest speakers Hig and Erin from GroundTruth Trekking, music by The Hot Strangs**
Fri/Nov 6	Plenary Speaker	**Plenary Speaker- Jim Magdanz**			vendor displays	
	early morning	Invasive Species	Sustainability and Well-Being in Alaska's Fisheries	Freshwater habitat		
	morning	Estuarine and Nearshore Marine Habitat	Weak Stock Salmon Management	Freshwater habitat		
	late morning	Student Best Oral Presentation and Poster Presentation Awards				
	lunch time	boxed lunches provided for all meeting attendees	Student Mentor Lunch	Environmental Concerns Committee meeting	meet here for shuttles to M/V Tiglax	
	afternoon					**M/V Tiglax tour**
	late afternoon					First Friday art walk in Homer

Homer City Map



Thursday, Nov 5, 2015 Awards Banquet and Student Fundraiser Auction

Banquet Program

Banquet Entertainment
Groundtruth Trekking – presentation, "*The Fisheries Influence*"
The Strangs – music

Live Auction
Auctioneer: Curtis Jackson

Awards
5K run winner
25 year membership awards
Cultural Diversity Travel Award
Molly Ahlgren Scholarship
Wally Noerenberg Award

Guest Speakers

Brentwood "Hig" Higgins and Erin McKittrick of Ground Truth Trekking

Based in Seldovia, Alaska, Ground Truth Trekking was founded in 2007 by Brentwood "Hig" Higgins and Erin McKittrick. Ground Truth Trekking seeks to educate and engage the public on Alaska's natural resource issues through a combination of wilderness adventure, scientific analysis, and the creation of web resources. GTT also provides scientific advisement to other organizations. Human-powered expeditions across Alaska give the "ground truth" of everything from mine proposals to climate change, through observation and conversation with locals. They combine this "ground truth" with "researched truth," using their scientific backgrounds to create comprehensive and accurate articles on key issues across the state. Their mission is to provide people with the necessary knowledge to make smart decisions about these issues, now and into the future.

Hig received a PhD in geology from the University of Washington in 2007, following a BA in geology from Carleton College in 1999. He studied the geologic record of tsunamis and has particular expertise in geologic hazards, sedimentology, and geomorphology. Erin received her MS in Molecular Biology from the University of Washington in 2005, following a BA in biology from Carleton College in 2001. She is the author of *Small Feet, Big Land: Adventure, Home and Family on the Edge of Alaska* and *A Long Trek Home; 4,000 Miles by Boot, Raft, and Ski*.

Hig and Erin are well known for long-distance treks throughout Alaska, now with their children Katmai and Lituya, including walking and packrafting from Seattle to False Pass, skiing along the Bering Strait from Nome to Deering, hiking and packrafting the Aleutians near Unalaska, and a walk along the edge of Cook Inlet, which will soon be released as a documentary, "Heart of Alaska". For more information, visit their website at www.groundtruthtrekking.org

** 2015 Alaska Chapter AFS Conference Schedule **

Sunday 1 November

Continuing Education
9:00 am – 5:00 pm – Fisheries Management Techniques, in Conjunction with UAS Sitka Fisheries Technology Program (Kachemak Bay Campus – Pioneer Hall Rm P203)

Monday 2 November

Continuing Education
9:00 am – 5:00 pm – Fisheries Management Techniques, in Conjunction with UAS Sitka Fisheries Technology Program (Kachemak Bay Campus – Pioneer Hall Rm P203)
9:00 am – 5:00 pm – Fisheries Pathology, in Conjunction with UAS Sitka Fisheries Technology Program (Laboratory Classroom)
7:30 am – 4:00 pm – Aircraft Survival Training (Seminar Room and pool)

Tuesday 3 November

Continuing Education
9:00 am – 5:00 pm – Fisheries Management Techniques, in Conjunction with UAS Sitka Fisheries Technology Program (Kachemak Bay Campus – Pioneer Hall Rm P203)
9:00 am – 5:00 pm – Fisheries Pathology, in Conjunction with UAS Sitka Fisheries Technology Program (Laboratory Classroom)

Social
1:30-3:30 – Learn to Curl at Kevin Bell Ice Arena (shuttle leaves from AIOVC at 1:15)

6:30 pm – 10:00 pm – Welcome Social at Pratt Museum & Second Annual Fishy Film Showing, co-sponsored with Cook InletKeeper & Kenai Fish Habitat Partnership

Wednesday 4 November
Maritime Wildlife Refuge, at Alaska Islands and Oceans Visitor Center

7:30 – 8:00 am – Continental breakfast in lobby

Large Conference Room

PLENARY SESSION

8:00 – 8:20 am: Welcome & **Opening remarks**

8:20 – 9:05 am – Plenary Speaker

Jim Lichatowich

Some Lessons Learned from 46 Years with Salmon at the Crossroads

Large Conference Room– Concurrent Session #1

Advances in Fisheries Science and Technology

Session Chair: Mike Byerly

9:10 – 9:30 am
Video Net Weirs
Ben Van Alen and Jake Musslewhite

9:30 – 9:50 am
Counting Fish Without Leaving the Office – Remote Monitoring of a Salmon-counting Weir
Jake Musslewhite, and Ben Van Alen

9:50 – 10:10 am
Assessment of benthic impacts of raised groundgear for the Eastern Bering Sea pollock fishery
Bradley Harris, Craig Rose, Carwyn Hammond, Susan Zagorski and Suresh Sethi

10:10 – 10:30 am - BREAK

10:30 – 10:50 am
Using remote sensing techniques to quantify iceberg habitats in selected tidewater glaciers in Alaska.
Courtney Pegus, Shannon Atkinson and Terrance J. Quinn, II

10:50 – 11:10 am
A Story of a Sub, an ROV, and Two Cameras and How They Help Us Count Yelloweye Rockfish
Jennifer Stahl, Kristen Green and Mike Byerly

11:10 – 11:30 am
Fish and Game of Drones, UAV Detected Salmon and Freshwater Habitat Characteristics
John O'Brien, Mark Hodges and Samuel Vanderwaal

11:30 – 11:50 am
Using an Autonomous Vessel to Assess the Impacts of Offshore Gold Mining on the Seabed
Mabel Baldwin-Schaeffer, Bradley Harris, Kevin Boswell Robert Foy, and John Olson

11:50 am – 12:10 pm
Using Acoustic Tags to Improve Inriver Chinook Salmon Estimates
Suzanne Maxwell, Greg Buck and April Faulkner

12:10 – 1:30 pm – NPRB Seminar Lunch (Lab Classroom for pre-registrants of this lunch only); Past Presidents Lunch (Seminar Room for Past Presidents only); otherwise, lunch on your own

1:30 – 1:50 pm
Synthesis of Bristol Bay Sockeye Salmon Genetic Data Improves Understanding of Stock-specific Migration and Harvest Patterns to Inform Commercial Fisheries Management
Tyler Dann, Christopher Habicht, William Templin, Lisa Seeb and James Seeb

1:50 – 2:10 pm
Strontium Isotopes in Otoliths: Insights into Freshwater Habitat Production and Life History Strategies of Pacific Salmon
Sean Brennan, Daniel Schindler and Christian Zimmerman

2:10 – 2:30 pm
RAD Sequencing of Chinook Salmon in Cook Inlet, Alaska: Discovering Markers Useful for Sustainable Management in a Genomic Context
Christopher Habicht, Tyler Dann, William Templin, Lisa Seeb and James Seeb

2:30 – 2:50 pm
Mobile Education Opportunities for Fisheries Professionals
Joel Markis, Reid Brewer, and Jim Seeland

Large Conference Room – Concurrent Session #2

Flatfish Biology

Session Co-Chairs: Julie Nielsen and Andy Seitz

2:50 – 3:10 pm
Characterizing and Quantifying Activity Patterns of Fish with Accelerometer Archival Tags: Pacific Halibut as a Case Study
Julie Nielsen, Franziska Broell, Tim Loher, Craig Rose, Paige Drobny and Andrew Seitz

3:10 – 3:30 pm
Satellite-reporting Accelerometer Tags for Monitoring Survival of Trawler-deck Released Halibut
Craig Rose, Julie Nielsen, Todd Lindstrom, Andrew Seitz, Timothy Loher, Paige Drobny, and John Gauvin

3:30 – 3:50 pm BREAK
3:50 - 4:10 pm
Spatial Changes in Halibut Charter Sport Fishing in Homer, Alaska
Maggie Chan and Anne Beaudreau

4:10 – 4:30 pm
Can Fishing Explain Declines in Size-at-Age of Pacific Halibut?
Jane Sullivan, Steven Martell and Gordon Kruse

4:30 – 5:10 pm
Relationship Between Dietary Carbon and Nitrogen Stable Isotopes and Size-at-age of Pacific Halibut
Sarah Webster, Bradley Harris and Nathan Wolf

5:00 – 6:30 pm
Women in Science (Large Conference Room)

6:30 – 8:00 pm
Poster Session (Large Conference Room, Seminar Room and Lobby); Authors to be at their posters 6:30-7:30 pm

8:00 – 11:00 pm
Networking Social at AJ's Steakhouse sponsored by Cook InletKeeper

Seminar Room – Concurrent Session #3

Wild Alaska Salmon; A Unifying Force For Connecting Alaskan Lives

Session Co-Chairs: Erin Harrington, Alaska Salmon Project and Peter Westley, University of Alaska Fairbanks

9:10 – 9:30 am
Homer Spit Nick Dudiak Fishing Lagoon – A Success and a Mystery
Bill Hauser, Nick Dudiak, Carol Kerkvliet and Peter Westley

9:30 – 9:50 am
Alaska's Policy for the Management of Sustainable Salmon Fisheries: Being a Teenager
Charles O. Swanton

9:50 – 10:10 am
Perspectives on Salmon Management, Conservation and Honoring Salmon Spirit
Barbara Blake

10:10 – 10:30 am– BREAK

10:30 – 10:50 am
Salmon Sisters
Claire Laukitis

10:50 – 11:10 am
Building Resilient Communities and Sustainable Economies over Centuries
Dune Lankard

11:10 – 11:30 am
Making "Ologists" Relatable to the General Public
Jewelz Barker

11:30 – 11:50 am
Bridging People Who Rely On and Impact Salmon
Andrea Sanders

11:50 am -12:10 pm
Ethnographic Views of People and Salmon in Alaska
Courtney Carothers

12:10 – 1:30 pm – NPRB Seminar Lunch (Lab Classroom for pre-registrants of this lunch only); Past Presidents Lunch (Seminar Room for Past Presidents only); otherwise, lunch on your own

1:30 – 1:50 pm
The Specific Importance of Chinook Salmon to the Riverine Subsistence Communities of the Yukon and Kuskokwim Rivers and How Tribal Capacity-building Can Help Save Chinook Stocks
Gale K. Vick and Ben Stevens

1:50 – 2:10 pm
The Economic Geography of Salmon: a conceptual framework and preliminary characterization of the spatial distribution of economic values associated with salmon in the Mat-Su Basin, Alaska
Davin Holen, Tobias Schwoerer,, David Albert

2:10 – 2:30 pm
Wild Alaska Salmon DISCUSSION

Seminar Room – Concurrent Session #4

Using Education and Communication to Improve Fisheries Management and Conservation

2:30 – 2:50 pm
Developing a Communications Strategy and Compelling Shared Story in Alaska
Katrina B. Mueller and Sara Boario

2:50 – 3:10 pm
We Are All the Salmon Project: Building a Shared Vision for Sustaining Salmon in Alaska
Erin Harrington

3:10 – 3:30 pm
Communicating Diversity through Diversity: Expanding the Communications Toolbox
Sara Thompson

3:30 – 3:50 pm – BREAK

3:50 – 4:10 pm
Community Engagement and Planning
Jewelz Barker

4:10 – 4:30 pm
Applying Various Strategies for Marine Invasive Species Monitoring across Prince William Sound
Lisa Matlock

4:30 – 4:50 pm
Including Youth in Fisheries Research and Habitat Restoration Projects
Laurel Devaney

4:50 – 5:10 pm –
Kuspuk School District Math-Science Expedition, Platform for Student Investigations about Fish Population Biology and Fish Community Ecology
Doug Molyneaux, Dave Cannon, Christa Jones and Eric Kuball

5:10 – 5:30 pm
DISCUSSION

5:00 – 6:30 pm
Women in Science (Large Conference Room)

6:30 – 8:00 pm
Poster Session (Large Conference Room, Seminar Room and Lobby); Authors to be at their posters 6:30-7:30 pm

8:00 – 11:00 pm
Networking Social at AJ's Steakhouse sponsored by Cook InletKeeper

Lab Classroom – Concurrent Session #5

Juvenile Fish Movement and Habitat
Session Co-Chairs: Jonathan Gerken and Mary Beth Loewen

9:10 – 9:30 am
Estimating the Distribution of Juvenile Chinook Salmon (*Oncorhynchus tshawytscha*) Using Habitat Modeling and eDNA in an Interior Alaska River Basin.
Allison Martin, Jeffrey Falke, James Savereide and J. Andres Lopez

9:30 – 9:50 am
Cohort-specific Variation in Habitat Associations by Juvenile Coho Salmon in the Big Lake Drainage, Southcentral Alaska
Catherine Bradley, Jonathon Gerkin, Joshua Ashlin and Suresh Sethi

9:50 – 10:10 am
Coho Salmon Smolt Migration Dynamics Within the Big Lake Watershed, Alaska
Joshua Ashline, Jonathon Gerken and Suresh Sethi

10:10 – 10:30 am – BREAK

10:30 – 10:50 am
Cold Water Habitat Use by Juvenile Salmon Directing Conservation in the Big Lake Basin
Sue Mauger, Heather Leba and Jonathon Gerken

10:50 – 11:10 am
Freshwater Predation of Juvenile Chinook Salmon in the Arctic-Yukon-Kuskokwim Region of Alaska
Kristen Sellmer, Erik Schoen, Mark Wipfli, J. Andres Lopez and Renae Ivanoff

11:10 – 11:30 am
Pulsed Food Subsidies Across a Habitat Mosaic Provide Heterogeneous Growth Opportunities for Rearing Salmon in a Glacial Alaskan River
Erik Schoen, Mark Wipfli, Kristin Rine and Tim Nightengale

11:30 – 11:50 am
Diverse Juvenile Life History Behaviors Contribute to a Single Spawning Stock of Sockeye Salmon
Timothy Walsworth, Daniel Schindler, Jennifer Griffiths, and Christian Zimmerman

11:50 am – 12:10 pm – BREAK

12:10 – 1:30 pm – NPRB Seminar Lunch (Lab Classroom for pre-registrants of this lunch only); Past Presidents Lunch (Seminar Room for Past Presidents only); otherwise, lunch on your own

Lab Classroom – Concurrent Session #6

North Slope Fish Populations, Habitat and Fisheries

Session Co-Chairs: Jeff Adams and Matthew Whitman

1:30 – 1:50 pm
Lake Trout (*Salvelinus namaycush*) Otoliths as Biochronological Indicators of Recent Climate Patterns in Arctic Lakes
Eric Torvinen, Jeff Falke, Christopher Arp, Matthew Whitman and Ben Jones

1:50 – 2:10 pm
Investigating the Movement, Habitat Selection and Foraging Ecology of Broad Whitefish (*Coregonus nasus*) in the Colville River Watershed, Alaska
Jason Leppi, Mark Wipfli, Dan Rinella, Matthew Whitman and Andrew Seitz

2:10 – 2:30 pm
Marine Behavior and Movements of Dolly Varden in Arctic Alaska
Michael Courtney, Andrew Seitz, Brendan Scanlon and Randy Brown

2:30 – 2:50 pm
Essential Habitats and Migration Timing of Anadromous Dolly Varden in the Canning River Drainage
Randy Brown

2:50 – 3:10 pm
Top-down Effects of Ninespine Stickleback on Invertebrate Communities of Small Arctic Ponds: An Experimental Approach
Sarah Laske, Amanda Rosenberger, William Kane, Mark Wipfli and Christian Zimmerman

3:10 – 3:30 pm
Simplified Complexity or Complex Simplification: What Structures Lentic Fish Communities on the North Slope, Alaska?
Stephen Klobucar, Levi Simmons, Gary Thiede, and Phaedra Budy

3:30 – 3:50 pm – BREAK

Lab Classroom – Concurrent Session #7

Arctic Marine Ecology
Session Chair: Vanessa von Biela

3:50 – 4:10 pm
Environmental and Biological Influences on the Distribution of Arctic Cod (*Boreogadus saida*) in the US Chukchi Sea
Jennifer Marsh, Franz Mueter and Edward Farley Jr.

4:10 – 4:30 pm
Evaluating Growth Rates of Arctic Cod, *Boreogadus saida*, Collected From 2009 to 2014 Across the Chukchi and Beaufort Seas
Alyssa Frothingham and Brenda Norcross

4:30 – 4:50 pm
Abiotic and Biotic Influences on Diet of Four Beaufort Sea Eelpout Species
Sarah Apsens and Brenda Norcross

4:50 – 5:10 pm
The Application of Eleven US Arctic Fish Species Otolith Length-fish Length Relationships to Marine Mammal Diet Studies
Kelly Walker and Brenda Norcross

5:00 – 6:30 pm
Women in Fisheries (Large Conference Room)

6:30 – 8:00 pm
Poster Session (Large Conference Room, Seminar Room and Lobby); Authors to be at their posters 6:30-7:30 pm

8:00 – 11:00 pm
Networking Social at AJ's Steakhouse sponsored by Cook InletKeeper

Thursday 5 November
Maritime Wildlife Refuge, at Alaska Islands and Oceans Visitor Center

7:30 – 8:00 am – Continental breakfast in lobby

PLENARY SESSION

8:00 – 8:20 am: Opening Remarks, Schedule updates, meeting announcements

8:20 – 9:05 am – Plenary Speaker

Stephanie Schmidt
Balancing Conservation of a Declining Resource and the Cultures That Depend On It

Large Conference Room – Concurrent Session #8

Quantitative approaches to future fisheries problem
Session Chair: Milo Adkinson

9:10 – 9:30 am
Evaluation of Growth, Survival, and Recruitment of Chinook Salmon in Southeast Alaska Rivers
Cory J Graham, Trent M. Sutton, and Milo D. Adkison

9:30 – 9:50 am
New Methods in Estimating Stock-Recruitment Relationships for Anadromous Species
Curry J. Cunningham, Daniel Schindler, and Ray Hilborn

9:50 – 10:10 am
In-season Genetic Mixed Stock Analysis for Fishery Management: Chignik Sockeye Salmon Sscapement
Kyle Shedd, Tyler Dann, Mary Loewen, Matthew (Birch) Foster, and Dawn Wilburn

10:10 – 10:30 am – BREAK

10:30 – 10:50 am
Environmental Controls on Growth in Two Distinct Populations of AYK Chinook Salmon
Jared E. Siegel, Megan McPhee, and Milo Adkinson

10:50 – 11:10 am
A New Mechanistic Model of Drift Feeding Based on Cognitive Limits on Visual Information Processing
Jason R. Neuswanger and Gary D. Grossman

11:10 – 11:30 am
A Bathymetric Based Habitat Model for Yelloweye Rockfish (*Sebastes ruberrimus*) on the Outer Coast of Alaska's Kenai Peninsula
Joshua Mumm, Bradley P. Harris, Roman J. Dial, and William R. Bechtol

11:30 – 11:50 am
Development of an Inseason Model to Predict Bristol Bay Sockeye Salmon Migration Timing
Katie A. Sechrist

11:50 am – 12:10 pm
Field Crew Takes the Weekend off: Statistical Arrival Models to Estimate Missed Passage Counts at Fish Weirs
Suresh A Sethi and Catherine Bradley

12:10 – 1:30 pm – AK Chapter Business Meeting (Large Conference Room) otherwise, lunch on your own

1:30 – 1:50 pm
Modelling Fishing Effects on Habitat Across the North Pacific
T. Scott Smeltz, Bradley P. Harris, John V. Olson, Suresh A. Sethi, and Craig S. Rose

Large Conference Room – Concurrent Session #9

Contributed Papers

Session Chair: Jeff Falke

1:50 – 2:10 pm
Density-Dependent and -Independent Mechanisms Influencing Spawning Habitat Selection by Chinook Salmon (Oncorhynchus tshawytscha) in the Chena River Basin, Alaska
Brock M. Huntsman, Jeff Falke, James Savereide, and Katrina Bennett

2:10 – 2:30 pm
Do Wild and Stray Hatchery-produced Chum Salmon Differ in Morphology, Behavior, and Levels of Egg Retention on the Spawning Grounds of a Small Stream in Southeastern Alaska?
Casey McConnell, Megan V. McPhee, and Peter Westley

2:30 – 2:50 pm
Maternal Effects in the Survival of Triploid Hatchery Chinook Salmon
Sabrina Larsen, Suresh A. Sethi, Meagan B. Krupa, and Bradley P. Harris

2:50 – 3:10 pm – BREAK

3:10 – 3:30 pm
Examining Pre-historic Sockeye Salmon Population Fluctuations in Upper Russian Lake, Alaska.
Molly D. McCarthy, Dan Rinella, and Alan Boraas

3:30 – 3:50 pm
An Examination of Inconnu Life History Strategies through use of Radiotelemetry and Otolith Microchemistry
Lisa Stuby

3:50 – 4:10 pm
Migration of Flannelmouth Sucker in the Desert Southwest
Nate C. Cathcart, Keith B. Gido, Mark C. McKinstry, and Peter D. MacKinnon

4:45 – 5:45 pm: 5K run & 2K walk from AIOVC to Homer Brewing Company
****shuttle provided from Brewing Company to AIOVC at 5:30 pm and 5:45 pm***

6:00 – 10:00 pm – Banquet at Lands End Resort
****bus service provided from Best Western Bidarka Inn to Lands End Resort at 5:45 pm and 6:30 pm***

Seminar Room – Concurrent Session #10

Ecosystem-based management in Alaska's Fisheries: opportunities and challenges

Session Co-Chairs: Daniel Schindler and Timothy Walsworth

9:10 – 9:30 am
Introduction and discussion

9:30 – 9:50 am
Back to the future; Historical Perspectives on Opportunities and Challenges for Ecosystem-based Fishery Management in Alaska
Phillip R. Mundy

9:50 – 10:10 am
North Pacific Fishery Management Council, Lessons Learned and Moving Forward in the Future
Diana L. Stram

10:10 – 10:30 am – BREAK

10:30 – 10:50 am
Ecosystem-based Fishery Management of Sustainable Groundfish Fisheries in the Eastern Bering Sea
Gordon H Kruse

10:50 – 11:10 am
Could Adaptive Management Detect the Magnitude of Species Interactions in an Alaskan Sockeye Salmon Fishery?
Timothy Walsworth

11:10 – 11:30 am
Socio-ecological Dimensions of Yukon River Chinook Salmon Fisheries
Caroline L. Brown

11:30 – 11:50 am
Alaska Salmon Management Versus an Ecosystem-based Approach: How are they Different and Would they Achieve Different Goals?
Daniel Schindler

11:50 am – 12:10 pm
Predators Exploit life-history Diversity of a Harvested fish: Direct Evidence of Brown Bears Surfing the Salmon Resource Wave
William W. Deacy, William Leacock, Jonathan B. Armstrong, and Jack A. Stanford

12:10 – 1:30 pm – AK Chapter Business Meeting (Large Conference Room) otherwise, lunch on your own

1:30 pm – 1:50 pm
Managing the Ecosystems of Togiak National Wildlife Refuge, Southwestern Alaska
Patrick B. Walsh

1:50 pm – 2:10 pm
Seasonal and Landscape Patterns of Marine-nutrient Assimilation in Rearing Juvenile Coho and Chinook salmon in the Unalakleet River, Western Alaska
Philip J. Joy, Wes Jones, Craig Stricker, and Mark S. Wipfli

Seminar Room – Concurrent Session #11

Volunteer Opportunities in Fisheries
2:15 pm – 4:00 pm
Joe Sullivan

4:45 – 5:45 pm: 5K run & 2K walk from AIOVC to Homer Brewing Company
****shuttle provided from Brewing Company to AIOVC at 5:30 pm and 5:45 pm***

6:00 – 10:00 pm – Banquet at Lands End Resort
****bus service provided from Best Western Bidarka Inn to Lands End Resort at 5:45 pm and 6:30 pm***

Lab Classroom – Concurrent Session #12

Probing long-term datasets to detect shifts in shellfish productivity
Session Chair: Carol Kerkvliet

9:10 – 9:30 am
Can sea-surface Temperatures Predict Targeted Visual Surveys of Octopus and Crab Abundance?
David. Scheel, Caitlin. Marstellar, and Tania L. Vincent

9:30 – 9:50 am
Effects of Stratification and Kibler Nutrient Limitation on Phytoplankton Blooms in Kachemak Bay, Alaska
Dominic Hondolero, Steve Kibler, Mark Vandersea, Wayne Litaker, and Kristine Holderied

9:50 – 10:10 am
An OA Lighthouse for the Shellfish Aquaculture Industry in the State of Alaska: Alutiiq Pride Shellfish Hatchery
Wiley Evans, Burke Hales, Jacqueline Ramsay, Jeff Hetrick, and Jeremy Mathis

10:10 – 10:30 am – BREAK

10:30 – 10:50 am
Research and Management of Scallops in Cook Inlet Management and Prince William Sound Management Areas
Jan Rumble

10:50 – 11:10 am
Spot shrimp research in Prince William Sound
Kenneth J. Goldman, Josh Mumm, Maria Wessel, and Karen Swartzbart

11:10 – 11:30 am
Management of Spot Shrimp in the Prince William Sound Management Area
Maria Wessel and Mike Thalhauser,

11:30 – 11:50 am
East Side Cook Inlet Razor Clam Stock and Fishery Assessment
Mike Booz, Carol Kerkvliet, Tim Blackmon, and Brad Harris

11:50 am – 12:10 pm
Session Discussion with presenters and Brad Harris, Nicky Szarzi, Bill Bechtol, Tim Blackmon, Catlin Marsteller, Kris Holderied

12:10 – 1:30 pm – AK Chapter Business Meeting (Large Conference Room) otherwise, lunch on your own

Lab Classroom – Concurrent Session #13

Speed Talks

Session Chair: Mike Daigneault

1:30 – 1:36 pm
Age, Growth, and Sexual Maturity of the Deepsea Skate, *Bathyraja abyssicola*
Cameron Provost, Bradley Harris, David Ebert, Kenneth Goldman and Cindy Tribuzio

1:37 – 1:43 pm
Assessing the potential for competition between Pacific Halibut (*Hippoglossus stenolepis*) and Arrowtooth Flounder (*Atheresthes stomias*) in the Gulf of Alaska
Cheryl L. Barnes

1:44 – 1:51 pm
Om nom nom: Establishing a Husbandry Protocol for Skates
Daniel Michrowski, and Terrance Quinn II

1:52 pm – 1:59 pm
Heave Away, Hove Away: on the High Seas for Salmon, with Sushi
Andy Seitz

2:00 – 2:06 pm
Lonely Hearts Club – Lumpsuckers in Alaska
Mary Beth Loewen

2:07 – 2:14 pm
The traveling fishery roadshow
Joel Markis

Lab Classroom – Continuing Education: Website Development

2:15 pm – 4:15 pm

Lisa Hupp, U.S. Fish and Wildlife Service

Friday 6 November

Maritime Wildlife Refuge, at Alaska Islands and Oceans Visitor Center

7:30 – 8:00 am – Continental breakfast in lobby

PLENARY SESSION

8:00 – 8:20 am: Welcome, schedule updates, notes

8:20 – 9:05 am – Plenary Speaker

Jim Magdanz
The Persistence of Subsistence: Wild Food Harvests in Rural Alaska, 1982-2012

Large Conference Room – Concurrent Session #14

Ecology, Life History, and Population Dynamics of Fishes in Estuarine and Nearshore Marine Habitats

Session Chair: Kathrine Howard

9:10 – 9:30 am
Spatial and temporal patterns in the Lower Yukon River fish communities
Katharine B Miller, Kathrine Howard, and Jim Murphy

9:30 – 9:50 am
Estuarine and Early Marine Life History of Yukon River Salmon
Kathrine Howard, Katharine B Miller, and Jim Murphy

9:50 – 10:10 am
Linking estuarine habitats, juvenile salmon, and the fish community in the Anchor River estuary
Brianna D Pierce, Coowe M Walker, and Charles Simenstad

10:10-10:30 am - BREAK

10:30-10:50 am
Trophic niches of juvenile Pacific salmon and cod rearing in nearshore habitats
Vanessa R von Biela, Heather A. Coletti, Seth D Newsome, Carissa N Turner, and Jared Guthridge

Large Conference Room – Concurrent Session #15

Invasive Species

Session Co-Chairs: Lisa Ka'aihue, Cook Inlet Regional Aquaculture Association & Andy Wizik, Cook Inlet Regional Aquaculture Association

10:50-11:10 am
Are introduced Northern pike driving salmon declines?
Adam Sepulveda, Aaron Dupuis, and David Rutz

11:10 – 11:30 am
Assessing trophic plasticity in a renowned piscivore, northern pike (Esox lucius), in its native and invaded range
Peter Westley, Adam Sepulveda, and Thomas P. Quinn

11:30 – 11:50 am
Eradication of Invasive Northern Pike from Alaska's Kenai Peninsula
Kristine Dunker

11:50 am – 12:10 pm
Using eDNA as a Tool to Evaluate the Effectiveness of Control Measures for invasive Northern Pike
Ora Russ

12:10 – 12:30 pm
Invasive Elodea: Management Actions in Alaska
Heather A.M Stewart

12:30 –*1:00 pm: Awards for Best Student Oral Presentation and Best Student Poster (Large Conference Room)*

1:00-2:30 pm: Student-Mentor Lunch (Seminar Room)

1:00-2:30 pm: Environmental Concerns Committee (Lab Classroom)

2:30 – 4:00 pm : Tour of M/V Tiglax (shuttle bus departs at 2:30 from AIOVC lobby)

Seminar Room – Concurrent Session #16

Sustainability and Well-being in Alaskan Fisheries
Session Co-Chairs: Phil Loring and Danielle Ringer

9:10 – 9:30 am
Conceptualizing and Operationalizing "Human Wellbeing" for Environmental Science and Management
Courtney Carothers, Sara Breslow

9:30 – 9:50 am
For Generations to Come: Human Dimensions and Community Well-being Within the Kodiak Archipelago Commercial Fishing Industry
Danielle Ringer, Courtney Carothers, Jesse Coleman, Paula Cullenberg and Rachel Donkersloot

9:50 – 10:10 am
Salmon Futures: Stakeholder-driven Salmon Management Scenarios Under Changing Environmental Conditions on the Kenai Peninsula
Jamie Trammell and Meagan Krupa

10:10-10:30 am - BREAK

10:30-10:50 am
Broken Links: How Limited Entry, Markets, and Family Have Transformed Access to and Participation in Bristol Bay's Commercial Fisheries
Jesse Coleman, Courtney Carothers, Rachel Donkersloot, Danielle Ringer, and Paula Cullenberg

10:50-11:10 am
Community impacts of Gear Bans in Alaska and Florida Commercial Fisheries
Philip Loring

Seminar Room – Concurrent Session #17

Weak Stock Salmon Management
Session Chair: Bill Bechtol

11:10 – 11:30 am
Utility of Using Escapement Data Collected from Fish Weirs to Help Inform Inseason Salmon Management in the Kuskokwim River
Brittany Blain and Zachary Liller

11:30 – 11:50 am
Management Strategies That Span Weak and Strong Runs of Anchor River Chinook Salmon
Carol Kerkvliet

11:50 am – 12:10 pm
Village Quotas Provide Small Harvest Opportunity for Kings on the Kuskokwim
Bill Bechtol

12:10 pm – 12:30 pm - BREAK

12:30 –1:00 pm: Awards for Best Student Oral Presentation and Best Student Poster (Large Conference Room)

1:00-2:30 pm: Student-Mentor Lunch (Seminar Room)

1:00-2:30 pm: Environmental Concerns Committee (Lab Classroom)

2:30 – 4:00 pm: Tour of M/V Tiglax (shuttle bus departs at 2:30 from AIOVC lobby)

Lab Classroom – Concurrent Session #18

Freshwater Habitat

Session Chair: Megan Marie

9:10 – 9:30 am
Monitoring Wetlands and Amphibians in Yellowstone and Grand Teton National Parks: Can Monitoring Help us Predict Their Future?
Adam Sepulveda, Andrew Ray and Blake Hossack

9:30 – 9:50 am
Determinants of Sockeye Salmon Migration Timing at the Northern Edge of Their Distribution
Michael Carey, Christian Zimmerman, Kevin Keith, Merlyn Schelske and David Douglas

9:50 – 10:10 am
Large Scale Spatial and Temporal Diet Patterns of Juvenile Salmonids (Oncorhynchus spp.) Rearing within a Large, Glacial Alaskan River
Kristin Rine, Mark Wipfli, Erik Schoen, Craig Stricker and Tim Nightengale,

10:10-10:30 am - BREAK

10:30-10:50 am
Salmon Habitat Mapping for Landscape-scale Planning in the Matanuska-Susitna Basin
Christine Woll, David Albert, Lee Benda, and Dan Miller

10:50-11:10 am
Linkages between landscapes, headwater streams and juvenile salmon rearing in the Kenai Lowlands, Alaska
Coowe Walker, Ryan King, Dennis Whigham, Mark Rains, Michael Callahan

11:10 – 11:30 am
New Perspectives on the Importance of Chinook Salmon Spawning in Headwater Tributaries of the Kuskokwim River
Jordan Head and Zachary Liller

11:30 – 11:50 am
Tracking Thermal Conditions of Alaska's Salmon Habitat Through Regional Water Temperature Monitoring Networks
Sue Mauger and Tim Troll

11:50- 12:30 - BREAK

12:30 –1:00 pm: Awards for Best Student Oral Presentation and Best Student Poster (Large Conference Room)

POSTER SESSION

6:30 – 8:00 pm – AIOVC Lobby and Seminar Room

1. **Interpretation of Essential Fish Habitat regulations in the United States**
Aileen M. Nimick, and Bradley P. Harris

2.

3. **High-seas movement and behavior of Chinook Salmon, elucidated with pop-up satellite tags**
Andrew C Seitz, Michael B. Courtney, Mark D. Evans, Robert V. Walker, and James Murphy

4. **Diet Analysis of Arctic Lampreys in the Bering Sea using Gene-Based Prey Identification**
Annyssa Interrante, Andres Lopez, Katie Shink, Trent Sutton, and Jim Murphy

5. **Effects of temperature regime on juvenile Chinook and Coho salmon growth in three geomorphologically distinct sub-basins of the Kenai River**
Benjamin Meyer, Daniel Rinella, Erik Schoen, and Mark S. Wipfli

6. **Utilization of Blood Plasma for Identifying Sex and Reproductive Status of Yelloweye Rockfish Subjected to Barotrauma and Recompression Events**
Brittany J Blain, and Trent . M Sutton

7. **Chandalar River Chum Salmon (*Oncorhynchus keta*) Riverscape-Scale Salmon Habitat Assessment and Monitoring**
Chelsea Clawson, Jeff Falke, Josh Rose, Aaron Martin, and Jordi Cristóbal

8. **Assessing the potential for competition between Pacific Halibut (*Hippoglossus stenolepis*) and Arrowtooth Flounder (*Atheresthes stomias*) in the Gulf of Alaska**
Cheryl L. Barnes, Anne H. Beaudreau, and Mary E. Hunsicker

9. **Cumulative Impacts Assessment of Non-Fishing Stressors on Fish Habitat, Norton Sound, Alaska.**
Chris V. Maio, Matthew. Balazs, Job Noordeloos, Bradley P. Harris, Suresh, and A. Sethi

10. **Morphological Variation of Introduced Brook Trout (*Salvelinus fontinalis*) in the Salmon Creek Watershed in Juneau, Alaska.**
Henry M. Masters and Carolyn A. Bergstrom

11. **Spatial Distribution, Food Habits, and Energetics of Age-0 Walleye Pollock (*Gadus chalcogrammus*) and Pacific Cod (*Gadus macrocephalus*) During Summer in the Eastern and Central Gulf of Alaska**
Jamal H. Moss, Marilyn F. Zaleski, and Ron A. Heintz

12. **Fine-scale resource selection by Sockeye Salmon (*Oncorynchus nerka*) in groundwater-fed ponds, Bristol Bay, Alaska**
Jeff Falke, Jason Ching, Morgan Sparks, Curry Cunningham, and Peter Westley

13. **Acoustic tagging of chum salmon in Norton Sound, AK**
Jenefer Bell and Justin Leon

14. **Assessing the accuracy and uncertainty of Landsat derived stream temperatures for use in Chinook salmon (*Onchorhynchus tsawytscha*) habitat assessments on the Anchor River**
John A. Hagan, Bradley P. Harris, and Suresh A. Sethi,

15. **Alaska Logbook - a mobile tool for field data collection, organization, management, and reporting**
Jon Bonkoski

16. **Genetic diversity of Arctic lamprey (*Lethenteron camtschaticum)* populations in the Yukon River drainage**
Katie G. Shink and J. Andres Lopez

17. **Distribution and Movement Rates of Chinook Salmon *Onchorhynchus tshawystcha* in the Stikine River based on Radio Telemetry**
Kristin R. Neuneker, Jeff Falke, Troy Jaecks, Phil Richards, and Peter Etherton

18. **Seasonal variability in ocean acidification in Kachemak Bay and lower Cook Inlet Alaska**
Kristine Holderied, Angela Doroff, Dominic Hondolero, and Natalie Monacci

19. **Exploring Habitat Information to Improve the Aleutian Island Pacific Cod (*Gadus macrocephalus*) Stock Assessment**
Laura A. Junge, Bradley P. Harris, and Sarah R. Webster

20. **Attention all Fish Squeezers! A New Compact and Waterproof Fish ID Book: A Handy Field Guide to the Nearshore Marine Fishes of Alaska**
Scott W. Johnson, Darcie Neff, and Mandy R. Lindeberg

21. **Escapement estimation of Buskin River coho radio telemetry**
Peter Westley and Michelle E. Stratton

22. **Predicting Sockeye Salmon (Oncorhynchus nerka) hatch timing by incorporating natural variability into an existing model**
Morgan M. Sparks, Peter H. Westley, Jeff A. Falke, and Milo D. Adkison

23. **Inseason application of radio telemetry data for management of Kuskokwim River Chinook salmon**
Nicholas J. Smith, Zachary W. Liller

24. Development and implementation of long-term effectiveness monitoring on a priority Sockeye system in Southeast Alaska.
Lydia C. Johnson, Jon Bonkoski, and Peter M Chaillé,

25. Assessing the prevalence and load of the parasite *Ichthyophonus* in Alaska Groundfish
Sioned E. Sitkiewicz, Bradley P. Harris, and Sarah R. Webster

26. Evaluation of Growth and Survival on the Recruitment of Chinook Salmon in two Southeast Alaska Rivers
Stephanie A. Berkman, Trent M. Sutton, and Milo D. Adkison,

27. The need for eradication of the invasive aquatic *Elodea* in Alaska
Aditi Shenoy, Amy Larsen, Heidi Kristensen, Nick Lisuzzo, and Trish Wurtz

Alaska Chapter of the American Fisheries Society
41st Annual Business Meeting
October 22, 2014, Juneau, Alaska

Past President: Mark Wipfli
President: Philip Loring
President Elect: Jennifer Stahl
Vice President: Mary Beth Loewen
Secretary: Nicky Szarzi
Treasurer: Lee Ann Gardner
Student President: Emily Whitney
Note-taker: Thomas Farrugia

1. Call to order by Mark Wipfli at 5:18pm.
2. Quorum is confirmed with 25 people.
3. Approval of the agenda passed unanimously without changes.
4. 2013 business meeting notes from last year were approved without changes. However, it was suggested that in future meetings the notes should include the winner of student awards (retroactively, of course).
5. Reports:
    a. Treasurer's report: Lee Ann Gardner handed out the Chapter financial summary. Total meeting gross revenue (preliminary) is $107,556. Attendance is very high, about 413, due to joint meeting with AWRA. Profit sharing with AWRA will be based on the percent of attendance from each society. CE classes very well attended this year, best since 2008 meeting.
    b. Committee reports:
        i. Award committee (report given by Mary Beth Loewen): There were no nominations for the Meritorious Service Award, Alaska Chapter Service Award or Almost Darwin Award, despite the deadlines being extended. Last year, the best presentation was awarded to Emily Lescak, and best poster to Bryce Mecum and Kevin Fraley. This year 37 student talks and 18 student poster, 22 evaluators. The best student presentation was awarded to and the best student poster to Allison Martin. 2015 award nominations should be submitted to Theresa Tanner by January 31, 2015.
        ii. Continuing Ed (report given by Kari Fenske): This year saw increased participation. 5 classes were offered originally, 2 cancelled, so 3 paid classes were held with 42 participants. In addition, 3 free classes were provided with 81 participants in collaboration with AWRA. Feedback from paid classes will be summarized by Kari and sent to Jennifer. Bill Becthol would like the Ex Comm to consider having a class not simultaneously with the annual meeting so people that can't make the meeting can still attend a CE class.
        iii. Cultural diversity (report given by Sara Gilk-Baumer): Only one applicant to the cultural diversity award. Sole applicant was very deserving. Molly McCarthy won and is presenting at the meeting. Maybe only 1 applicant because the call came late and people already had funding?

iv. Electronic communication (report given by Hamachan): List serve is back online and working. Anyone who is on the list serve can send an email to the list serve, don't need to send it to Hamachan asking him to send it out! List serve membership is compared to actual membership, and if somebody is delinquent Hamachan will start sending emails letting them know. Bert Lewis would like to be more inclusive than exclusive and maybe let people stay on the list serve a couple of years if they are delinquent. But those people still get the newsletter that is suppose to be reserved to members in good standing. Since the newsletter is online, maybe that is not a reason to kick them off the list. We still want people to receive information. If somebody is a national AFS lifetime member, they think they are AK Chapter lifetime member. They need to pay for our lifetime membership too, but there is no way of doing it online, which needs to be changed.
v. Environmental Concerns (no report).
vi. Finance (report by Mary Beth Loewen): Bonds paying modest returns.
vii. Fisheries Communication and Education (no report)/
viii. Membership (report by Mary Beth Loewen): Membership is looking good with a total of 340 (25 lifetime, 174 regulars, 139 students and young professional).
ix. Molly Alhgren (report given by Lee Ann Gardner): It was recommended that two $6000 awards be given. Recipients this year are Lauren Bailey and Sky Brandt.
x. Newsletter (report by Bill Bechtol): Four newsletters were produced this year. Each issue is distributed by email, plus 65 to 70 hard copies to agencies, libraries, headquarters. Total distribution of 435 to 440 per issue. The total cost for all four issues was $1264. Looking for people to submit more feature articles!
xi. Past presidents: nothing to report yet.
xii. Program (report by Jennifer Stahl): The 2014 meeting was composed of 4 plenaries, 29 sessions (6 freshwater, 5 AWRA, 12 fisheries, 5 hydro/fisheries), 215 talks, 2 informal lunch talks, 48 posters. Over 400 registrants. It was decided not to print abstracts to save money and paper. To save more money, the cover and inside pages were printed separately and then assembled, which led to some minor errors.
xiii. Resolution and Bylaws (report by Hamachan): no issues right now, if any come up, bring it up through the Ex Comm/
xiv. Students (report given by Emily Whitney): This year, there are 51 student volunteers with travel/registration covered by the Chapter, plus another 30 with other funding. Students are from UAF, UAA, APU and UAS.
xv. Wally Noerenberg Award (report by Mark Wipfli): There were no nominations in 2014, but this is not uncommon. Mark Wipfli was randomly drawn to be one new member of the committee to replace Bill Bechtol. Also Carol Kerkvliet and another unnamed person will be new members of the committee.

6. Outgoing President's Address: Phil Loring wanted to thank AK AFS for a great experience being president
7. Old Business: no old business
8. New Business
    a. AFS Western Division report by Jim Bowker: He is very impressed with our meeting, the very engaged students, and the collaboration with AWRA is very positive. 1st Alaska Film Festival was also very impressive, and should be taken to Portland at the National Meeting. WDAFS meeting in Mazatlan was awesome. What can the Division do for the Chapter? WDAFS can elevate issues of the Chapter to larger scale (Montana chapter wrote letter about damming issues, could do the same with the Susitna dam). Current present Hilda Sexauer is doing great and shows importance of diversity in leadership, and this is represented in AK Chapter too. Idaho Chapter wrote a book called Unwritten Laws of Fisheries, which should be shared far and wide, would this be of value to our membership? WDAFS wants to help the Chapters, so get in contact with Jim. WDAFS also wants to become more relevant in the beltway, so our national government knows it can turn to AFS for fisheries leadership and expertise. Compared to other Chapters in the Division, AK gets a lot of funding to their students, which is wonderful! Keep in mind: what can the Division do for the Chapter?
    b. Update to Vice President election: Aaron Marten is interested in VP position. Votes for VP coming in from list serve, and Hamachan has not received any votes. Sara suggests using Survey Monkey, with still having the bios in the Newsletter. Lee Ann is kept on as Treasurer.
    c. 25 year membership pins (report by Jennifer Stahl): The award announcement is in the banquet program, and will be presented by Mark.
    d. Reappointment of all committee chairs: Reappointed by Jennifer.
9. Open Forum – no items were discussed.
10. The meeting was adjourned by Jennifer Stahl at 6:14 pm.

Notes

Alaska Chapter of the American Fisheries Society
42st Annual Business Meeting Agenda
5 November 2015
Homer Alaska

1. Call to Order – Jennifer Stahl
2. Determination of a Quorum
3. Approval of Agenda
4. Approval of committee reports from the 2014 Alaska Chapter AFS Business Meeting
5. 2015 Reports

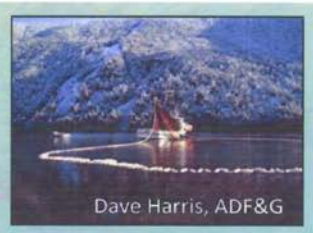
a.	Treasurer's report	Lee Ann Gardner
b.	Committee reports	
i.	Awards	Aaron Martin
ii.	Continuing Education	Sara Miller & Katie Palof
iii.	Cultural Diversity	Sara Gilk-Baumer
iv.	Electronic Communication	Bert Lewis
v.	Environmental Concerns	Nicky Szarzi
vi.	Finance	Lee Ann Gardner
vii.	Fisheries Communication and Education	Katrina Mueller
viii.	Membership	Aaron Martin
ix.	Molly Ahlgren Scholarship	Lee Ann Gardner
x.	Newsletter	Bill Bechtol
xi.	Past Presidents	Jenny Stahl
xii.	Program	Mary Beth Loewen
xiii.	Resolutions and Bylaws	Hamachan Hamazaki
xiv.	Student Sub-units	sub-unit presidents
xv.	Wally Noerenberg Award	Ken Gates

6. New Business
   a. AFS Western Division report
   b. Hosting 2018/2019 Western Division meeting
   c. Motion to move chapter meeting to spring
   d. New officers
   e. Update on Environmental Concerns Committee chair and members
   f. Reappointment of all committee chairs
7. Open forum

Adjourn

Alaska Chapter of the American Fishery Society (AFS)

Since 1972


Dave Harris, ADF&G

The mission of the Alaska Chapter of AFS is to promote scientific research and enlightened management of aquatic resources of Alaska for optimum use and enjoyment by the public and to encourage comprehensive and continuing education for fisheries scientists. The chapter has approximately 400 members, composed of individuals from universities, state and federal agencies, tribes, the private sector, and Alaskan communities. Alaska is one of 10 chapters in the Western Division of AFS.

Committees

- Awards
- Continuing Education
- Cultural Diversity
- Electronic Communication
- Environmental Concerns
- Executive
- Financial Assets Oversight
- Fisheries/Environmental Education
- Membership
- Molly Ahlgren Scholarship Award
- Past-Presidents
- Program
- Resolutions and Bylaws
- Wally Noerenberg Award

Student Subunit Groups

University of Alaska Fairbanks (UAF)
UAF School of Fisheries, Juneau Center
University of Alaska Anchorage
Alaska Pacific University

Iliamna Lake Sockeye Salmon - Morgan Sparks, UAF

Resources

AK Chapter website: http://www.afs-alaska.org/
Parent Society website: http://fisheries.org
Listserve: afs-alaska@peach.ease.lsoft.com
Newsletter: editor at bechtolresearch@hughes.net

Membership

Eligible for Alaska chapter membership as parent society member. Become a member or renew at: http://fisheries.org/membership. Annual dues for parent society: student - $20, young professional/retiree - $40, regular - $80. Annual chapter dues: student - $5, all others - $10.

Benefits

- Voice on environmental concerns
- *Fisheries* magazine subscription
- Chapter newsletter, *Onchorynchus*
- Western Division Membership
- Parent, Western Division, and Alaska Chapter meeting discounts
- Eligible for awards and scholarships

Awards/Scholarships

- Almost Darwin Award
- Best Student Oral Presentation
- Best Student Poster Presentation
- Cultural Diversity Travel Award/ Scholarship
- Meritorious Service Award
- Molly Ahlgren Scholarship
- Service Award
- Wally Noerenberg Award

Annual Meeting

Conference for those interested in Alaska fisheries and their habitats. Held in the fall, typically October or November, with the location rotating between Alaskan communities. Includes continuing education courses, oral presentations, guest speakers, poster social, and banquet. Information can be found at AFS Alaska chapter website. Professionals and students are encouraged to submit abstracts for poster and oral presentations in late summer/early fall.

ORAL SESSION ABSTRACTS

Advances in Fisheries Science and Technology Concurrent Session #1

Video Net Weirs

*Ben Van Alen, USDA Forest Service, Juneau Ranger District**
Jake Musslewhite, USDA Forest Service, Juneau Ranger District

Knowing that enough fish make it back to spawn is the foundation of fishery management. For salmon, with many streams, limited funds, and multiple management concerns we need efficient and reliable methods to estimate escapements. In Southeast Alaska, thanks to Federal subsistence funding, we are using pairs of swim-through video net weirs to accurately and efficiently estimate escapements of salmon into lakes and streams. The "go-with-the-flow" net weirs guide upstream migrating fish through video chutes under a wide range of flow conditions. The pair of motion-triggered video cameras on each chute allows fish to swim though whenever they wish and us to validate counts between weirs. This presentation will show the solar-powered mini-DVR video system we've used on picket and net weirs in the region, the double-entry bookkeeping method we use to validate counts, and adaptations for downstream fish passage, high fish abundances, high flows, and better, fish-triggered, video.

Counting Fish Without Leaving the Office – Remote Monitoring of a Salmon-counting Weir

*Jake Musslewhite, USFS Juneau Ranger District**
Ben Van Alen, USFS Juneau Ranger District

Over the 2014 and 2015 field seasons, we developed a remote monitoring system to assist in operation of the Sitkoh lake video weir project. This remote monitoring system provides real-time video from the project site over the internet, allowing us to monitor and conduct the project with only minimal onsite visits by field crews. The system provides site-monitoring imagery with live underwater video of fish passing through the weirs and aboveground views of the general project surroundings and equipment. Battery voltage and other "system health" parameters can be monitored remotely, and various devices can be turned on or off as needed. Email utilities are used to automatically send motion-triggered images, reports of system status, or special alarms. A set of wireless links between the project site and the village of Angoon was used to connect the system to the internet, making it accessible anywhere internet access is available. Video viewing and device configuration generally uses standard web browsers and built-in user interfaces. The system was assembled using affordable off-the-shelf devices and "biologist-level" technical background, and could easily be adapted for a wide range of uses. Future applications include real-time automated escapement monitoring and the possibility of conducting more projects with the same level of personnel and funding.

Assessment of benthic impacts of raised groundgear for the Eastern Bering Sea pollock fishery

*Bradley P. Harris, Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University**
Craig Rose, FishNext Research
Carwyn F. Hammond, National Marine Fisheries Service, Alaska Fisheries Science Center
Susan L. Zagorski, Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University
Suresh A. Sethi, Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University

The US pollock (Theragra chalcogramma) fishery is a major contributor to domestic and global fish production. The industry is working collaboratively with us to develop a new trawl that efficiently captures pollock near the seafloor while minimizing seabed contact and salmon, crab and halibut bycatch. During spring 2014, we tested the seabed contact characteristics of six groundgear configurations in the eastern Bering Sea. This talk will review results to date and emphasize background and motivations for the project, industry collaboration, and the integration of gear modification research into the fisheries management process.

Using remote sensing techniques to quantify iceberg habitats in selected tidewater glaciers in Alaska.

Courtney Pegus, Shannon Atkinson and Terrance J. Quinn, II*

Warming climates have enhanced rates of ice loss and promoted significant retreat of several tidewater glaciers worldwide over the past century. Some tidewater glaciers in Alaska have experienced unprecedented losses of glacial ice from receding glaciers as well as significant declines (~75%) in populations of harbor seals (Phoca vitulina). Calving tidewater glaciers release floating ice which provides important resting and pupping substrate for the harbor seal during the summer months (May-July) and molting platforms for adults in the fall (August). Changes in floating iceberg habitats can give rise to elevated mortality and/or promote movement of seals to more suitable habitats containing higher densities of floating ice or ice platforms having preferred dimensional characteristics; however, these dynamics are poorly understood. Aerial surveys of these dynamic iceberg habitats are both costly and weather dependent because they are conducted using fixed-winged aircraft. Identifying an accurate and cost-effective method for surveying iceberg habitats will facilitate monitoring efforts in these environments as well as quantifying dimensional characteristics of icebergs that are utilized by harbor seals. In this study we will develop a technique to investigate fine-scale and landscape characteristics of floating iceberg habitats using remote sensing. Dimensional features of floating ice (e.g., area, height, slope, etc.) will be both surveyed in the field and photographed using micro-drones and data obtained from remote sensing techniques will be compared with field measurements for accuracy. This research will examine the accuracy of using drone technology to measure and quantify floating iceberg habitats in dynamic tidewater glaciers.

A Story of a Sub, an ROV, and Two Cameras and How They Help Us Count Yelloweye Rockfish

*Jennifer Stahl, Alaska Department of Fish and Game**
Kristen Green, Alaska Department of Fish and Game
Mike Byerly, Alaska Department of Fish and Game

Yelloweye rockfish are an economically valuable species caught in the commercial, recreational, and subsistence fisheries in Southeast Alaska. Like most rockfishes, the life history traits of yelloweye rockfish (slow growing, long lived, and late maturing) necessitate careful management to avoid over-exploitation of stocks. Consequently, we have assessed yelloweye rockfish using visual survey methods. From 1989 to 2009, the Alaska Department of Fish and Game surveyed yelloweye rockfish using a manned submersible. Distance methods were used to estimate yelloweye rockfish density from in-situ observations along line transects. However, the absence of a cost-effective submersible led the department to use an alternative visual survey tool to assess rockfish stocks: a remotely operated vehicle (ROV). In order to adapt distance sampling techniques to the ROV, paired stereo cameras were used to record video data and SeaGIS measurement software to obtain distances to fish. In the last four years, three management areas along the outer coast of Southeast Alaska have been successfully surveyed using the ROV. This presentation will include results from our most recent survey conducted in the Fairweather grounds. For all areas surveyed, density estimates were obtained that were comparable to those attained with the submersible. In addition, suitable sample sizes and good precision (CV estimates from 13-25%) were achieved. Our research is among the first to use an ROV for stock assessment purposes.

Fish and Game of Drones, UAV Detected Salmon and Freshwater Habitat Characteristics

John P. O'Brien, ERM Alaska, Inc.; Mark Hodges, ERM Alaska, Inc.
Samuel J. Vanderwaal, Northern Embedded Solutions

Chinook and chum salmon spawn in the Chena River, a clear-water runoff system in Interior Alaska, Yukon River Watershed. Unmanned aerial vehicles (UAV) mounted with cameras have proven to be capable of detecting Chinook salmon redds but further testing is needed. In October, 2015 a Quadcopter UAV with vertical take-off and landing (VTOL) capability was fitted with a camera and tested over the upper Chena River for ability to detect salmon redds, salmon carcasses, secondary channels or abandoned channels (as potential sub-surface flow paths), log jams and other channel obstructions (as potential hydrologic controls), and streamside vegetative cover. These test flights indicate UAV ability to remotely detect salmon habitat features and serve as a basis for aerial habitat observation of other salmon producing rivers. UAVs have advantages over conventional (manned) aircraft (e.g. fixed wing airplanes and helicopters): they are less expensive to build, buy, operate, and maintain and fewer materials and hazardous chemicals are needed in construction. UAVs are more energy efficient and use less fuel than conventional aircraft. From an operational standpoint UAVs are more convenient and safe with fewer logistic considerations. They also cause fewer disturbances, are quieter in flight, and are less likely to alter the behavior of wild animals. This paper presents the findings of UAV flights conducted for the purpose of fisheries research and monitoring tasks through digital video and photography captured in the optical and infrared spectrums, and recommendations for mission planning for similar future exercises.

Using an Autonomous Vessel to Assess the Impacts of Offshore Gold Mining on the Seabed

*Mabel A. Baldwin-Schaeffer, Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University**
Bradley P. Harris, Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University
Kevin M. Boswell, Fisheries Ecology & Acoustics Laboratory at Florida International University
Robert J. Foy, Kodiak Laboratory National Marine Fisheries Service
John V. Olson, Habitat Conservation Division National Marine Fisheries Service

The intensity and distribution of Norton Sound seabed mining operations off Nome, Alaska, are increasing rapidly due to high gold prices, advances in underwater mining technologies, and a reality television series produced by the Discovery Channel. Since 1996, the number of permitted offshore mining operations has grown from 3 to more than 200 and the total area designated for mining has increased from 320 to nearly 24,000 acres. Mining activities may adversely impact benthic structures (e.g. cobbles, shell hash, hydroids) thought to be important for Norton Sound Red King Crab (Paralithodes camtschaticus). The photo/video methods typically used to assess benthic structures are problematic in Norton Sound due to near zero-visibility conditions resulting from Yukon River sediments, shallow depths and frequent wind-driven wave events. We tested an Autonomous Sampling Vessel (ASV) in the western public mining area off Nome in 2014 and 2015 equipped with a Kongsberg M3 Multibeam Sonar and a DIDSON. In 2014, we surveyed 70 km of nearshore producing high-resolution, spatially-referenced physical and biological data within the mining area. To assess the persistence of the mining effects on the seabed, the study area was resurveyed in 2015. A total of 80 km of seabed were surveyed including the 2014 transects and 15 new transects were added in deeper water. Tailings piles and excavation activities were clearly visible in the acoustic imagery during both surveys. The comparison of 2014 and 2015 surveys ongoing.

U**sing Acoustic Tags to Improve Inriver Chinook Salmon Estimates**

*Suzanne Maxwell, Alaska Department of Fish and Game **
Greg Buck, Alaska Department of Fish and Game
April Faulkner, Alaska Department of Fish and Game

An acoustic tag study was conducted to determine where and in what proportion Chinook salmon Oncorhynchus tshawytscha migrate within the existing sonar site on the Nushagak River. The sonar project estimates fish passage with dual-frequency identification sonars (DIDSONs) and apportions estimates to species using drift gillnetting. The sonar project was designed to estimate sockeye salmon, a species that swims close to shore, and not Chinook salmon, a species that utlizes most of the 300-m wide river. We inserted acoustic tags into Chinook salmon in the lower river and set up an acoustic array at the sonar site, 13 km upriver, to detect tagged fish as they swam past. After processing the position estimates for each fish, the resulting fish tracks were used to determine whether a given fish would have passed through the footprint of the DIDSON beam. During this 4-year study, 799 Chinook salmon were tagged, and an average of 56% passed through the sonar beam footprints. Several fish, 12.4%, made multiple trips through the array, some making several upriver and downriver trips. Based on where in the river the fish tracks were most abundant, we determined that a single mid-river DIDSON and drift zone would substantially improve the Chinook salmon estimates. Another option to improve the sonar estimate is to develop an expansion factor based on the acoustic tag results, which would require extending the study for additional years to determine the stability of the expansion factor.

Synthesis of Bristol Bay Sockeye Salmon Genetic Data Improves Understanding of Stock-specific Migration and Harvest Patterns to Inform Commercial Fisheries Management

*Tyler H. Dann, Alaska Department of Fish and Game**
Christopher Habicht, Alaska Department of Fish and Game
William D. Templin, Alaska Department of Fish and Game
Lisa W. Seeb, University of Washington
James E. Seeb, University of Washington

In 2006, the Alaska Department of Fish and Game developed a genetics program to better understand and manage sockeye salmon in Bristol Bay. The program has been used to estimate the contribution of nine major drainages (stocks) to mixed stock fisheries and provide relative abundance information in-season. An important product of the program is improved estimates of total run for these stocks; these estimates populate brood tables that are the foundation of the fishery's management. While this has been a useful tool for managing runs at a broad scale, the population genetic structure is capable of identifying abundances at finer scales that may better align with ecological processes influencing population dynamics. Furthermore, the fishery often harvests temporal components of a stock at different rates with unknown impacts at the population level. We synthesized 8 years of genetic data to address the question: Do temporal patterns of migration and harvest of intra-drainage groups of populations differ? Our results advance population-based management by characterizing temporal patterns of harvest at finer scales and are a useful context for future in-season management decisions.

Strontium Isotopes in Otoliths: Insights into Freshwater Habitat Production and Life History Strategies of Pacific Salmon

*Sean R. Brennan, University of Washington**
Daniel E. Schindler, University of Washington
Christian E Zimmerman,. USGS Alaska Science Center

The diverse population structure of Pacific salmon, variation in their life history strategies, and access to intact heterogeneous habitats, buffer their regional productivity from perturbations. However, insights into freshwater habitat productivity at fine spatial scales, variation in habitat-use strategies of juveniles prior to ocean-migration, and how these two ecological dimensions influence overall production of salmon and respond to disturbances are difficult to obtain, especially in large and remote areas, such as Alaska. Recent research in Alaska has shown how variation in strontium isotope ratios within watersheds is able to simultaneously determine both i) natal origins at relatively small spatial scales and ii) variation in life history strategies of individuals and populations harvested in coastal fisheries. Strontium isotope ratios of river waters vary within and among watersheds as a function of geologic diversity; these ratios act as a kind of natural tag that is reliably recorded in the otoliths of fish via a 1:1 relationship over the course of an individual's life, unmodified by physiological or environmental effects. Thus, strontium isotope records within the otoliths of fish combined with robust baseline isotope maps of all potential habitats represent a viable tool to delineate inter-annual production of freshwater habitats and freshwater life history strategies. Here, we present the findings of strontium isotope-based mixed stock analyses of Chinook salmon incidentally caught in Nushagak Bay and sockeye salmon collected from the ADF&G Portage Creek sonar site in the lower Nushagak River in Bristol Bay, Alaska. We also summarize our current efforts to expand these approaches into other areas of the State, including the Yukon River. Generating time-series, which elucidate these patterns annually from population aggregates captured in coastal fisheries or termini of large rivers, will also provide a framework for

investigating how these production patterns covary with environmental parameters of freshwater habitats.

RAD Sequencing of Chinook Salmon in Cook Inlet, Alaska: Discovering Markers Useful for Sustainable Management in a Genomic Context

*Christopher Habicht, Alaska Department of Fish and Game**
Tyler H. Dann, Alaska Department of Fish and Game
William D. Templin, Alaska Department of Fish and Game
Lisa W. Seeb, University of Washington
James E. Seeb, University of Washington

Genetic tools are commonly applied to identify population structure among conservation units, estimate harvest compositions via genetic stock identification, and guide supportive breeding programs. However, the application of genetic tools is often limited by the inability to provide information at geographic scales necessary to address conservation problems. This mismatch of scale between genetic structure and conservation units often results from the inability of molecular markers to resolve weak genetic structure among populations of conservation interest. Such is the case with populations of Chinook salmon from rivers in northwest Cook Inlet, Alaska. A subsistence fishery conducted by the village of Tyonek harvests an unknown composition of Chinook salmon from genetically similar populations from multiple river systems. We examined RAD markers in the context of a linkage-map to investigate genomic signals of adaptation among these populations and to identify adaptively important markers. We also investigate whether adaptively important markers can be used for discrimination of weakly structured populations.

Mobile Education Opportunities for Fisheries Professionals

*Joel Markis, University of Alaska Southeast, Sitka**
Reid Brewer, University of Alaska Southeast, Sitka
Jim Seeland, University of Alaska Southeast, Sitka

In the busy climate of boom and bust seasonal field work there is little time for educational opportunities for fisheries employees. The University of Alaska Southeast Fish Tech program has recently created mobile applications that are so flexible, that they allow even the busiest industry professionals time for educational opportunities. In fall 2015, the UAS Fish Tech program began its launch of fisheries classes that are completely contained in an Apple IPad. All of the lectures, readings, videos and exams are available without an internet connection and with the advent of solar panel IPad cases, without the need for power. In spring 2016, Fish Tech will have three courses available on the IPad: Fisheries of Alaska (3cr), Fisheries Management Techniques (3cr), and Alaska Salmon Culture I (3cr). These classes will be available to students on UAS supplied IPads or classes can be loaded on pre-owned IPads. The UAS Fish Tech program has also begun performing one credit field labs in hub communities throughout Alaska. In fall 2015, Fish Pathology labs were performed in Ketchikan, Homer and Sitka, Alaska Salmon Culture labs were performed in Sitka and Anchorage and a Fisheries Management Techniques lab was performed in Homer. With consultation and collaboration with fisheries industries, these lab classes are a great way for students to gain "hands-on application" of important fisheries techniques. Fisheries science and technology are constantly changing with updated protocols and new equipment being introduced almost monthly. These mobile educational opportunities are a means for fisheries professionals to stay abreast of the latest information and techniques created to foster maximum flexibility for remote and seasonal employees.

Flatfish Biology– Concurrent Session #2

Characterizing and Quantifying Activity Patterns of Fish with Accelerometer Archival Tags: Pacific Halibut as a Case Study

*Julie K. Nielsen, University of Alaska SFOS**
Franziska Broell, Dalhousie University
Tim Loher, International Pacific Halibut Commission
Craig Rose, FishNext Research
Paige Drobny, Spearfish Research
Christopher Taggart, Dalhousie University
Andrew Seitz, University of Alaska Fairbanks SFOS

Archival tags that measure and record acceleration are increasingly used to provide information about animal behavior and movement. This new technology is particularly important for understanding activity patterns of fish, which can be difficult to observe directly. We provide a general overview of accelerometer archival tag technology and how various types of tags may be used to provide information on fish activity and behavior. We illustrate these points with data from three types of accelerometer archival tags deployed on Pacific halibut in the laboratory and at liberty in southeastern Alaska.

Satellite-reporting Accelerometer Tags for Monitoring Survival of Trawler-deck Released Halibut

Craig S. Rose, FishNext Research
Julie Nielsen, University of Alaska, Fairbanks
Todd Lindstrom, Wildlife Comuters
Seitz, Andrew, University of Alaska, Fairbanks
Timothy Loher, Int. Pacific Halibut Commission
Paige Drobny, Spearfish Research
John Gauvin, Alaska Seafood Cooperative

Bycatch mortality of halibut captured by trawls has been a critical management issue since trawlers have fished Alaskan waters. The intensity of related conflicts has increased recently, due to declines in halibut available to the commercial halibut longline fishery, resulting in increased efforts to understand and reduce halibut bycatch mortality. Under existing handling requirements, trawl-caught halibut cannot be released before sampling in the vessel's factory. The resulting release delays can produce high mortality rates. Trawlers are developing ways to quickly sort halibut from catches, while accounting their numbers, size, and survival. This particularly requires accurately measuring how many released halibut survive. A prior study using large pop-up tags equipped with accelerometers, apparent halibut movements indicated in acceleration data were confirmed by changes in depth. We plan measuring 60-day survival of released halibut with accelerometer-equipped pop-up tags, but need small, reliable, and relatively inexpensive tags to monitor halibut survival by detecting voluntary movements. Three halibut, tagged with Wildlife Computers MiniPAT9 pop-up satellite tags with depth, accelerometer, light, and temperature sensors, were released in a Southeast Alaska embayment. After recording data at one second intervals for 24 days and subsequent release, tags were located and recovered. Analysis of archived, detailed data found very different behavioral patterns among specimens, but consistent correspondence between activity patterns as indicated by changes in depth and in tag tilt. Halibut movement bouts were well

defined and interspersed by long stationary periods. An efficient movement detection algorithm, based on acceleration patterns, is proposed and will be incorporated into Halibut Survivorship PAT tags (Halibut sPAT); simplified tags with the same shape, but equipped only with accelerometer and wet/dry sensors. This will provide a valuable tool for monitoring survival of sedentary species like halibut and provide a modern validation of current survival estimation methods based on viability assessments.

Spatial Changes in Halibut Charter Sport Fishing in Homer, Alaska

*Maggie N. Chan, UAF**
Anne Beaudreau, UAF

Distributions and abundance of fish populations can be substantially altered in locations where people expend fishing effort. Therefore, knowledge on where fishing pressure occurs, as well as the extent, manner, and drivers of those fishing pressures, is an important part of understanding regional fish distributions. This project looks at fishing locations in the charter sport fishing sector, with a focus on Pacific halibut (Hippoglossus stenolepis). We examined spatial changes exhibited by charter sport fishing operators in Homer, AK since the 1980s. This talk presents preliminary findings based on interviews with sport charter operators in summer 2015 in Homer. Interview respondents were asked to identify fishing locations for halibut and other targeted species over his or her charter career. Respondents were asked to describe the drivers of temporal and spatial changes. Interview maps were digitized in ArcGIS and changes in fishing locations over time were identified using spatial indicators in ArcGIS. Results indicate that operators have transitioned to more easily accessible fishing locations over time. Additionally, variables such as regulated size limits or business structure play a role in spatial use. Our analysis will explore the drivers behind these changes and will be useful for understanding the effects of environmental change or regulatory pressure on regional fishing patterns.

Can Fishing Explain Declines in Size-at-Age of Pacific Halibut?

*Jane Y. Sullivan, University of Alaska Fairbanks **
Steven J. D. Martell, International Pacific Halibut Commission
Gordon H. Kruse, University of Alaska Fairbanks

The biomass of Pacific halibut (Hippoglossus stenolepis) has been declining since the late 1990s. Reductions in size-at-age explain more than half of the observed decline in halibut biomass. For example, in the 1980s an age-20 female halibut weighed 135 pounds on average, and in 2014 an age-20 female weighed less than 45 pounds. One possible explanation for declines in size-at-age is the cumulative effects of size-selective fishing. Under this hypothesis, fast growing halibut have a higher total mortality rate relative to a slow growing halibut because they recruit to the minimum legal size limit at a much younger age. The net result is a population that consists of primarily slower growing individuals. We use an age and size-structured equilibrium model to examine the relationship between fishing intensity and size-at-age. We fit a von Bertalanffy growth model for each sex to size-at-age data collected from a fisheries independent survey during the 1980s (a period when size-at-age peaked) and use these growth parameters to define the mean size-at-age and variability in size-at-age in the equilibrium model. Fishing mortality was modeled as a function of length, and the effects of fishing mortality and discard mortality were jointly considered in the analysis. Results were evaluated in terms of changes in mean weight-at-age with fishing intensity

under equilibrium conditions. Realized exploitation rates of all fisheries combined ranged from 25% to 49% from 1996 to 2014, with a mean rate of 34%. An exploitation rate of 34%, preliminary results suggest that cumulative effects of size-selective fishing explain between 30% and 65% of the observed declines in size-at-age since the 1980s, depending on sex and age. Model results are sensitive to the coefficient of variation in size-at-age, discard mortality rates, and fisheries selectivity. We discuss management implications of size-selective fishing and how it affects MSY-based reference points.

Relationship Between Dietary Carbon and Nitrogen Stable Isotopes and Size-at-age of Pacific Halibut

Sarah R. Webster, Alaska Pacific University
Bradley P. Harris, Alaska Pacific University
Nathan Wolf, Alaska Pacific University
Jeffery M. Welker, University of Alaska Anchorage

Declining Pacific halibut (Hippoglossus stenolepis) size-at-age in Southcentral Alaska remains unexplained and may be diet-driven. During the summers of 2012-2013 we implemented a port-sampling program in Homer to record sex, length, and location, and to collect prey samples, muscle tissue, and otoliths from halibut landed in the sport fishery. Our objectives were to 1) describe the stable isotope (d13C and d15N) ratios of halibut prey; 2) evaluate halibut diet composition using stable isotopes; and 3) determine if diet was correlated with size-at-age. Sampling was size-based and targeted 30 individuals from each 10-cm size group for males and females. The assimilated dietary proportions were established using Bayesian implementations of stable isotope mixing models. Halibut muscle tissue (568 samples) had a wide range of stable isotope values (δ13C = -18.73‰ to -14.75‰, δ15N = 13.43‰ to 19.62‰) and (after fractionation adjustment) overlapped the values of prominent prey. Prominent prey (fish, crabs, cephalopods, amphipods) had unique isotopic signatures of d13C and d15N (MANOVA, F (3, 179) = 34.76, p<0.001). In all size bins with at least 30 fish, faster growing fish were more enriched in d13C (p<0.01) and d15N (p<0.01), indicating that faster growers are feeding at a higher trophic level and in a more benthic environment. In several instances, mixing models suggest faster growers may be consuming more octopuses. This supports the hypothesis that diet may be driving size-at-age. Approximately 50 additional samples (both prey and halibut muscle) were analyzed for d34S. The results are currently being integrated into stable isotope mixing models to determine whether the addition of sulfur is useful and practical for future studies.

Wild Alaska Salmon; A Unifying Force For Connecting Alaskan Lives - Concurrent Session #3

Homer Spit Nick Dudiak Fishing Lagoon – A Success and a Mystery
Bill Hauser, Nick Dudiak, Carol Kerkvliet and Peter Westley*

The Homer Spit Lagoon was dredged, unclaimed, unused, and barren of anadromous salmonids before 1980 and Alaska Department of Fish and Game viewed it as an opportunity to create a readily-accessible salmon sport fishery. In this talk we review the history, evidence of success, and a remaining biological mystery associated with this unique fishery at the end of the road. After more than three decades of salmon returns, the project appears to be a resounding success from the point of view of the biological, economical, management, recreational, and community. One mystery, however, remains unanswered. How do salmon imprint and return home to the Homer Spit Lagoon in the absence of any apparent freshwater or obvious olfactory cues for migration? We explore a proposed hypothesis, which posits that salmon returning to the Homer Spit Lagoon are navigating through a map of deviations in the geomagnetic field of the earth and that olfactory cues are not necessary for successful return. Thus, projects such as the Homer Spit Lagoon fishing hole represent serendipitous opportunities to learn about the biology and ecology of Pacific salmon. This talk summarizes the work of countless individuals and special thanks go to the generations of fishery biologists and technicians, hatchery managers and technicians, and administrators who have made this project successful.

Alaska's Policy for the Management of Sustainable Salmon Fisheries: Being a Teenager
Charles O. Swanton

The subject policy codified in 2001 was the result of thousands of hours of effort, literature review, public input and myriad public discussion on the topic of salmon conservation biology and sustainable exploitation. Integral to the policy were lessons learned from almost two centuries of commercial exploitation spanning the range of pacific salmon on the west coast of the North American continent. Consistent with lessons learned from the Pacific Northwest were the need to offer deference to freshwater habitats on the watershed level, all life history migration corridors, reporting of stocks not meeting escapement goals inclusive of action and research plans while integrating the needs of future generations. This policy fundamentally changed, in a positive manner, the way we report on salmon population status on a species and regional basis to the Alaska Board of Fisheries and in turn how this regulatory body has dealt with salmon stocks that are underperforming for whatever reason. It is my belief that this policy in the future will be viewed as a seminal piece of work thereby solidifying Alaska's status as having the premier salmon management system in the world and the historical track record to prove it.

Perspectives on Salmon Management, Conservation and Honoring Salmon Spirit
Barbara Blake, office of Lt. Governor Byron Mallott

This presentation will provide a glimpse of the treatment and understanding of salmon from different focus groups within Alaska. Within the role of fisheries management we will explore the State and Federal relationship to salmon. This segment will focus on managing salmon with the goal of a continued, sustainable resource for commercial, sport and subsistence fisheries. Through the conservation lens we will examine the role each of these entities serve in protecting the resource. All these groups strive to protect salmon for ecological, economic and cultural benefits. From the perspective of tribal members, we see an honoring of the salmon spirit. In honoring salmon, the fish are not only a resource, but also a spirit to be respected akin to the spirit of a human being. The perspective from each role changes according to beliefs; however, there are some individuals who choose to crossover and operate within multiple viewpoints.

Salmon Sisters
Claire Laukitis

In this talk I will address a few of the key challenges and opportunities facing Alaska's next generation of commercial fishermen. Gained from my experience growing up in a remote costal community on the Aleutian Islands dependent upon Alaska's sustainable fisheries, investing in Alaska's fisheries and building "Salmon Sisters"-- a company offering ocean-inspired, conservation-minded clothing and wild Alaska salmon directly to your door. The sisters have created a dynamic partnership, and with it work to creatively advance awareness of the role of wild sustainable seafood in our food chain. Every design Salmon Sisters makes is inspired by the sisters' deep love for the ocean, their reverence for the fish that have fed and supported their family, and a hope that they can spread awareness for the future of sustainable fisheries. Salmon Sisters works with organizations that support conservation of wild spaces and wild seafood.

Building Resilient Communities and Sustainable Economies over Centuries
Dune Lankard

Dune Lankard, an Alaskan Native Eyak, will present about the Eyak Preservation Council (EPC) and the Native Conservancy (tNC) land trust's work to protect and preserve wild salmon habitat and traditional and cultural ways of life in Prince William Sound and the Copper River watershed since the Exxon Valdez oil spill in 1989. Dune's Eyak tribe has survived in and along the Copper River Delta and the Gulf of Alaska for the last 3500 years. As salmon and forest people, the Eyaks have an inherent connection to the land, the ocean, and all Native people and fishing communities who continue to rely on pristine productive habitat and renewable fishing economies. "Through our EPC and tNC work we have been able to invite the experience and promote the cross-over between culture and fish, salmon and resilience, community and sustainability. We realize that in order to survive during these environmental and economically challenging times on our planet, we must build our resilient communities around our local food sources…they must be viewed as they were, as sacred…" Dune will talk about how we all can empower ourselves and design local communities to take more control over food sovereignty, food security and slow food issues that lead to local processing, regional cold storages and community kitchens. The importance of producing higher quality subsistence foods and encouraging direct marketing of regionally based commercial food sources can provide healthier foods and sustainable thriving local economies.

Making "Ologists" Relatable to the General Public
Jewelz Barker, Tanana Valley Watershed Association
Communicating to your audience in a relevant and relatable way is key to motivating the public. Individuals self-identify their relationship to any given topic in proven models: first from awareness, then to understanding and finally to engagement. Educating "ologists" to speak the language of local residents is key to securing commitment or concern. This presentation will explore the four year strategy (2012 – 2016) implemented by the Tanana Valley Watershed Association to connect Interior residents to their Chinook Salmon resources in the Chena and Salcha Rivers.

Bridging People Who Rely On and Impact Salmon
Andrea Sanders, Alaska Native Policy Center, First Alaskans Institute

In Alaska, many people rely on Salmon as a resource, but due to both unacknowledged and acknowledged tensions - economic, racial, regulatory - many don't have the opportunity to explore and understand how each fishing sector impacts another. There is great opportunity to bridge that knowledge and use deeper understanding to further the promotion and protection of wild Alaskan salmon into the future. The Alaska Native Policy Center (ANPC) at First Alaskans Institute (FAI) asks, *how do we start having a statewide dialogue about Salmon management structures, and its impact on people, to move beyond adversarial, competitive 'user groups' towards stewards of one of the states most precious resources?* The ANPC seeks interest and ideas to help design a series of dialogues and cross-cultural exchanges to inform, educate and provide the opportunity to evaluate and elevate the current status of our salmon, our salmon 'society' and our state's current salmon management systems.

Ethnographic Views of People and Salmon in Alaska
Courtney Carothers
As a cultural anthropologist, I have had amazing opportunities to participate in ethnographic research in diverse communities throughout the state. My research has given me an intimate look at some of the oldest salmon-people relationships, and some of the newest ones just developing. In this paper, I explore how salmon have long formed enduring ties between people, place, and culture (e.g., in Kodiak's Alutiiq communities) and how salmon continue to forge new relationships (e.g., in Barrow's emerging subsistence salmon fishery).

The Specific Importance of Chinook Salmon to the Riverine Subsistence Communities of the Yukon and Kuskokwim Rivers and How Tribal Capacity-building Can Help Save Chinook Stocks
Gale K. Vick , Ben Stevens
The Yukon River Drainage is about 330,000 square miles (bigger than the state of Texas.) The Kuskokwim River Drainage is about 65,000 square miles, about the size of Washington State. The presenters will briefly illustrate the specific importance of Chinook salmon to the river communities of the Yukon and Kuskokwim River drainages and how the 20 year decline of Chinook stocks have been a formidable hardship. The presentation will talk about how tribal communities have voluntarily, by resolution on both sides of the border, stood down from Chinook harvest in an

effort to conserve stocks and increase spawning aggregate and how tribes are building capacity to help agencies and each other to work toward greater understanding of how to increase and protect Chinook stocks for the long run. This is far more than some of the lip service that has been given to local considerations in the past. This 20 minute presentation will include: (1) A brief description of subsistence living on the Y-K, number of communities and maps of the Yukon River and Kuskokwim River drainages (2) The importance of salmon to riverine systems and subsistence communities, particularly the AYK , with subsistence as a state and federal priority in times of low abundance, issues of food security (replacement value of quality protein) and cultural and generational integration (3) The immense complications of managing on the Yukon River, including state and federal agents, tribal and international treaty (4) The need for better consistent data (5) The potential for utilizing community based monitoring systems (6) The importance of an integrated communications system (7) The importance of local and traditional knowledge (LTK) Hand outs will be available.

The Economic Geography of Salmon: a conceptual framework and preliminary characterization of the spatial distribution of economic values associated with salmon in the Mat-Su Basin, Alaska

*Davin Holen, Cultural Research North**
Tobias Schwoerer, Institute of Social and Economic Research, UAA
David Albert, The Nature Conservancy

Production of wild salmon is a service provided by naturally occurring ecosystems in Alaska that supports a wide range of economic, social and cultural values for people. The range of benefits that people derive from salmon can be measured in various ways, and accounting of these values represents a flow of services to society. Within salmon producing landscapes, other activities such as urban or resource development also benefit society yet may temporarily or permanently alter the capacity for salmon production, and thus affect the flows of salmon ecosystem services to people in the future. A challenge for Alaska in the future is to meet society's goals for growth and resource development in ways that also meet society's goals for sustainability, diversity and abundance of wild salmon. The purpose of this project is to help improve information on the economic contribution of salmon to the people of Alaska, with specific focus on the spatial distribution and relative valuation of salmon stocks that support sport, commercial and subsistence fisheries to inform land use and resource planning. This project compiled available data on economic measures of consumptive use of salmon in the Matanuska-Susitna Basin, including sport fishing, commercial and subsistence harvest. We defined economic values to include market and non-market net benefits related to commercial, sport, and subsistence fisheries for salmon species from anadromous streams in the Matanuska and Susitna River basins. We categorized stakeholders in these fisheries into Mat-Su residents, other Alaska residents, and participants from outside Alaska within the U.S. and other countries. The goal is to understand the economic geography of salmon, and not necessarily a full accounting of the absolute magnitude of specific economic flows. That is, we were more interested in the relative distribution of economic values provided by salmon than the absolute value of those contributions.

Using Education and Communication to Improve Fisheries Management and Conservation– Concurrent Session #4

Developing a Communications Strategy and Compelling Shared Story in Alaska

*Katrina B. Mueller, U.S. Fish and Wildlife Service**
Sara Boario, U.S. Fish and Wildlife Service

What is the overarching story that ensures people recognize, understand, relate to, and remember our organization? Are they willing to stand up on our behalf because they see the value of our work? These questions prompted U.S. Fish and Wildlife Service staff in Alaska to come together in February 2015 to lay the foundation for development of an integrated strategy to help guide and better leverage existing communications capacity. The goal of the ongoing effort is to develop a compelling shared narrative and identity, as well as more consistent, coordinated, and proactive content that resonates with both staff and the Service's target audiences. We present the process undertaken to date, how we went about identifying our agency's own unique Alaska-specific story that reflects our value, values, and voice, an example of how we are telling our story in a step down fashion, and lessons learned.

We Are All the Salmon Project: Building a Shared Vision for Sustaining Salmon in Alaska

Erin D. Harrington, The Salmon Project

Alaskans are passionate about their salmon resource. They also can be perplexed about its actual status as a sustainable resource, and can find it difficult to access "reliable" information to help inform their understanding. Public opinion research reveals Alaskans generally have confidence in the university and management agencies as information sources, but getting scientific results into the hands of the general public can prove challenging. This talk will explore some emerging avenues that The Salmon Project is using to build bridges between scientists and managers and the Alaska public.

Communicating Diversity through Diversity: Expanding the Communications Toolbox

Sara Thompson

The Columbia River Inter-Tribal Fish Commission (CRITFC) is the supporting and coordinating agency for the fisheries management policies for the four Columbia River Treaty Tribes; the Umatilla, Yakama, Nez Perce and Warm Springs. CRITFC is governed by the tribes' fish and wildlife committees and have developed the capacity to implement fishery programs as co-managers across their ancestral homelands that collectively stretch over one-third of the entire Columbia River Basin in the United States (66,591 square miles). CRITFC strives to serve diverse audiences over multiple landscapes that include tribal communities, the general public and tribal fishers living along the Columbia River. In order to effectively communicate with these audiences CRITFC utilizes a diverse set of communication tools. Social media and film have joined mainstream media outlets as important components in the communication efforts. While each tool serves different purposes and accomplishes a variety of goals, they still serve the broader purpose of promoting the work of CRITFC and the four member tribes, as well as highlighting the challenges facing Columbia Basin fish populations.

Community Engagement and Planning

Jewelz Barker, Tanana Valley Watershed Association

Communities can achieve sustainability when they embrace scientific exploration, cultural evolution, and innovative design. In 2014, the Tanana Valley Watershed Association initiated a formal Conservation Action Planning process with a variety of partners that assessed key threats to watershed health and determined actionable objectives to improve river ecosystems and conserve fish. The goal of this project was to improve the ecological, socio-economic, and cultural resilience of the Tanana Valley community by supporting informed and collaborative watershed restoration planning and prioritization. Watershed health impacts the entire community, so it is important to establish and sustain pathways of meaningful engagement for residents to address watershed health issues that affect their communities Learn about successful planning processes and how to facilitate dialogue among diverse working groups, best management practices for communication planning, knowing your audience's barriers and objections, and working strategically toward stewardship and collaborative buy-in.

Applying Various Strategies for Marine Invasive Species Monitoring across Prince William Sound

*Lisa M. Matlock, Prince William Sound Regional Citizens' Advisory Council**
Joe Banta, Prince William Sound Regional Citizens' Advisory Council

The Prince William Sound Regional Citizens' Advisory Council works as part of a larger state-wide Alaska Invasive Species Working Group to monitor for marine invasive species in Prince William Sound. Over 85% of ballast water deposited into Alaskan waters originates from the coastal tanker trade and ends up in Prince William Sound. The council has made it a priority to monitor for potential ballast-water borne invasive species such as European green crab and tunicates. For our monitoring efforts to be effective, the council needs active monitors in each community in the Sound. No one model for recruiting, training, and maintaining monitoring capacity has worked for every place. The council chose flexibility instead and today utilizes a variety of monitors including school groups, paid youth interns, local volunteers, and contractors to meet our ongoing marine invasive species monitoring needs. Some of these citizen scientists also incorporate education and outreach efforts in their area as part of their council work. In this presentation, we will explore how each of these citizen science models works with the unique needs of each community in Prince William Sound. We hope to inspire other organizations to consider how citizen science projects might be adapted community by community, meeting the needs of both data collection and local people. More information about the council's marine invasive species work can be viewed at: http://www.pwsrcac.org/programs/environmental-monitoring/marine-invasive-species/studies/.

Including Youth in Fisheries Research and Habitat Restoration Projects
Laurel Devaney, USFWS

Including youth in fisheries research and habitat restoration projects is cost effective, but also helps youth become stewards of their fisheries resources and develop a commitment to maintain them. It's also an ideal way to spark interest in fisheries careers. This session will describe a number of ways the Fairbanks Fish & Wildlife Field Office includes youth in their research and restoration projects. This will include a description of the Youth Habitat Conservation Corps program, as well as touching on other ways to include youth in your work such as job shadowing, citizen science projects, and helping with High School Science Symposium projects. In addition, the presentation will discuss recruiting and selecting students, developing school and community partnerships, and seeking funding, along with some common "do's and don'ts" to consider.

Kuspuk School District Math-Science Expedition, Platform for Student Investigations about Fish Population Biology and Fish Community Ecology
*Douglas B Molyneaux,**
Dave Cannon,
Jones Christa, EXCEL Alaska, Inc.
Erich H. Kuball, Kuskpuk School District

The Kuspuk School District, which is located in the middle Kuskokwim drainage, annually hosts a "Math and Science Expedition" (MSE) that centers on middle and senior high school students spending several days rafting down the Salmon and Aniak rivers in the company of several adults who engage students in a variety of math, science, and leadership activities. In recent years the science and math activities have focused on conducting standardized surveys of the juvenile fish community at each campsite with the objective of assessing whether changes occur in the species composition as students progressed from subalpine headwaters where the narrow steep sided channel cuts through bedrock, to the mainstem Aniak River with a broad flood plain of braided channels lined with tall spruce and poplar trees and abundant in-channel large woody debris. Thirty students participated in the program, mostly from local communities along the middle and lower Kuskokwim River. At the end of the float trip each student leaves with a data set that includes speciated catches from replicate samples at each camp site coupled with paired fish length and weight measurements. Adult mentors follow-up to encourage students to use their data set in developing science fair projects. The MSE is being presented here as a model that could be adapted at other schools to use citizen science as a means to increase research and monitoring capacity.

Juvenile Fish Movement and Habitat – Concurrent Session #5

Estimating the Distribution of Juvenile Chinook Salmon (*Oncorhynchus tshawytscha*) Using Habitat Modeling and eDNA in an Interior Alaska River Basin.

*Allison N Martin. School of Fisheries and Ocean Sciences, University of Alaska Fairbanks**
Jeffrey A Falke, U.S. Geological Survey, Alaska Cooperative Fish and Wildlife Research
James W. Savereide, Alaska Department of Fish and Game, Sport Fish Division
J. Andres Lopez, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks

In Alaska, it is estimated that less than 50% of waterbodies (e.g., streams, rivers or lakes) with the potential to support anadromous fishes have been documented. Identification and protection of these unsampled water bodies will be critical in light of increasing threats (e.g., climate change, fishing pressure, and land development) to fish populations, yet challenging when budgetary and logistical limitations are considered. Newly developed, non-invasive rapid-assessment techniques can reduce costs and sampling effort while increasing detectability (i.e., probability of observing an individual) across life stages. We parameterized an intrinsic potential (IP) model to predict juvenile Chinook salmon habitat potential throughout the Chena River, a clear water tributary of the Yukon River located in interior Alaska. The model was developed from a digital stream layer attributed with stream reach-scale geomorphic characteristics from which habitat preference curves were fit. Results of the IP model predicted 930.8 stream-km to have high rearing habitat potential (IP > 0.7) with 8,180.7 stream-km of lower potential (IP < 0.7). Subsequently, we divided the Chena River into 149 tributary catchments (> 20 km2 surface area) and used the model and the State of Alaska Catalog of Anadromous Waters (AWC) to classify each tributary as high IP, low IP and known to be used by juvenile Chinook based on the AWC. Ten tributaries from each category were randomly selected and three replicate water samples were collected during summer 2014 and 2015 at each site (N = 60 sites). Environmental DNA (eDNA) was extracted from water samples and amplified using quantitative PCR techniques. Based on genetic analyses, occurrence, relative abundance, and detectability of juvenile Chinook salmon were estimated under an occupancy estimation framework. Our results will provide tools for managers to rapidly and efficiently map critical rearing habitats and prioritize sampling efforts to expand the known distribution of juvenile salmon in interior Alaska streams.

Cohort-specific Variation in Habitat Associations by Juvenile Coho Salmon in the Big Lake Drainage, Southcentral Alaska

*Catherine Bradley, U.S. Fish and Wildlife Service**
Jonathon Gerkin, USFWS
Joshua Ashline, USFWS
Suresh Sethi, USFWS

Identifying patterns in salmonid habitat associations is one key step in prioritizing restoration and conservation activities aimed at maintaining sustainable populations. This information is also essential to monitor the effects of such activities post-implementation. In this study, we examined habitat associations by juvenile coho salmon (Oncorhynchus kisutch) in the Big Lake drainage, Southcentral Alaska. The drainage is situated in one of the fastest growing regions of Alaska and is important spawning and rearing habitat for a robust coho population. As such, it is a focal test area for the balance of sustainability in the face of increased human activity. We identified habitat

correlates to relative juvenile coho abundance and examined habitat characteristics specific to young-of-the-year (YOY) and 1+ cohort abundance. Deep water sections are dominated by 1+ juveniles, while YOY relative abundance increases in shallow, wide stream sections. Results also suggest that both groups are less abundant in areas characterized by heavy canopy coverage, but YOY juveniles proportionately increase in sites with low levels of canopy coverage. Considerations for the application, assessment, and inference of generalized linear mixed models (GLMM) are also specifically addressed. The information gathered in this study will be used as part of a broader modeling effort to identify stream sections in the Big Lake drainage currently inaccessible by impassable culverts but which could provide a significant increase in rearing habitat after connectivity is reestablished. Results indicate that cohort-specific juvenile abundances should be monitored to fully assess the response to restoration activities.

Coho Salmon Smolt Migration Dynamics Within the Big Lake Watershed, Alaska

*Joshua D. Ashline, USFWS Anchorage Field Office**
Jonathon Gerken, USFWS Anchorage Field Office
Suresh A. Sethi, USFWS Conservation Genetics Lab

Approximately 80 culverts exist within the Big Lake Watershed, the majority of which are characterized as impediments to juvenile Pacific salmon movement at certain flows. In order to inform the potential impact of fish passage barriers on juvenile salmon during the smolting life stage, we present information from a multi-year study utilizing passive integrated transponder technology to assess juvenile Coho Salmon, Oncorhynchus kisutch, smolt out-migration behavior and survival in the Big Lake watershed in southcentral Alaska. A total of 6,224 juvenile Coho Salmon were tagged during the summers of 2011 and 2012; of these, 1,503 (24%) were successfully detected as out-migrating smolts. Smolt migrations originated from five primary overwintering areas, and survival through the outward smolt migration varied significantly across migration origination area. We assessed factors influencing differential survival through the smolt migration, including: distance from the estuary, smolt size, and number of culverts passed.

Cold Water Habitat Use by Juvenile Salmon Directing Conservation in the Big Lake Basin

Sue Mauger, Cook InletKeeper,*
Heather Leba, Cook Inletkeeper
Jonathon Gerken, U.S. Fish and Wildlife Service

The Big Lake basin contains some of the highest biological value watersheds in the Susitna Valley and supports sport and personal use salmon fisheries. Yet stream temperatures within the Big Lake basin have been documented to be above thresholds known to be stressful to salmon and are sensitive to climate change impacts. We used thermal infrared (TIR) imagery collected along 50 river miles within the Big Lake basin to identify 36 significant cold water inputs that may act as "thermal refugia" for migrating adults and rearing juvenile salmon. Using the TIR to guide site selection, we developed a study plan to determine if Coho salmon preferentially select cold-water habitats for summer rearing. Cook Inletkeeper and U.S. Fish and Wildlife Service biologists conducted fish and macroinvertebrate sampling, habitat assessments, and temperature surveys at three sites within the Big Lake basin during monthly sampling events from July – October, 2015. Cold water influenced reaches were compared to control reaches at each site to observe measurable differences in fish use between habitats. We will provide Great Land Trust a parcel-

level prioritization of key habitats based on the thermal imagery as well as fish abundance data. Linking spatially-explicit temperature information with fish use data is a big step forward in our efforts to identify and protect key thermal refugia that may help support healthy, sustainable salmon populations in the Big Lake basin.

Freshwater Predation of Juvenile Chinook Salmon in the Arctic-Yukon-Kuskokwim Region of Alaska

*Kristen W Sellmer, Alaska Cooperative Fish and Wildlife Research Unit, Institute of Arctic Biology, University of Alaska Fairbanks**
Erik R. Schoen, Alaska Cooperative Fish and Wildlife Research Unit, Institute of Arctic Biology, University of Alaska Fairbanks
Mark S Wipfli, U.S. Geological Survey, Alaska Cooperative Fish and Wildlife Research Unit, Institute of Arctic Biology, University of Alaska Fairbanks
J. A López, Fisheries Division, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks
Renae Ivanoff, Norton Sound Economic Development Corporation,

Predation can represent an important source of mortality for juvenile salmon during their freshwater residence. The magnitude and timing of predation, and other predator-prey interactions, can have important consequences for prey populations. Many factors influence top-down controls of trophic systems, but for juvenile Chinook Salmon in the AYK region these patterns are largely unknown. Our objective was to quantify spatial, temporal, and size-structured patterns of predation on juvenile Chinook Salmon in the AYK region. We sampled four piscine predator species (Arctic Grayling, Burbot, Dolly Varden, and Northern Pike) across seasons and habitats in three study regions within the Yukon and Unalakleet River Basins. We used gut content analysis to quantify the diet composition of these predators, and DNA sequencing to identify heavily digested prey items. Prey species were identified by matching 'barcode' gene sequences against those available in authoritative public databases. We also quantified the distribution and body size of juvenile Chinook Salmon to determine potential habitat overlap with predators and size selective predation. Preliminary results showed relatively high rates of consumption of juvenile Chinook by Burbot in late spring indicating episodic predation on out-migrating smolts. The impacts of this brief period of spatial overlap between juvenile Chinook and Burbot contrasted with results from summer months, when rearing age-0 Chinook co-occurred with larger size classes of Arctic Grayling, but were rarely consumed. Interestingly, high rates of piscivory were observed in Arctic Grayling at the coastal sites. Determining what factors lead to predation upon juvenile Chinook Salmon by piscivores may help managers predict the implications of predator assemblages and environmental factors for Chinook Salmon productivity within the AYK region.

Pulsed Food Subsidies Across a Habitat Mosaic Provide Heterogeneous Growth Opportunities for Rearing Salmon in a Glacial Alaskan River

*Erik Schoen, Alaska Cooperative Fish and Wildlife Research Unit, Institute of Arctic Biology, University of Alaska Fairbanks**
Mark Wipfli, U.S. Geological Survey, Alaska Cooperative Fish and Wildlife Research Unit, Institute of Arctic Biology, University of Alaska Fairbanks
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For juvenile salmon, faster growth often confers a better chance of survival, due to size-selective mortality during the fry, smolt, and early marine life-stages. Glacial rivers with large salmon runs are heterogeneous in water temperature and in the amounts of freshwater, terrestrial, and marine-derived food resources available within different habitats; yet, the interplay and relative importance of these factors for salmon growth remain poorly understood. We compared the diet and growth patterns of juvenile Chinook and Coho salmon among glacially influenced mainstem habitats, sloughs, and clear-water tributaries in the Susitna River, Alaska. We investigated the influence of food availability, food quality, water temperature, and other physical variables on feeding and growth rates using bioenergetics and growth-rate potential models. Water temperatures varied widely at a fine spatial scale among habitats within each reach. Sloughs and tributaries contained the highest invertebrate densities, and some also had salmon spawning in pulses during midsummer-fall. In 2013, juvenile salmon in these habitats shifted from feeding on invertebrates to salmon eggs if they surpassed a gape limitation threshold during spawning runs. Juvenile salmon consumed few salmon eggs during 2014, potentially due to cooler water temperatures and fewer spawning pink salmon. Initial bioenergetics results suggested salmon growth was relatively insensitive to temperature, but highly sensitive to food supply. Understanding how environmental factors interact to provide a mosaic of growth opportunities within complex watersheds is important for managing fish stocks and their habitats, particularly in the face of environmental change.

Diverse Juvenile Life History Behaviors Contribute to a Single Spawning Stock of Sockeye Salmon

*Timothy Walsworth, University of Washington**
Daniel Schindler, University of Washington
Jennifer Griffiths, Stockholm University
Christian Zimmerman, USGS Alaska Science Center

Habitat conditions vary widely across space and time, with consequences for growth and survival opportunities of aquatic species. Mobile organisms are able to take advantage of different habitat conditions through migrations, and previous studies have focused on optimal habitat use strategies for individuals to accumulate growth and survival advantages. However, linking juvenile habitat use and growth to recruitment at the population level has proven difficult for highly mobile organisms. In the Chignik River watershed, Alaska, one population of sockeye salmon spawns upstream of two rearing lakes with considerably different rearing conditions (e.g., depth, temperature, productivity). Individuals rearing longer in the upstream lake have been shown to obtain larger size and better body condition, suggesting greater chances of survival. Here, we examined the juvenile habitat use of sockeye salmon which had survived to return to the spawning grounds to determine the extent

of time spent in the different juvenile rearing habitats. Otolith microchemical analysis revealed that the more productive headwater lake accounted for about half of the juvenile growth for those individuals surviving to spawn in a single river of the upper watershed. However, 47% of adults achieved more than half of their growth in the downstream, less productive lake. Further, 3% of individuals migrated downstream to an estuarine environment prior to returning to freshwater to overwinter before migrating to sea. These results describe a diversity of viable life-history behaviors that contribute to a single spawning population of sockeye salmon, which may buffer the population against poor conditions in any single rearing environment, reduce density-dependent mortality, and have implications for conservation and protection of critical habitats. A network of accessible alternative habitats may be critical for the long-term viability of populations presented with changing climate and land use conditions.

North Slope Fish Populations, Habitat and Fisheries – Concurrent Session #6

Lake Trout (*Salvelinus namaycush*) Otoliths as Biochronological Indicators of Recent Climate Patterns in Arctic Lakes

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Jeff A. Falke, U.S. Geological Survey, Alaska Cooperative Fish and Wildlife Research Unit
Christopher D. Arp, Water and Environmental Research Center, University of Alaska Fairbanks
Matthew S. Whitman, Bureau of Land Management, Arctic Field Office
Ben M. Jones, U.S. Geological Survey, Alaska Science Center

Climate is changing rapidly in high latitude ecosystems such as those in Arctic Alaska. Due to logistics associated with this region, long-term air temperature data are limited and lake temperature has only recently begun to be monitored. Studies to obtain more spatially and temporally comprehensive air and lake temperature data are needed. In terrestrial systems, tree-ring data and dendrochronolgy techniques are used as a reliable proxy to reconstruct temperature regimes, however, most of Arctic Alaska is devoid of trees. These same dendrochronology techniques can be applied to growth-increment widths found in otoliths of long-lived fishes such as Lake Trout (Salvelinus namaycush). Following aging, growth increments can be measured, an age related growth decline correction applied, and the resulting growth chronology can be correlated to different climate parameters. A pilot study in 2014 resulted in the collection of otoliths from 13 adult Lake Trout. These individuals ranged from 491-732 mm FL (mean=579), and ranged in age from 12-44 mm FL (mean=20). A regression of length vs. age showed a strong relationship (P-value=0.0062; r2=0.509). In 2015, a more concentrated effort resulted in otoliths from 40 adult Lake Trout (range 472-903 mm FL; mean=591). These individuals were captured from lakes in the Fish Creek watershed selected based on depth and hydrologic connectivity. Lake Trout were detected in 14 of the 25 lakes sampled. Limnologic data (e.g., productivity, water temperature) were also collected and measures of lake connectivity were estimated. Otoliths from these fishes will be used to calculate growth rate variability over time. The growth of these fish will be compared to existing temperature data resulting in a master growth chronology. This master growth chronology may be used as a multidecadal proxy of recent past air and lake temperature regimes and will be an important addition to climatological data for the region.

Investigating the Movement, Habitat Selection and Foraging Ecology of Broad Whitefish (*Coregonus nasus*) in the Colville River Watershed, Alaska

*Jason Leppi, School of Fisheries and Ocean Sciences & U.S. Geological Survey, Alaska Cooperative Fish and Wildlife Research Unit, University of Alaska Fairbanks; The Wilderness Society**
Mark Wipfl, School of Fisheries and Ocean Sciences & U.S. Geological Survey, Alaska Cooperative Fish and Wildlife Research Unit, University of Alaska Fairbanks
Dan Rinella, Alaska Natural Heritage Program and Department of Biological Sciences, University of Alaska Anchorage
Matthew Whitman, Bureau of Land Management, Arctic Field office
Andrew Seitz, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks

Subsistence fisheries on the North Slope provide an important food source for the majority of Arctic communities, yet little is known about the life history patterns and key habitat used by migratory broad whitefish. Colville River broad whitefish are a culturally important subsistence resource for the community of Nuiqsut, whose residents historically have harvested more than 28,000 pounds annually, yet primary spawning, feeding and overwintering areas have not yet been identified. Extreme seasonal variation in Arctic biophysical conditions has caused broad whitefish to develop complex migration strategies to maximize growth, reproduction and survival, but little is known about the life history of Colville broad whitefish. Our recently initiated research is targeting summer and winter migratory populations along the main-stem Colville collecting diet, muscle tissue and otoliths; and we plan to use radio tags to determine seasonal movements of adults among habitat types. We will use muscle tissue for stable isotope and genetic analysis and will use otoliths for determining age and growth patterns over individual's lives. Given the importance of broad whitefish for subsistence users and the likelihood of the aquatic resources to be impacted by climate change and oil and gas development, understanding life history patterns and habitat use is necessary for the management and conservation of Colville broad whitefish. Identification of broad whitefish habitat and migration patterns will enable land managers and industry to avoid sensitive areas and refine development plans that minimize impacts to the subsistence fishery.

Marine Behavior and Movements of Dolly Varden in Arctic Alaska

*Michael B. Courtney, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences**
Andrew C. Seitz, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences
Brendan Scanlon, Alaska Department of Fish and Game, Sport Fish Division
Randy Brown, U.S. Fish and Wildlife Service

In Arctic Alaska, Dolly Varden Salvelinus malma is highly valued as a subsistence fish; however, little is known about its marine ecology. Therefore, we are using pop-up satellite archival tags (PSATs) to study the oceanic habits, distribution and migration patterns of Dolly Varden that spend summers in the Beaufort Sea. While attached to a fish, the PSATs collect temperature, depth and ambient light data (for daily geoposition estimates), after which they release from the fish and transmit the collected data and provide an end location to satellites. To date, we have tagged and released 34 Dolly Varden (54–81 cm) in both freshwater (n = 18) and nearshore marine waters (n = 16). Preliminary results show several different dispersal types including foregoing an oceanic migration, movement in nearshore and offshore marine waters, and movement to several rivers on Alaska's North Slope. Information gained from this study has the ability to inform future management considerations by subsistence users, biological resource managers, and mineral and energy developers and regulators.

Essential Habitats and Migration Timing of Anadromous Dolly Varden in the Canning River Drainage

Randy Brown, US Fish and Wildlife Service

The Canning River marks the western boundary of the Arctic National Wildlife Refuge (ANWR) across the coastal plain in northern Alaska. The river supports a large population of anadromous Dolly Varden Salvelinus malma that feed in coastal waters of the Beaufort Sea during summer, where they are harvested in subsistence fisheries, and spawn and overwinter in freshwater habitats within the drainage. The U.S. Fish and Wildlife Service initiated a 3-year radio telemetry project to identify spawning and overwintering habitats and describe seasonal migrations of anadromous Dolly Varden within the Canning River drainage. Because the eastern Arctic is relatively deficient in water for industrial use compared to the western Arctic, this information will be valuable if hydrocarbon development is ever permitted along the coastal plain within the ANWR. During 2014 and 2015, 210 radio transmitters were surgically implanted in mature size Dolly Varden, half of which were clearly preparing to spawn and half of which were not. During the first year of the project, three major congregations of overwintering, non-spawning fish were located in the lower 140 km of the Canning River, downstream from the mouth of the Marsh Fork. During the second year of the project, several major spawning aggregations were located in association with perennial springs, mostly in the upper reaches of the drainage. Preliminary data indicates that the seaward migration in spring takes place within a few days in early June. In contrast, the return migration to freshwater extends at least through July and August. These findings will be discussed as they relate to similar studies in other drainages and issues related to development.

Top-down Effects of Ninespine Stickleback on Invertebrate Communities of Small Arctic Ponds: An Experimental Approach

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Fish may exert top-down control on their invertebrate prey, altering structure and composition of aquatic communities. The use of experiments comparing fishless to fish-inhabited systems provides insight on impacts of fish on their food webs. Despite their widespread presence in Arctic lakes, the role of Ninespine Stickleback Pungitius pungitius in Arctic ecosystems is not well understood. The objective of this study was to examine their potential role as an invertebrate predator in Arctic lentic freshwaters. We hypothesized that the addition of Ninespine Stickleback to fishless ponds would (1) change the invertebrate assemblage, (2) reduce the richness of invertebrate taxa, (3) lower overall invertebrate abundance, (4) reduce biomass, and (5) cause a downward shift in invertebrate size. We tested these hypotheses by stocking Ninespine Stickleback into isolated trough ponds and compared effects over time to fishless control ponds. We found Ninespine Stickleback exerted strong top-down pressure on invertebrate communities. The influence of fish on the fish-naïve invertebrate community occurred rapidly and persisted throughout the short growing season, causing communities to shift away from pre-stocking and control conditions. Taxonomic richness and invertebrate biomass declined in the presence of fish, while the influence of stocking on abundance and average invertebrate size was less certain. By stocking fish into

simple systems we could effectively isolate their effects on the invertebrate community, indicating the potential and the nature of a top-down role that Ninespine Stickleback could play in Arctic freshwater lake food webs. Because they occupy both top and intermediate trophic levels, the role of Ninespine Stickleback in food webs is likely substantial as both a predator on invertebrates and as a forage fish for piscivores.

Simplified Complexity or Complex Simplification: What Structures Lentic Fish Communities on the North Slope, Alaska?

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Lake food webs are structured by complex interactions between and among trophic levels, but when overall species richness is low, these interactions may be more readily revealed. On the North Slope, Alaska, criteria derived from geomorphic constraints of the landscape regulate fish distribution of relatively few species. However, beyond this coarse filter, there is a surprising amount of variation in trophic structure (e.g., top predator, maximum size) given the low species diversity. Trophic structure is likely a function of complex interactions that are partially determined by surface water connectivity. We used case studies from lakes surrounding Toolik Field Station to examine diversity, and attempt to explain variation in trophic structure. We summarized community composition, fish size and age structure, and diet across different community structures in which potential apex predators are: 1) arctic char (closed); 2) arctic char (open?); 3) lake trout; and, 4) arctic char and lake trout. For instance, in lakes where lake trout are present, we expect char to be excluded due to competitive interactions; yet, we observed lakes when lake trout and char co-exist, and our catches of char are more numerous (3:1) and larger (mean TL = 515 mm vs. 440 mm) than lake trout. In these lakes, however, lake trout exhibit increased piscivory, while char diets more often contain less energetic invertebrates. These char diets are similar to lakes containing char only, and we observed a wide range of size structures (mean TL = 475 mm, 400 mm, 270 mm, 230 mm, for example) in these char only lakes. Future work (e.g., eDNA, genetics, and stable isotopes) will seek to better understand the complexities of trophic structures of North Slope lakes. In the face of a changing climate, predictable patterns of lake trophic structure may become unpredictable and new fish community structures may emerge.

Arctic Marine Ecology – Concurrent Session #7

Environmental and Biological Influences on the Distribution of Arctic Cod (*Boreogadus saida*) in the US Chukchi Sea

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Arctic cod (Boreogadus saida) have been consistently identified as the most abundant forage fish in the US Chukchi Sea and throughout the Arctic Ocean. With climate warming and extended open-water seasons, there is increased interest in shipping, oil exploration and expansion and/or development of commercial fisheries. Future effects of continued climate warming and potential anthropogenic disturbances might have large impacts on the Chukchi Sea ecosystem, especially on cold-adapted species such as Arctic cod. We use oceanographic and biological data collected during comprehensive fisheries oceanographic surveys in the summers of 2012 and 2013 to examine environmental and biological influences on the distribution and abundance of Arctic cod. Specifically, we model Arctic cod catch per unit effort (age-0 and age-1+ separately) as a function of environmental (salinity, water temperature and nutrients) and biological (potential competitors, zooplankton abundance/composition) variables. We present preliminary results on the potential environmental and biological drivers in the distribution of Arctic cod and speculate on how their distribution may shift with climate warming and the resulting ecosystem changes.

Evaluating Growth Rates of Arctic Cod, *Boreogadus saida*, Collected From 2009 to 2014 Across the Chukchi and Beaufort Seas

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Brenda L. Norcross, PhD. , University of Alaska Fairbanks

Dramatic changes to the Arctic have highlighted the need for a greater understanding of the present ecosystem. Arctic Cod, Boreogadus saida, commonly dominate fish assemblages in the Arctic region and inhabit two geographically unique seas in the U.S. Due to the importance of Arctic Cod in the Arctic food web, establishing current benchmark information such as growth rates, will provide a better understanding as to how the species will adapt to the effects of climate change. To investigate differences in Arctic Cod life history across nearly 1500 km of vital habitat, growth rates were examined using a von Bertalanffy growth equation. Arctic Cod were collected from 2009 to 2014 from the Chukchi and Beaufort seas. Arctic Cod collected from the Chukchi Sea had an overall smaller maximum achievable length (210 mm) compared to the Beaufort Sea (253 mm) despite a larger sample size in the Chukchi Sea (n=1569) than the Beaufort Sea (n=1140). Growth rates indicated faster growth in the Chukchi Sea (K =0.33) than in the Beaufort Sea (K= 0.29). Arctic Cod collected from the Chukchi Sea had similar achievable maximum lengths throughout, but those collected from the southern Chukchi Sea grew at faster rates (K=0.45). Arctic Cod in the eastern Beaufort Sea region had a higher overall maximum achievable length (243 mm) potentially suggesting favorable conditions in this region for Arctic Cod. Knowledge about contemporary growth rates of Arctic Cod in the Chukchi and Beaufort Seas can be used in future comparisons to evaluate potential effects of increasing climate change and anthropogenic influences.

Abiotic and Biotic Influences on Diet of Four Beaufort Sea Eelpout Species

*Sarah J. Apsens, University of Alaska Fairbanks**
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Eelpouts of the genus Lycodes are a group of demersal fish commonly found in the U.S. Beaufort Sea. They are relatively numerous, having composed a significant proportion of fish catch during trawl surveys. Eelpouts are consumed by marine mammals and birds, and like other fish in the Arctic, served as an important link between low and high trophic levels. Currently, however, their exact role in the Arctic food web is still poorly understood. Additionally, how environmental factors like depth and longitude impact eelpout diet is not known. Percent number (%N) and percent weight (%W) were used to describe diet, and multivariate techniques were used to look for patterns across environmental (depth and longitude) and biological (length) gradients. Fish were collected in August and September of 2012 and 2014 as part of the U.S.-Canada Transboundary cruises. Stomachs from four eelpout species were examined: Adolf's Eelpout Lycodes adolfi, Canadian Eelpout L. polaris, Archers Eelpout L. sagittarius, and Longear Eelpout L. seminudus. Polychaetes, benthic amphipods, brittle stars, and harpacticoid copepods composed a large part of the observed diet for all four Lycodes species, but proportions differed by species. Intraspecific similarity was low, suggesting these fish have diverse diets even among individuals of the same species. Fish total length was found to be correlated with diet composition for all fish species examined except L. seminudus. Longitude and depth were found to be correlated with diet for L. sagittarius. Identifying prey and factors influencing diet are initial steps towards characterizing the ecological role of this fish genus in the U.S. Arctic food web. Ecological information on abundant fish species is needed for the development of ecosystem-based management practices. Establishing a benchmark for this group is important for understanding their current and future role in the rapidly changing Arctic food web.

The Application of Eleven US Arctic Fish Species Otolith Length-fish Length Relationships to Marine Mammal Diet Studies

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Brenda L. Norcross, Institute of Marine Science, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks

The Arctic ecosystem has moved into the spotlight of scientific research in recent years due to increased oil and gas exploration and climate change. Arctic fishes and Arctic marine mammals represent key parts of this ecosystem, with fish being a common part of ice seal diets in the Arctic. Determining sizes of fish consumed by ice seals is difficult because otoliths are often the only part left of the fish after digestion. Otolith length is known to be positively related to fish length. By developing species-specific otolith-body morphometric relationships for Arctic marine fishes, fish length can be determined for fish prey found in seal stomachs. Fish were collected during ice free months in the Beaufort and Chukchi seas 2009 – 2014, and the most prevalent species captured during these years were chosen for analysis. Otoliths from eleven fish species from seven families were measured. All species had strong linear relationships between otolith length and fish total length. Ten species had coefficient of determination values over 0.75, indicating that most of the variability in the otolith length-fish length relationship was explained by the linear regression. These relationships will be applied to otoliths found in stomachs of three species of ice seals (spotted Phoca largha, ringed Pusa hispida, and bearded Erignathus barbatus) and used to estimate fish total length at time of consumption. Fish lengths can in turn be used to calculate fish weight,

enabling further investigation into ice seal energetic demands. This application will aid in understanding how ice seals interact with fish communities in the US Arctic. A better understanding of predator-prey interactions in the US Arctic will aid in predicting how ice seal and fish species will adapt to a changing Arctic.

Quantitative approaches to future fisheries problem – Concurrent Session #8

Evaluation of Growth, Survival, and Recruitment of Chinook Salmon in Southeast Alaska Rivers

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Trent M. Sutton, University of Alaska Fairbanks
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Recent declines in the spawning runs of Chinook Salmon Oncorhynchus tshawytscha have caused social and economic hardships throughout Alaska. Previous research suggests that salmon abundance is mediated by size-dependent mortality, with the time period during freshwater and early marine residence being critical for influencing survival patterns and, ultimately, recruitment to the spawning stock. Therefore, growth is thought to be a crucial determinant of recruitment; however, the relative importance of freshwater versus marine growth in determining recruitment success remains uncertain. We conducted a scale-based retrospective analysis of the effects of freshwater and marine growth on survival to the age of reproduction for female Chinook Salmon by brood year in the Taku and Unuk rivers (southeastern Alaska). In both the rivers, Chinook Salmon total return was significantly and positively related to growth during the first year at sea. In addition, our results indicate Chinook Salmon smolts from both systems may experience size-selective mortality soon after entering the marine environment. Finally, we found that Taku River Chinook Salmon growth was dependent on previous annual growth (e.g., a positive relationship between freshwater and first year marine growth). In contrast, we found less evidence of growth dependence in Unuk River Chinook Salmon. These evaluations will allow for a more complete understanding of the factors that influence Chinook Salmon returns and inform the development of more accurate and reliable forecasts for making management decisions on Chinook Salmon stock status and escapement goals in southeastern Alaska rivers.

New Methods in Estimating Stock-Recruitment Relationships for Anadromous Species

Curry J. Cunningham, Daniel Schindler, and Ray Hilborn*

Approximation of stock-recruitment relationships with the Ricker model in order to define MSY-based management goals for Alaska commercial salmon fisheries has historically been limited by two issues: 1) The equilibrium (unfished) population size parameter is often poorly defined by the time-series of data available, and 2) Patterns of correlated variation in production over time are not represented when a single stock-recruitment relationship is assumed. To overcome these two issues, we created a Bayesian Ricker-type stock-recruitment model that incorporates prior information on equilibrium population size from isotope-based reconstructions of pre-enumeration salmon abundance based upon paleolimnological sampling of nursery lake sediments, and allows a stock to vary between alternative production regimes over time. Transition between production regimes is treated as a 1st-order Markov process, whereby state transition probabilities may be estimated directly from the data. By estimating elements of the transition probability matrix we were to simulate future production state occupancy and define management goals that are robust to future variation in production.

In-season Genetic Mixed Stock Analysis for Fishery Management: Chignik Sockeye Salmon Escapement

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The two distinct runs of sockeye salmon in the Chignik River watershed (early run to Black Lake and late run to Chignik Lake) provide for both an important commercial fishery and crucial subsistence resource for four year-round communities in the Chignik area. Substantial temporal overlap in the returns of Black Lake and Chignik Lake sockeye salmon from late June through late July complicates management of the Chignik River system. Managers require stock-specific information in order to meet a variety of complex goals—such as escapement for each run—while still providing subsistence harvest opportunities for residents dependent on the resource. In order to achieve separate escapement goals for the Black Lake and Chignik Lake stocks simultaneously, as well as maximize surpluses available to subsistence and commercial harvesters, ADF&G managers use inseason estimates of the stock-specific escapement to the Chignik River. Previously, stocks were differentiated by tagging studies, scale pattern analysis, or by a "cut-off date" to determine the end of the early run and beginning of the late run. Post-season genetic mixed stock analysis of escapement samples taken during the transition period of early run to late run from 2010-2011 indicated that annual variation in run-timing could result in misallocation of escapement between the two stocks using the "cut-off date" method. Starting in 2012, in-season genetic mixed stock analysis has provided managers with timely, accurate information to make decisions and better target run-specific escapement goals.

Environmental Controls on Growth in Two Distinct Populations of AYK Chinook Salmon

Jared E. Siegel Megan McPhee, and Milo Adkinson*

Chinook salmon (Oncorhynchus tshawytscha) from the Arctic-Yukon-Kuskokwim (AYK) region have experienced declines in abundance and productivity since the late 1990s. Diminished returns have led to a number of restrictions on subsistence and commercial harvests which have been detrimental to the region's residents, many of whom depend on subsistence harvest for basic nutrition and commercial fishing for their livelihoods. Beyond decreasing abundance, trends towards a younger age of returning adults and smaller size at age have also been reported. The factors affecting AYK Chinook growth and productivity are not well understood. One hypothesis is that physical and biological ocean conditions have shifted in the Bering Sea, causing an increase in mortality of Chinook salmon during the early marine growth stage. Environmental changes may congruently be causing alterations in later saltwater growth and age at maturity, which can also affect productivity. Further studies investigating environmental factors controlling productivity are necessary to help predict how AYK Chinook will continue to respond to Bering Sea ecosystem changes due to climate change. This study investigates environmental influences on growth of Chinook salmon throughout their lifecycle by modeling stage-specific growth, determined through retrospective scale analysis, with Bering Sea environmental variables for two distinct AYK populations (the Andreafsky River on the lower Yukon and the Kogrukluk River on the mid-Kuskokwim). Scales were gathered from escapement weirs (and partially by carcass surveys on the Andreafsky) operated by the US Fish and Wildlife Service and the Alaska Department of Fish and Game on the Andreafsky and Kogrukluk rivers respectively from 1980-2013. Here, we report preliminary modeling results for individual freshwater and saltwater growth zones (FW1 and SW1 – SW4) while describing differences between the sexes and the two populations.

Model of Drift Feeding Based on Cognitive Limits on Visual Information Processing

*Jason R. Neuswanger, University of Georgia**
Gary D. Grossman, University of Georgia

Recent reviews have shown that mechanistic models of drift-feeding behavior are useful, in many theoretical and management contexts, for understanding energy intake as a function of physiological capabilities and environmental conditions. However, these models have had limited predictive success, and clear evidence now contradicts some of their foundational assumptions. To clarify conflicts between drift-feeding models and data, and to identify new metrics for evaluating such models in the future, we reviewed empirical tests of past models and other studies of the spatial behavior or diet composition of drift feeders. We then developed a new mechanistic model in which the primary characteristics of drift-feeding behavior follow from universal cognitive constraints on the rate at which animals can process visual information. This new drift-feeding model treats prey detection as a random (Poisson) process, which permits a more realistic depiction of prey detection locations and probabilities. It also incorporates signal detection theory to describe tradeoffs between search speed (a function of water velocity) and accuracy in discriminating prey from inedible debris. This model replicates and exceeds the qualitative successes of past models without using their falsified assumptions. We are currently testing it with laboratory and field data using three Alaskan drift-feeding salmonids.

A Bathymetric Based Habitat Model for Yelloweye Rockfish (*Sebastes ruberrimus*) on the Outer Coast of Alaska's Kenai Peninsula

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Roman J. Dial, Department of Environmental Science at Alaska Pacific University
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Habitat-based stock assessments are effective for heterogeneously distributed species closely associated with specific habitats such as yelloweye rockfish (Sebastes ruberrimus), part of the Demersal Shelf Rockfish (DSR) assemblage. Management of DSR off Southeast Alaska is tied to habitat-based abundance estimates. In contrast, management of DSR in Southcentral Alaska is based on catch limits that are static and derived from historical catch averages rather than biologically significant reference points. The Alaska Department of Fish and Game is using Remotely Operated Vehicle (ROV) video surveys at several sites along the Kenai Peninsula's outer coast to estimate yelloweye densities within habitat strata. However, before a coastwide abundance estimate can be calculated, an estimate of the total area of suitable habitat is required. Toward this end we explored the feasibility of modeling yelloweye habitat within the North Gulf District in Southcentral Alaska using high resolution multibeam bathymetry, following previously developed methods. The habitat model took the form of a generalized linear model with bathymetrically derived terrain metrics (rugosity, slope, and bathymetric position index) as predictor variables. The model was parameterized and validated using yelloweye presence/absence ground truth from ROV observations. When evaluated for the Chiswell Island training area, the model correctly classified 96.0% (n = 100) of a reserved set of presence/absence validation points (Cohen's Kappa = 0.92; AUC = 0.98). When evaluated for the independent Nuka Island study area, the overall accuracy was 82.5% (n=332; Kappa = 0.65; AUC = 0.95). This study suggests that suitable yelloweye habitat can be identified with reasonable accuracy using high resolution multibeam bathymetry, and such a model has fair portability among sites within the North Gulf District.

Development of an Inseason Model to Predict Bristol Bay Sockeye Salmon Migration Timing

Katie A. Sechrist, University of Alaska Fairbanks

Knowledge of the timing of sockeye salmon (Oncorhynchus nerka) returning to Bristol Bay, Alaska is important for inseason management of the largest high-value commercial salmon fishery in North America. Because the run occurs within a narrow time span, the fishery typically begins in late June and ends in late July, migration timing can have a substantial effect on inseason estimates of sockeye salmon abundance. Accurate information on whether the run is early, average, or late is needed to assist with development of inseason estimates of run size, management of spawning salmon escapement, particularly during the early portion of the run, and aid planning operations of the salmon industry. The current study aims to identify both preseason and inseason biological/environmental predictors of Bristol Bay sockeye salmon migration timing at the Port Moller test fishery and develop a model to derive inseason projections of stock specific migration timing and inshore arrival to the five major Bristol Bay commercial fishing districts. This research has the potential to provide fisheries managers with a better understanding of migration timing, and thus inseason projection of sockeye salmon abundance, and would greatly benefit management, industry, and Bristol Bay communities by allowing fishery managers to better conserve weak stocks, distribute harvest over the entire run, and increase economic benefits from the fishery through maximum and efficient utilization of the resource.

Field Crew Takes the Weekend off: Statistical Arrival Models to Estimate Missed Passage Counts at Fish Weirs

*Suresh A. Sethi, Fisheries and Ecological Service Division, U.S. Fish and Wildlife Service**
Catherine Bradley, Fisheries and Ecological Service Division, U.S. Fish and Wildlife Service

Missed counts are commonplace when enumerating fish passing a weir. Typically connect-the-dots linear interpolation is used to impute missed passage; however, this method fails to characterize uncertainty about estimates, and cannot be implemented when the tails of a run are missed. In this talk, we present a statistical approach to imputing missing passage at weirs which addresses these shortcomings, consisting of a parametric run curve model to describe the smoothed arrival dynamics of a fish population and a process variation model to describe the likelihood of observed data. Statistical arrival models are fit in a Bayesian framework and tested with a suite of missing data simulation trials and against a selection of Pacific Salmon (Oncorhynchus spp.) case studies from the Yukon River drainage, Alaska, U.S.A. When compared against linear interpolation, statistical arrival models produced equivalent or better expected accuracy and a narrower range of bias outcomes. Statistical arrival models also successfully imputed missing passage counts for scenarios where the tails of a run were missed.

Modelling Fishing Effects on Habitat Across the North Pacific

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John V. Olson, National Marine Fisheries Service - Habitat Conservation Division
Suresh A. Sethi, Aquatic Science & Technology Laboratory at Alaska Pacific University
Craig S. Rose, FishNext Research

We have implemented a modeling framework to quantify potential impacts on benthic habitat from fishing activities across the North Pacific. The 'Fishing Effects' model is based on a discrete time linear difference equation that tracks habitat impact and recovery dynamics in monthly time steps within 5 km x 5 km grid cells in a four million sq. km model domain. The model is based on four inputs: 1) a spatially explicit database of trawls and other bottom-contact fishing activities since 2003; 2) gear dimensions and their corresponding contact adjustment to calculate area impacted by each vessel; 3) habitat based recovery and susceptibility dynamics based on an exhaustive literature review; 4) a map of sediment across the North Pacific from which we infer habitat features. The sediment map was developed specifically for this model using indicator kriging to interpolate over nearly 250,000 sediment samples compiled from many disparate surveys. Outputs from the model will be used for a variety of seascape-level analyses including assessment of fishing impacts on essential fish habitat, identifying locations of sensitive habitat given current fishing effort, and simulating how gear modifications may reduce fishing impacts.

Contributed Papers– Concurrent Session #9

Density-Dependent and -Independent Mechanisms Influencing Spawning Habitat Selection by Chinook Salmon (Oncorhynchus tshawytscha) in the Chena River Basin, Alaska

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Jeff Falke, U.S. Geological Survey, Alaska Cooperative Fish and Wildlife Research Unit
James Savereide, Alaska Department of Fish and Game, Division of Sport Fish
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Density-dependent (DD) and -independent (DI) processes are well-known to influence population growth through either local (e.g. survival) or regional (e.g. dispersal) mechanisms. For populations of concern, such as Chena River Chinook salmon, distinguishing between the strength of DD and DI mechanisms along the riverscape would be useful for managers working to restore historic levels of salmon productivity. We developed spatially and temporally explicit models throughout the Chena River to predict important DI mechanisms known to influence Chinook salmon spawning success. We used resource-selection functions to predict suitable spawning habitat based on geomorphic characteristics, a rainfall-runoff hydrologic model to generate stream flow metrics, and modeled stream temperature as a function of climatic variables. These DI variables, along with escapement estimates (DD) were used to predict Chinook salmon spawner counts throughout core and periphery sections of the Chena River. Additionally, we used isodar analysis to identify whether spawners actively defend spawning habitat or follow an ideal-free distribution along the riverscape. Model selection indicated that variation in aerial counts was best explained by escapement and whether the sampling unit was found in the spawning core or periphery. No DI variables were included in any best supported model in the candidate set, which may have resulted from the coarse spatial scale of our analyses. Furthermore, non-linear isodar plots suggested that spawning habitat in both the core and periphery were actively defended by Chinook salmon, although there was strong evidence for ideal-free distribution as well. Our results are consistent with other studies indicating Chinook salmon actively defend high quality spawning resources. Future research should explore DD vs. DI mechanisms at finer spatial scales to identify limiting factors within both core and peripheral spawning habitats of the Chena River.

Do Wild and Stray Hatchery-produced Chum Salmon Differ in Morphology, Behavior, and Levels of Egg Retention on the Spawning Grounds of a Small Stream in Southeastern Alaska?

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Megan V. McPhee, UAF SFOS Juneau
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Straying salmon of hatchery origins and their subsequent interactions with naturally occurring wild populations is of concern to conservationists in many regions. To date, our understanding of differences between hatchery and wild salmon comes primarily through the study of Chinook salmon, Atlantic salmon, and Steelhead and little is known about differences in Chum salmon (Oncorhyncus keta). Until recently, few investigations have been made into interactions between hatchery and wild origin chum populations of Alaska, and it is unclear what affects, if any, strays have on recipient populations. In this presentation we discuss preliminary findings of work aimed to quantify potential phenotypic differences between stray hatchery and wild chum salmon on the spawning grounds. During July and August of 2015 data were collected on a small spawning

population of chum salmon near Juneau Alaska known to receive substantial proportion of stray salmon of hatchery origin. Chum salmon were captured blind to their origin as wild or hatchery-produced as they entered the stream, tagged, and physical characteristics recorded. Fish were then released and visually tracked throughout the spawning season. Tags were recovered from carcasses and the mode of death was recorded (e.g. natural senescence, pre-spawn mortality, bear kill) and their otoliths removed to determine origin based on the presence or absence of hatchery induced thermal marks. Analyses that are still on-going will explore differences in date of freshwater entry, lifespan, body size and shape, and extent of egg retention in females. Additionally, inter and intra-species competition for space will be discussed along with suggested implications and plans for future work.

Maternal Effects in the Survival of Triploid Hatchery Chinook Salmon

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Meagan B. Krupa, Natural Heritage Program at University of Alaska Anchorage
Bradley P Harris, Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University

Stocking water bodies with sterile, triploid salmonids is effective at minimizing the genetic risks caused by hatchery-wild interactions. Although the triploid induction process has been thoroughly researched, the role of maternal effects and the impact of pressure shock duration on the survival of triploid fish have not been established. The objective of this study was to determine the role of maternal effects and pressure shock duration on the egg and fry survival of Chinook salmon (Oncorhynchus tshawytscha). Eggs were sampled from eight randomly selected females and fertilized with milt from eight randomly selected males. Eggs were pressure shocked 400 centigrade temperature minutes after fertilization at 10,000 PSI for treatments of three, four, or five minutes. Preliminary results suggest that there is more variation in survival between female groups than variation in survival between treatment groups. Preliminary results also suggest that subjecting fish to longer pressure shock durations does not negatively impact survival. Blood samples for ploidy determination were taken at the emergent fry stage, stained using 1.5 mL of DAPI solution and stored at -20°C for future analysis. Ploidy determination using flow cytometry was unsuccessful due to freezing effects.

Examining Pre-historic Sockeye Salmon Population Fluctuations in Upper Russian Lake, Alaska.

*Molly D. McCarthy, Department of Biological Sciences, University of Alaska Anchorage**
Dan Rinella, Department of Biological Sciences & Alaska Natural Heritage Program, University of Alaska Anchorage
Alan Boraas, Department of Anthropology, Kenai Peninsula College

Sockeye salmon are one of Alaska's most valuable natural resources, and understanding millennial-scale abundance trends and associated climatic drivers can inform adaptation to future conditions while illuminating adaptation strategies used by prehistoric indigenous people. When sockeye salmon return from sea to spawn in fresh water, they transport large quantities of nutrients and energy to otherwise unproductive nursery lakes. This nutrient influx (1) contains nitrogen with a stable isotopic signature (i.e., the ratio of 15N:14N) that differs from the freshwater background and (2) supports blooms of planktonic algae (i.e., diatoms) that thrive only in nutrient-rich

conditions. These nitrogen isotopes and diatoms are preserved in lake sediments, allowing reconstruction of salmon abundance over thousands of years. We collected sediment cores from Upper Russian Lake, aged the sediments, measured N stable isotopes, and characterized diatom communities. Nitrogen values indicated that sockeye salmon populations over the past ~4000 years have been present in this lake and fluctuating, excluding a 600 year time period from 100BC to 500AD where nitrogen levels dropped to reference lake levels. During this drop off, sedimentary characteristics changed drastically, indicating a possibility that the lake became inaccessible to salmon due to local climate conditions. Shortly following this fall in sockeye abundance, a cultural shift occurred from Riverine Kachemak people, who utilized sockeye salmon, to Sedentary Dena'ina of the Kenai Peninsula, who utilized coho salmon. We are further investigating local and regional climate variables that may have caused this drop off, which may have caused the change in patterns of habitation and technology among prehistoric humans.

An Examination of Inconnu Life History Strategies through use of Radiotelemetry and Otolith Microchemistry

Lisa Stuby, Alaska Department of Fish and Game

A radiotelemetry study of inconnu (*Stenodus leucichthys*) conducted during 2007-2015 in the Kuskokwim River drainage in Alaska has expanded our understanding of life history strategies. Four spawning areas have been identified and examined: Big and Tonzona rivers, and the South and Middle forks. 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 1-1.5 weeks in mid-October. Most of the radio-tagged inconnu overwintered in the lower Kuskokwim River and the brackish upper Kuskokwim Bay. After spring ice out many of these fish swam upriver and spent summers feeding at the mouths of major tributaries. However, some inconnu spent the entire summer in the lower Kuskokwim River and others spent the entire winter in the middle and upper Kuskokwim River, with year to year variations for individual inconnu.

Migration of Flannelmouth Sucker in the Desert Southwest

*C. Nate. Cathcart, Kansas State University**
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Fish migrations and their ecological contributions to freshwater systems are well described for trout and salmon. However, other large-bodied fishes like species of the family Catostomidae undertake annual migrations for spawning but are poorly understood relative to salmon. We described the Flannelmouth Sucker (Catostomus latipinnis) migration in two small tributaries of the San Juan River, U.S.A. from 2013-15 to show movement (e.g., who, when, where, and how many), population structure (e.g, size and age), predation, spawning behavior, and larval biology. We used passive integrated transponder antennas and tags to monitor Flannelmouth Sucker movements in addition to standardized sampling of tributaries for adult and larval fishes in McElmo Creek (UT, CO) and the Mancos River, NM. Predation was documented by assessing sampled fish for wounds, carcass counts, and game cameras. We observed spawning behavior of Flannelmouth Sucker aggregations for two days in mid-March 2015. Flannelmouth Sucker typically

began spawning migrations in late-February and early-March before spawning in mid- to late-March. Spawning adults were most numerous in reaches farther than 20 km away from the mainstem San Juan River in McElmo Creek but in the Mancos River, spawning fish were within a kilometer of the mainstem. Predation was dominated by the Great Blue Heron (Ardea herodias) during the migration. All spawning activities were performed after 1200 h with a mean sex ratio of 3:1, male: female. Larval growth indicated McElmo Creek had one spawning and hatching event whereas Mancos River likely had at least two separate occasions of spawning. Our results suggest many Catostomidae species are overlooked or unknown contributors to the function of freshwater systems via migratory pathways that can link river network positions to each other (i.e., tributary and mainstem habitats) as well as terrestrial and aquatic food webs.

Ecosystem-based management in Alaska's Fisheries: opportunities and challenges – Concurrent Session #10

Back to the future; Historical Perspectives on Opportunities and Challenges for Ecosystem-based Fishery Management in Alaska

Phillip R. Mundy, Auke Bay Lab, AFSC, NOAA

It has been barely a century since Johann Hjort, a founder of the International Council for the Exploration of the Sea, ICES, published his seminal work on fish stock assessment. Dr. Hjort's concepts that it was possible to estimate the size of a fish stock, and that it was possible to determine a rate of harvest on a fish stock that could be sustained indefinitely, form the foundation of modern fisheries science. Even so his concepts were not widely understood, and even less well accepted, when first published. Over the course of the twentieth century, Dr. Hjort's concepts became increasingly understood and accepted by the scientific community and by the general public, and they have been repeatedly validated in application to many different species of fish and wildlife. The concept of ecosystem based fishery management, EBFM, as it has come to be understood in this the second decade of the twenty-first century is at approximately the same level of understanding and acceptance among scientists and the public as were Hjort's concepts a century ago. Nonetheless EBFM, by a variety of synonyms, has already been adopted in principle by the world's leading fishery management institutions. In looking at the history of the development of EBFM as a specialized application of the much broader ecosystem approach to management, EA, it is possible not only to better understand EBFM, but to identify challenges and opportunities for implementing EBFM in Alaska.

North Pacific Fishery Management Council, Lessons Learned and Moving Forward in the Future

Diana L. Stram, North Pacific Fishery Management Council, Anchorage, Alaska

The North Pacific Fishery Management Council, one of eight regional fishery management councils managing federal fisheries 3-200 miles offshore, has long been a leader in precautionary management and development of ecosystem-based fishery management. Since its first fishery management plans were created after implementation of the Magnuson Steven Act in 1976, the NPFMC has taken a precautionary approach to management and embodied what later became

known as ecosystem-based fishery management. A variety of actions are directly responsive to the directive to manage the ecosystem as whole and move beyond single-species management. These include development of fishery ecosystem plans (FEP), bans on forage fish, a 2 mmt cap on overall harvest in the Bering Sea, halting the northward progression of the fishing fleet in response to climate change, development of ecosystem indices to monitor long-term health and sustainability in the Bering Sea and Gulf of Alaska, protecting habitat, marine mammal protections measures and biomass-based bycatch limits to protect vulnerable species such as western Alaska Chinook salmon. The Council maintains an standing Ecosystem Committee to address on-going ecosystem-based management issues, and moved forward with the adoption of a ecosystem policy which characterizes its vision and implementation strategies while continuing to participate in the discussion and development of Ecosystem Based Fisheries Management on a national level.

Ecosystem-based Fishery Management of Sustainable Groundfish Fisheries in the Eastern Bering Sea

*Gordon H. Kruse, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks**

In 2013, Alaska commercial fisheries landings accounted for 2.6 million t (5.8 billion pounds) worth US$1.9 billion dollars. These landings were 58.6% of the total US landings. Such high annual yields are associated with a fishery management system that is widely regarded as among the most precautionary and successful in the world. Here, the ecosystem-based fishery management approach toward sustainable groundfish resource utilization in the eastern Bering Sea is considered as an example. I review key features of the fishery management plan and management policy, annual stock assessment and catch specification processes, ecosystem considerations including management of bycatch and discards, habitat protections, and incorporation of economics and human dimensions into management decisions. This approach has resulted in many favorable outcomes, such as relatively stable groundfish biomass and catches, stable fish community size spectrum, reduced fishing effort, compliance with catch limits, reduced fishery discards, declining seabird bycatch, expanded habitat protections, and increases in relative abundance of structure-forming invertebrates. However, despite these encouraging diagnostics, other undesirable trends have been difficult for fishery managers to reverse, such as declines in some populations of crabs, Pacific halibut, salmon in western Alaska, marine mammals, and seabirds. Climate variability appears to explain many of these different patterns, but research continues to explore the potential for other direct and indirect effects of fishing on the Bering Sea ecosystem.

Could Adaptive Management Detect the Magnitude of Species Interactions in an Alaskan Sockeye Salmon Fishery?

*Timothy Walsworth, University of Washington**
Daniel Schindler, University of Washington

Increased concern for possible shortcomings of single-species management has generated interest in expanding fisheries management strategies to account for multiple species, particularly predators or prey of historic target species. The Chignik River, Alaska, supports a valuable salmon fishery, with fishery management and harvest focused primarily on sockeye salmon with less effort on coho salmon. As such, commercial fishery structure exerts an asymmetric effect on ecosystem structure. Species interactions within the freshwater rearing lakes may exacerbate the effects of asymmetric harvest, as juvenile coho salmon consume over half of the emerging sockeye fry

annually, potentially limiting the productivity of the sockeye populations. Here, we examine relationships between coho salmon escapement and sockeye salmon productivity in Chignik. A common impediment to implementing more ecosystem based approaches to managing fisheries is poor or lack of data on non-target fishes. Adaptive management has been put forth as a method for managing ecosystems while learning about their structure and function through management activities implemented as experiments. We use simulation models to examine the effect of directed coho salmon fishery (as an adaptive management strategy) on future sockeye salmon production, and examine the effectiveness of different management strategies for learning about the system. Our results suggest that limiting coho salmon escapement through directed harvest can substantially increase the harvest of sockeye salmon. The effect of the directed coho harvest on sockeye productivity is highly variable between years, and depends on the target escapement goal set for coho salmon. Further, even under conditions with very strong negative effects of coho salmon predation on sockeye salmon harvest, the effects of an adaptive management strategy take a long time to manifest in fishery productivity. Our results highlight challenges inherent in using adaptive management strategies in stochastic systems without control or reference systems to which to compare dynamics.

Socio-ecological Dimensions of Yukon River Chinook Salmon Fisheries

Caroline L. Brown, Alaska Department of Fish and Game

Runs of Chinook salmon in the Yukon River have been weak or below average since 2000. As a result, managers have worked closely with stakeholders to control harvest, including the elimination of commercial harvests and severe restrictions in subsistence fishing since 2008. This crisis has urged calls for an investigation of the effects of the decline on subsistence and commercial fishermen who live in rural Yukon River communities. However, understanding these effects is not always straightforward. Unlike the single species focus of much biological research and management actions, understanding salmon as a subsistence resource in the Yukon River requires attention to its place in a larger, seasonal subsistence cycle of harvesting multiple animal and plant resources. Salmon, especially Chinook salmon which is targeted throughout the drainage as a "keystone species," also play various roles in the lives of community residents as an important part of mixed cash economies and as a subject of regulation. As a cultural resource, Chinook salmon are part of relationships people have with other animals, the weather, the land, and each other. As such, thinking about socio-ecological systems more broadly is challenging because of these multiple linkages. This talk will describe a recent ethnographic study that outlines important questions for an EBFM approach in the Yukon River.

Alaska Salmon Management Versus an Ecosystem-based Approach: How are they Different and Would they Achieve Different Goals?

Daniel E.Schindler, Jonathan B.Armstrong, and Timothy J.Cline*

Alaska salmon fisheries are managed with the primary goal of achieving sustainable production to fisheries. However, a management approach whose primary goal is focused on yields to salmon fisheries may be fundamentally different from an approach whose goal is to optimize other ecological functions including the flows of marine-derived resources to support ecological functions in watersheds where salmon spawn. In particular, current management is often criticized for under-valuing the inputs of marine-derived resources needed to support consumers such as grizzly

bears and trout, which both support economically valuable tourism. Further criticisms include heavy interceptions of marine-derived nutrients needed to support the production base of aquatic and riparian food webs. Here we will provide a critical examination of whether current management practices are suppressing the performance of watershed processes, thereby constraining the overall ecological and economic values of Alaska salmon.

Predators Exploit life-history Diversity of a Harvested fish: Direct Evidence of Brown Bears Surfing the Salmon Resource Wave

*William W. Deacy, Flathead Lake Biological Station, University of Montana**
William Leacock, Kodiak National Wildlife Refuge
Jonathan B. Armstrong, Oregon State University
Jack A. Stanford, Flathead Lake Biological Station, University of Montana

One of the goals of Ecosystems Base Fisheries Management (EBFM) is recognizing and mitigating indirect effects of fisheries on trophic interactions. Most research on indirect effects has considered how the abundance of managed fishes influences trophic interactions with other species. However, recent work has shown that attributes besides abundance, such as life history variation, can strongly mediate species interactions. For example, phenological variation within prey species may enhance foraging opportunities for mobile predators by increasing the duration over which predators can target vulnerable life stages of prey. Here, we present direct evidence of individual brown bears exploiting variation in sockeye salmon spawning phenology by tracking salmon runs across a 2,800 km2 region of Kodiak Island. Data from 40 GPS collared brown bears show bears visited multiple spawning sites in synchrony with the order of spawning phenology. The average time spent feeding on salmon was 67 days, while the average duration of spawning for one population was only 40 days. The number of sites used was correlated with the number of days a bear exploited salmon, suggesting phenological variation in the study area influenced bear access to salmon, a resource which strongly influences bear fitness. These results suggest fisheries managers attempting to maximize harvest while minimizing impacts on non-target species should strive to protect the population diversity that underlies the phenological variation used by wildlife consumers. These results underscore the need to understand how fisheries affect life history diversity in addition to abundance in order to minimize negative effects of fisheries management on non-target species, a goal of EBFM.

Managing the Ecosystems of Togiak National Wildlife Refuge, Southwestern Alaska

Patrick B. Walsh, Togiak National Wildlife Refuge, U.S. Fish and Wildlife Service

Togiak National Wildlife Refuge is a 1.8 million ha federal conservation unit in southwestern Alaska at the junction of Bristol and Kuskokwim Bays. Togiak Refuge's primary mandates were established by Congress through the Alaska National Interest Lands Conservation Act of 1980, including a mandate to conserve biological diversity, with emphasis placed on salmonids. This mandate is clarified through the U. S. Fish and Wildlife Service's Biological Integrity, Diversity, and Environmental Health policy. Pursuant to this policy, we make management decisions based on ecological information gathered through the Togiak Refuge Inventory and Monitoring Program. Relative to the theme of this session, we have long been concerned that salmon harvest, which often exceeds 50% of estimated runs, has the potential to negatively affect ecosystem components by reducing the quantity of nutrients that the system would otherwise receive. Thus, we have long

worked with partners from the Alaska Department of Fish and Game, universities, tribes, and other entities to gather information to support or refute this concern. Here I explain what we've found, and discuss issues that we have confronted in pursuing ecosystem-based management.

Seasonal and Landscape Patterns of Marine-nutrient Assimilation in Rearing Juvenile Coho and Chinook salmon in the Unalakleet River, Western Alaska

*Philip J. Joy, ADF&G-SFD & UAF-SFOS**
Wes Jones, Norton Sound Economic Development Corporation
Craig Stricker, US Geological Survey, Fort Collins Science Center
Mark S. Wipfli, US Geological Survey, Alaska Cooperative Fish and Wildlife Research Unit, UAF

Marine nutrients imported to freshwater systems by migrating salmon, or marine-derived nutrients (MDN), have been identified as a significant variable affecting growth and survival of juvenile salmon. Understanding how marine nutrients from spawning salmon affects overall stock productivity requires an understanding of seasonal patterns of MDN assimilation, how these patterns vary across a watershed and how they relate to escapements of spawning salmon. To better understand these processes, MDN content in juvenile coho (Oncorhynchus kisutch) and Chinook salmon (O. tshawytscha) was monitored for three years at multiple locations in the Unalakleet River (western Alaska). MDN content was measured through stable isotope analysis, and dietary routes examined via gut content analysis. MDN content in salmon tissue was lowest in the summer, before spawning events, increased in the fall after salmon returns, and was highest in winter. Emigrating smolt had higher MDN levels than rearing parr, but MDN content in tissue was unrelated to fish brood year. In less complex sections of river characterized by minimal sinuosity and off-channel habitat, MDN content in juvenile salmon tissue fluctuated annually in association with spawning salmon. MDN levels fluctuated less dramatically in more complex sections of river characterized by abundant off-channel habitat and only demonstrated a seasonal increase when escapements exceeded that of the prior year. Gut content analysis revealed low levels of egg consumption by parr during the three years of this study and seasonal increases in MDN content were associated with a variety of invertebrate prey. Smolt diets demonstrated high levels of predation on pink (O. gorbuscha) and chum salmon (O. keta) smolt and chloroperlid stoneflies. Results demonstrated that marine nutrients and subsidies from pink and chum salmon benefit coho and Chinook salmon through a variety of pathways and suggest the need to consider multiple species in management of such systems.

Probing long-term datasets to detect shifts in shellfish productivity – Concurrent Session #12

Can sea-surface Temperatures Predict Targeted Visual Surveys of Octopus and Crab Abundance?

*David Scheel, Alaska Pacific University**
Caitlin Marstellar, Alaska Pacific University
Tania L. Vincent, Alaska Department of Fish & Game

Octopuses are common by-catch in Pacific cod and crab pot fisheries in Alaskan waters. By-catch limits for octopuses in Alaska are set using catch data from previous years. This retroactive strategy is due to data-limited management for which no forecast of octopus abundance is available. However, in upwelling systems elsewhere in the world, octopus abundance is forecast by marine productivity linked to upwelling strength, often indicated by sea-surface temperatures. We analyzed the relationship of Gulf of Alaska sea-surface temperatures to the abundance of giant Pacific octopuses (Enteroctopus dofleini) in targeted visual surveys over the period 1995 to 2014 in Prince William Sound, AK. Octopus counts on these surveys had significant negative correlations with winter sea-surface temperatures over the previous 2.5 years in eastern Gulf of Alaska waters located in ocean currents up-stream of the survey areas, with R2 from 0.48 to 0.61. This negative correlation provides a possible predictive index for octopus abundance as measured by targeted visual surveys. These methods may be useful tools in management of octopuses in Alaska. We are exploring applications of the same methods to populations of seven different species of crabs that occur in southcentral Alaska coastal waters and are eaten by octopuses.

Effects of Stratification and Kibler Nutrient Limitation on Phytoplankton Blooms in Kachemak Bay, Alaska

*Dominic Hondolero, NOAA/CCFHR**
Steve Kibler,,NOAA/CCFHR
Mark Vandersea, NOAA/CCFHR
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Kristine Holderied, NOAA/CCFHR

In Alaska, harmful algal blooms (HABs) are a threat to human health, mariculture operations, and may be linked to seabird and mammal mortalities. The 2014-2015 warm anomaly and coincident bloom of Pseudo-nitzschia in the northeastern Pacific caused fishery closures as well as seabird and mammal mortalities from California to Alaska. In September 2015 commercial oyster harvests were closed temporarily because of increased levels of the toxin causing paralytic shellfish poisoning, associated with Alexandrium blooms. The ephemeral and patchy occurrence and climate-driven changes of HAB events in coastal Alaska creates a need for better monitoring methods and improved access to HAB risk information. At NOAA's Kasitsna Bay Laboratory, partnered with researchers from the Center for Coastal Fisheries and Habitat Research in Beaufort, North Carolina, we have been conducting year-round monitoring of phytoplankton and oceanography in Kachemak Bay to assess seasonal and spatial phytoplankton distributions and triggers for HABs. Our monitoring efforts in Kachemak Bay have indicated that dissolved nutrient availability and water column stratification are important factors governing bloom development and termination as well as phytoplankton community structure. An intensive study conducted during the summer of 2015 investigated linkages between water column stratification and

phytoplankton distribution. Where stratification was weaker, the Chlorophyll-A concentrations, in general, were higher. These results suggest that mixing from deeper, colder waters in plays a significant role in the timing and strength of HABs in Kachemak Bay. Future work will further examine the role of water stratification and nutrients for HABs with the goal of creating a web-based HAB risk assessment tool that will be available to managers and resource users in Kachemak Bay.

An OA Lighthouse for the Shellfish Aquaculture Industry in the State of Alaska: Alutiiq Pride Shellfish Hatchery

Wiley Evans, Burke Hales, Jacqueline Ramsay, Jeff Hetrick, and Jeremy Mathis*

The invasion of anthropogenic carbon dioxide (CO2) into the ocean is progressively shifting the marine carbonate system such that the saturation states of calcium carbonate (CaCO3) minerals are decreasing. This global scale secular change is occurring in conjunction with large natural variability in coastal settings, which acts to shift the envelope of variability leading to longer and more frequent exposure to adverse conditions. These changes are a great concern in the State of Alaska, a high-latitude setting vulnerable to rapid modifications in the marine carbonate system due to anthropogenic CO2 invasion and where an emerging shellfish industry plans major growth over the coming decades. At the Alutiiq Pride Shellfish Hatchery (APSH) in Seward, Alaska, marine carbonate system variability has been tracked since October 2013. Measurements made at APSH detail trends in the saturation state of aragonite (Ωarag), the more soluble form of CaCO3, from intake water near continuously over a two-year period. The initial 10 months of data have been published and describe changes over the seasonal time scale. Specifically, these data pinpoint a 5-month window of favorable Ωarag conditions for growing early life stages of vulnerable shellfish species that is estimated to close by 2040. The latter portion of the record is accessible through the U.S. Integrated Ocean Observing System (IOOS) Pacific Region Ocean Acidification (IPACOA) data portal, which provides data streams from a number of shellfish hatcheries from Alaska to California. This talk will describe results from the early data collected at APSH, trends in the newer data hosted on IPACOA, and a newly funded project to expand the measurement capacity to include analyzing discrete samples collected from neighboring villages to Seward as well as develop a dosing system to test species responses to carbonate system conditions resulting from ocean acidification.

Research and Management of Scallops in Cook Inlet Management and Prince William Sound Management Areas

Jan M. Rumble, Alaska Department of Fish and Game

The Alaska Department of Fish and Game's (ADF&G) Region 2 research and management staff in Cordova and Homer are responsible for monitoring and managing shellfish in Cook Inlet and Prince William Sound. ADF&G conducts fishery independent scallop surveys, one in Kamishak Bay (part of Cook Inlet) and one near Kayak Island (just outside of PWS). These abundance surveys provide information to determine whether a commercial fishery will be opened and the guideline harvest levels associated with each of the scallop beds. Surveys for scallops are conducted biennially in these locations with dredge by ADF&G research and management staff. Abundance and harvest in both of these areas has varied over the years. In 2015, Kamishak was open for commercial scallop fishing, while Kayak Island was closed due to low abundance of scallops.

Spot shrimp research in Prince William Sound

*Kenneth J. Goldman, Alaska Department of Fish and Game**
Josh Mumm, Alaska Department of Fish and Game
Maria Wessel, Alaska Department of Fish and Game
Karen Swartzbart, Alaska Department of Fish and Game

The Alaska Department of Fish and Game (ADF&G) estimates the relative annual abundance of spot shrimp, Pandalus platyceros, in Prince William Sound (PWS), Alaska using a longline pot survey. Survey catch per unit effort (CPUE) of abundance and biomass (total catch weight) are used in concert with the previous year's commercial and noncommercial fisheries harvest to estimate a harvestable surplus of spot shrimp with a surplus production model (Schaefer model). Model results provide the following year's guideline harvest level (GHL) for both commercial and noncommercial spot shrimp fisheries. This longstanding survey began in 1989 and provides the ability to examine changes in trends of abundance over time as well as the relative size and sex composition of this protandric hermaphroditic species in PWS.

Management of Spot Shrimp in the Prince William Sound Management Area

*Maria Wessel, Alaska Department of Fish and Game**
Mike Thalhauser, Alaska Department of Fish and Game

Spot shrimp (Pandalus platyceros) in Prince William Sound (PWS) are a popular resource that is harvested by commercial, sport, personal use and subsistence users. Commercial landings of spot shrimp were first documented in 1960 with harvest peaking in 1986 at 290,632 lb, but the commercial fishery was closed for 18 years between 1992 and 2009 because of low abundance, documented by an annual Alaska Department of Fish and Game (ADF&G) longline pot survey. Noncommercial fisheries for shrimp remained open during these years of the commercial closure. In 2009, the Alaska Board of Fisheries adopted a management strategy for PWS shrimp pot fisheries designed to allow all user groups to respond to fluctuations in spot shrimp abundance. For the commercial fishery, this management strategy includes a threshold level of abundance (110,000 lb) which needs to be reached before the fishery may open and a guideline harvest level (GHL) of 40 percent of the total allowable harvest (TAH) in the years the fishery is open. Other management tools include: mandatory inseason reporting, a yearly rotation of three different fishing areas, and an adjustable pot limit (maximum 100) developed from the number of vessels registered, the GHL, and the previous catch per unit effort (CPUE) in the management area. The noncommercial fishery has a GHL of 60 percent of the TAH, a pot limit of no more than 5 pots per person and 5 pots per vessel, and a permit/harvest recording form requirement. Both commercial and noncommercial fisheries have now been open for six seasons since 2010 under this new management strategy. TAH has ranged from 128,100 lb (2012) to 167,500 lb (2015), and overall harvest has ranged from 87 to 139 percent of the TAH.

East Side Cook Inlet Razor Clam Stock and Fishery Assessment

*Mike Booz, ADF&G**
Carol Kerkvliet, ADF&G
Tim Blackmon, ADF&G
Brad Harris, APU

Pacific razor clams (Siliqua patula) on the east side of Cook Inlet between the Anchor River and Kasilof River support the largest and only road accessible sport/ personal use fisheries in Alaska. Historically, these fisheries have harvested roughly one million razor clams annually. The east side Cook Inlet razor clam stock and fisheries are managed by the Alaska Dept. of Fish & Game (ADF&G), Division of sport fish. Assessments rely primarily on three datasets: 1) estimates of density and abundance of juvenile (<80mm) and mature (≥80mm) razor clams at Clam Gulch and Ninilchik; 2) the age and length composition of the razor clam harvest; and 3) overall and beach specific razor clam harvest and effort. Major declines in juvenile and mature size razor clams have occurred since 2012. Additionally in recent years, the harvest has been comprised of fewer age classes with the predominate and average age shifting towards younger clams. This has been coupled with a drastic decline in mean length of the razor clam harvest and with decrease in the percentage of large clams (≥120 mm) in the harvest. Current annual harvest is roughly half of the historic annual harvest. The causes of these declines are unknown but for the past three years ADF&G has annually issued Emergency Order restrictions to the fisheries to allow the stock to rebuild. Assessments will be continued to monitor the stock as it rebuilds. Both ADF&G and Alaska Pacific University have sought additional funds to further explore abundance, recruitment, and natural mortality with a goal of identifying sustainable harvest levels. In this presentation, we will present the results of our current assessment work to provide an understanding of the management of the fisheries.

Speed Talks – Concurrent Session #13

Age, Growth, and Sexual Maturity of the Deepsea Skate, *Bathyraja abyssicola*

*Cameron M. Provost, Fisheries, Aquatic Science and Technology Laboratory at Alaska Pacific University**
Bradley P. Harris, Fisheries, Aquatic Science and Technology Laboratory at Alaska Pacific University
Ebert, David A. Moss Landing Marine Laboratory and the Pacific Shark Research Center at California State University
Kenneth J. Goldman, Alaska Department of Fish and Game in Homer, Alaska
Cindy A. Tribuzio, NOAA Auke Bay Laboratory in Juneau, AK

Our understanding of the age, growth, and sexual maturity traits of many chondrichthyan fishes is growing. This study set out to estimate age using vertebral centra and caudal thorns, determine size at age, and determine maturity at size and age in the deepsea skate, Bathyraja abyssicola. Sex, maturity, total length, caudal thorns, and vertebra were collected from 52 specimens taken on National Marine Fisheries Service cruises between the years 2001 and 2012. Aging approaches attempted for both vertebral centra (histology and gross sectioning) and caudal thorns (surface staining) failed to produce enough information to construct accurate growth profiles. However, moderate success with centra sectioned using the histological method provided a glimpse at basic life history characteristics. Deepsea skates appear to mature late in their lives with juveniles (n = 9) ranging from 6 to 30 years of age, adolescent individuals (n = 4) ranging from 7 to 35 years of age and adults (n=1) living at least to 45 years of age. Females were generally larger (n = 7, mean = 989.9 mm) than male specimens (n = 10, mean = 717.5). These Rajiformes are found in deep waters

(350 - 3000 meters) from northern Baja, California to the Bering Sea, and may occur as bycatch in the deep fisheries. This project will provide the first assessment of Bathyraja abyssicola age, growth, and sexual maturity traits; information needed for informed skate management.

Assessing the potential for competition between Pacific Halibut (*Hippoglossus stenolepis*) and Arrowtooth Flounder (*Atheresthes stomias*) in the Gulf of Alaska

*Cheryl L. Barnes, University of Alaska Fairbanks**
Anne H. Beaudreau, University of Alaska Fairbanks
Mary E. Hunsicker, Northwest Fisheries Science Center

Pacific Halibut (Hippoglossus stenolepis) has supported important commercial, recreational, and subsistence fisheries in the Gulf of Alaska (GOA) for over a century. However, recent decreases in spawning biomass and size-at-age have generated concerns among those who depend upon and manage the resource. Intensified competition with an increasing Arrowtooth Flounder (Atheresthes stomias) population has been identified as one of many potential mechanisms for reduced productivity of Pacific Halibut. This has led to increased interest in evaluating trophic interactions among these groundfish predators as well as the prey species upon which they rely. To enhance our understanding about the potential for competition between Pacific Halibut and Arrowtooth Flounder, we assessed their overlap in resource use from bottom trawl survey data obtained by the NOAA Alaska Fisheries Science Center. Indices of spatial and dietary overlap were calculated by sub-region (i.e., western, central, and eastern GOA) and year (1984 to 2011). Variation in the degree of resource partitioning between Pacific Halibut and Arrowtooth Flounder related to environmental (e.g., sea surface temperature) and demographic (e.g., predator and prey biomass) data will also be assessed using generalized linear models. These analyses will provide a better understanding about the extent to which Pacific Halibut and Arrowtooth Flounder share resources and help pinpoint conditions in which interspecific competition may limit population-level productivity of Pacific Halibut.

Om nom nom: Establishing a Husbandry Protocol for Skates

*Daniel B. Michrowski, School of Fisheries and Ocean Science, UAF**
Terrance J. Quinn II, School of Fisheries and Ocean Science, UAF

As part of comprehensive research into the discard mortality of skates (Rajidae) subsequent to longline capture, we are conducting a laboratory study of live skates captured with commercial longline gear. These skates often sustain injuries from both capture and crew handling. The goal of this study this study is to examine the mortality resulting from these injuries. Necessary for a study of this sort is the establishment of transport and husbandry protocols, and the assurance that these protocols do not themselves induce mortality. We discuss the steps taking in establishing and testing protocols. We will show a video showing a skate feeding in a holding tank during a recent pilot study which used these protocols.

Ecology, Life History, and Population Dynamics of Fishes in Estuarine and Nearshore Marine Habitats – Concurrent Session #14

Spatial and temporal patterns in the Lower Yukon River fish communities

*Katharine B. Miller, Alaska Fisheries Science Center**
Kathrine. Howard, Alaska Department of Fish and Game
Jim. Murphy, Alaska Fisheries Science Center

The fish community in the lower Yukon River has received little study with the only prior research occurring in the late 1980's. In 2014 and 2015, we conducted sampling on the three main tributaries of the lower Yukon River from ice-out (May) through July. The results of this research provide insights into migrational patterns, distribution, and seasonal abundance of common Yukon River species including whitefishes (Coregonus spp.), sheefish (Stendous leucichthys nelma), burbot (lota lota), and Arctic lamprey (Lethenteron camtschaticum). We evaluate these patterns in the context of environmental variables including river discharge and temperature.

Estuarine and Early Marine Life History of Yukon River Salmon

*Kathrine G. Howard, Alaska Department of Fish and Game**
Katharine Miller, Alaska Fisheries Science Center, NOAA Fisheries
James Murphy, Alaska Fisheries Science Center, NOAA Fisheries

The transition from freshwater to marine rearing habitats and the first few weeks of marine residency are believed to be a critical time for juvenile salmon survival. In 2014 and 2015 a unique combination of research projects enabled observations of juvenile Yukon River salmon across this critical time period: as fish leave the river from ice break-up through July, and in the ocean in August and September. The combination of results provides new information on Yukon River juvenile salmon outmigration timing, size and growth patterns, and habitat use. Results are compared to those from the only prior Yukon River study documenting salmon marine entry, conducted in 1986, to provide insights for timing and size variability in changing climatic conditions.

Linking estuarine habitats, juvenile salmon, and the fish community in the Anchor River estuary

*Brianna D. Pierce, University of Washington**
Coowe M. Walker, Kachemak Bay Research Reserve
Charles Simenstad, University of Washington

The distribution of species across a landscape and the factors that govern habitat use are central to ecology and conservation biology. Because certain habitats disproportionately influence species' survival, resource managers are tasked with identifying and preserving or restoring critically important habitats for culturally and economically valuable species such as salmon. Recent declines in wild Alaskan salmon populations have highlighted the need to understand critical juvenile rearing habitats. Estuaries are receiving increased attention as juvenile salmon habitat in the Pacific Northwest, but less is known about juvenile salmon use of estuaries in Alaska. By examining the

tradeoffs that govern species' movement and distribution among estuarine habitats, we can gain a pivotal understanding of the linkage between juvenile salmon and the estuarine landscape. Using field and quantitative techniques, we are addressing the ecological processes driving fish community structure and habitat use in the Anchor River estuary, southcentral Alaska. We evaluated fish abundance and distribution patterns with respect to environmental habitat characteristics and fish community composition. We tagged juvenile salmon and staghorn sculpin with passive integrated transponder (PIT) tags to elucidate patterns of movement and residence throughout the estuary. Next, we will link distribution and abundance patterns with fine scale telemetry data to develop a spatially explicit model incorporating biotic and abiotic processes to predict habitat use and highlight critical habitat characteristics.

Trophic niches of juvenile Pacific salmon and cod rearing in nearshore habitats

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Nearshore ecosystems are well known rearing habitats for juvenile fish. As a first step toward understanding the food webs for nearshore rearing fish, we analyzed the stable carbon and nitrogen isotope values of juvenile Pacific Salmon (Oncorhynchus spp.) and cod (i.e., Gadids) to investigate differences among species and across habitat patches with and without submerged vegetation (macrophytes or eelgrass). Carbon isotope values indicate sources of primary production and generally distinguish food webs based on phytoplankton from those based on submerged vegetation, while nitrogen isotope values typically indicate trophic level. Juvenile fish were collected along Katmai National Park and Preserve coastline using beach seines during July 2013. Collections included Pink Salmon (Oncorhynchus gorbuscha, n = 44), Chum Salmon (Oncorhynchus keta, n = 14), Sockeye Salmon (Oncorhynchus nerka, n = 9), small unidentified cod (35-45 mm, n= 14), and larger Pacific Cod (Gadus macrocephalus, 96-127 mm, n = 9). Carbon and nitrogen isotope values were considered separately using ANOVA with post-hoc pairwise comparisons ($P < 0.05$). Carbon and nitrogen values differed among species with Pacific Cod having higher carbon and nitrogen values than any salmon species. Higher carbon isotope values may indicate larger contributions of submerged vegetation to Pacific Cod, while higher nitrogen values likely indicate a higher trophic level compared to juvenile salmon. Pink Salmon had higher carbon and nitrogen values than other salmon species, but differences were small and are unlikely to reflect substantial differences in energy sources or trophic position. Vegetation at the capture location was unrelated to carbon and nitrogen values within species, suggesting that fish, prey, or suspended particles of primary producers move freely across patches with and without vegetation. Stable isotope analysis of primary producers is underway and will allow quantitative estimates of primary production sources to the food webs of nearshore rearing salmon and cod.

Invasive Species – Concurrent Session #15

Are introduced Northern pike driving salmon declines?

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Introduced Northern pike (Esox lucius) are hypothesized to be a driver of salmonid fish declines across the globe. Pike are renowned piscivores that favor soft-rayed fish, like salmonids. Concern over introduced pike is especially high in southcentral Alaska, where pike were illegally introduced to the Susitna River and Kenai River basins in the 1950s and have since spread to > 100 lakes and 70 drainages. Chinook salmon, coho salmon, sockeye salmon, and rainbow trout populations have declined in lakes and drainages where pike occur– presumably because of pike predation. To test the hypothesis that pike predation has caused declines in salmonids, we applied field-derived diet data, water temperature data and population abundance data to estimate pike consumption of salmonids and other prey species in Alexander Creek and the Deshka River, tributaries to the Susitna River. Data were collected in the summers of 2011, 2012, and 2013. We found that juvenile anadromous salmonid dominated pike diets throughout the summer, especially pike < 500 mm total length. Bioenergetics modeling estimated that an individual pike < 500 mm consumed up to 400 grams (≈ 250 fish) of juvenile anadromous salmonids each summer, while larger pike consumed up to 350 grams (≈ 200 fish) per individual. We estimated a minimum of 2600 pike < 500 mm and 1740 pike > 500 mm in Alexander Creek and 700 pike < 500 mm and 250 pike > 500 mm in the Deshka River. When individual bioenergetics estimates are put in the context of pike abundance, it becomes readily apparent that pike can drive salmonids to low abundance and possible extirpation.

Assessing trophic plasticity in a renowned piscivore, northern pike (Esox lucius), in its native and invaded range

Peter Westley, Adam Sepulveda, and Thomas P. Quinn*

A pervasive hypothesis in invasion biology is that phenotypic plasticity facilitates colonization and persistence in new environments by allowing invaders to exhibit different traits in different conditions. As a subset of this hypothesis, trophic generalists (i.e. species that utilize a range of prey across trophic levels) are more often predicted to be invaders than specialists (i.e. those species dependent on one or few prey items). In this talk we present a comparative analysis of the tropic plasticity of northern pike, a piscivore of mythical proportions. Specifically, we quantify the variation in northern pike diet from three populations in the native range of Bristol Bay, Alaska (Lake Aleknagik, Stonehouse Lake, and Long Bay Lake) with diets of invasive populations from the Mat-Su Basin (Alexander Creek and Deshka River) of Southcentral, Alaska. Analyses simultaneously reveal that northern pike prefer to consume fish when available and also have the capacity for trophic plasticity in the absence of fish prey. For example, diets of native northern pike in Stonehouse Lake were comprised almost entirely of invertebrates (e.g. Anisoptera larvae) whereas other populations had higher contributions of fish in their diet. Our results are consistent with the hypothesis that the invasion of northern pike is facilitated by plasticity in their trophic ecology and suggest that invasion success of northern pike will not be inhibited by dietary restrictions.

Eradication of Invasive Northern Pike from Alaska's Kenai Peninsula

*Kristine J. Dunker, Alaska Department of Fish and Game**
Robert L. Massengill, Alaska Department of Fish and Game

Invasive northern pike on the Kenai Peninsula of Alaska are apex predators that have decimated fish populations. Left unchecked, northern pike are likely to spread. The Alaska Department of Fish and Game (ADF&G) has conducted northern pike control and eradication activities involving mechanical removal and rotenone treatments on the Kenai Peninsula for over a decade. Recent rotenone treatments have included native fish restoration efforts. In 2012, a 7,000 acre-foot open lake that supports wild anadromous fish was treated with rotenone while native fish were held captive in a nearby lake or propagated through broodstock collections. Following the treatment, these fish were used to reestablish native fish populations in the lake. Currently, ADF&G is conducting a multi-year project to remove northern pike from a 42 square-mile drainage including six lakes and twenty miles of anadromous stream. This endeavor also includes a large native fish restoration component. In addition to native fish restoration, the primary purpose of these projects is to prevent northern pike from spreading. ADF&G's ultimate goal is to completely eradicate northern pike from the Kenai Peninsula to eliminate their threat entirely. Recent northern pike eradication projects have been a critical step toward that goal.

Using eDNA as a Tool to Evaluate the Effectiveness of Control Measures for invasive Northern Pike

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Kristine J. Dunker, Alaska Department of Fish and Game

The circumpolar northern pike (Esox lucius) occurs naturally north and west of the Alaska range but is not native in Southcentral Alaska. Illegal introductions of pike in Southcentral Alaska have resulted in the successful colonization of this invasive species throughout the Susitna River Basin, the Anchorage Area, and watersheds on the Kenai Peninsula. This issue is a major conservation and fishery management concern because northern pike are an apex predator and can negatively impact native fish species including salmon and trout. The Alaska Department of Fish and Game has implemented an invasive pike management plan to prevent, manage, and control pike in locations where pike are not native. As part of this plan, managers identified a group of four pike invaded lakes in the Soldotna Creek Drainage on the Kenai Peninsula and used netting methods for initial removal of captured individuals. The genetic tool eDNA was then used to detect remaining pike individuals for pre chemical (post netting) and post chemical treatment measures. The previously verified eDNA assay was robust for the detection of pike both pre and post chemical application. In addition to being effective in detection, the eDNA assay revealed trends suggesting the potential for relative density prediction in these four systems over a temporal scale.

Invasive Elodea: Management Actions in Alaska
Heather A.M. Stewart, State of Alaska Department of Natural Resources

Alaska is valued for its natural resources, pristine environment, and outdoor activities. However, it is not immune to invasive species despite its geographic isolation, relatively cold climate and extensive undeveloped landscape. Elodea is Alaska's first submerged aquatic invasive plant species. In optimal growing conditions, Elodea is able to form dense single-species stands and becomes a dominant species in water up to 2m deep, while reducing temperature and oxygen concentrations, and increasing sedimentation. Studies have shown that Elodea's aggressive growth and vegetative propagation is responsible for the loss of aquatic habitat biodiversity, displacing rare and aquatic species, and degrading salmon spawning grounds. The first occurrence of Elodea in Alaska was found near Cordova within Eyak Lake in 1982 as part of an herbarium study. It wasn't until 2009, when Elodea was found established near Fairbanks in the Chena Slough that sounded the alarm of management. Surveys in 2010 determined Elodea was also established in three Anchorage lakes. In 2011 Elodea was discovered in three lakes on the Kenai Peninsula, and additional waterbodies near Cordova on the Copper River Delta. To date, Alaska has ~22 waterbodies infested with Elodea including the world's busiest floatplane airport: Lake Hood. Management practices in Alaska have had varied stragegies and results. 2014 herbicide treatments on the Kenai Peninsula have proven to be preliminarily effective for achieving eradication, as two of the three waterbodies have no detected Elodea in 2015. Three of Anchorage's lakes were first treated with herbicides during the 2015 field season. Lake Hood was treated with herbicides 43 days after Elodea was discovered in 2015, a testament to early detection and rapid response. Future treatments of the Fairbanks area and the Matanuska-Susitna's Alexander Lake are scheduled for 2016. Efforts to implement a Statewide Elodea Eradication Plan with stakeholders are currently ongoing.

Sustainability and Well-being in Alaskan Fisheries – Concurrent Session #16

Conceptualizing and Operationalizing "Human Wellbeing" for Environmental Science and Management
Courtney Carothers, Sara Breslow*

With the adoption of ecosystem-based management, in which the ecosystem is defined to include people, environmental decision-makers, managers, and scientists are increasingly seeking indicators that can track the effects of changing environmental conditions and management strategies on human wellbeing. The challenge for social scientists is to translate the wealth of research on the human-environment relationship into terms usable by scientists and managers. In this paper we present a comprehensive conceptual framework of human wellbeing that is designed to guide the selection of indicators for an integrated ecosystem assessment. Developed for the US west coast, the framework may be adapted for other regions with appropriate modifications. We propose four major constituents of wellbeing: connections, capabilities, conditions, and cross-cutting domains. The latter includes the domains of equity and justice, security, resilience, and sustainability, which we suggest may be assessed through the cross-cutting analysis of the other constituents. Underpinning the framework is a detailed table of attributes that link to specific management responsibilities and key qualities of wellbeing discussed in the social science literature. We use the framework to identify potential indicators for two focal attributes: resource access, and self-determination. We find that existing indicators and data are available for many

measures of "conditions", but largely unavailable for measures of "connections" and "capabilities." The framework promotes a multidimensional understanding of human wellbeing in ecosystem-based management, by encouraging a broader spectrum of social indicators, and outlining major areas in need of social science research.

For Generations to Come: Human Dimensions and Community Well-being Within the Kodiak Archipelago Commercial Fishing Industry

*Danielle J. Ringer, University of Alaska Fairbanks and Kodiak Seafood and Marine Science Center **
Courtney Carothers, University of Alaska Fairbanks
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Rachel Donkersloot, Alaska Marine Conservation Council

Fisheries sustainability concepts and approaches involve numerous ecological, economic, cultural and political dimensions. In regards to participation the average age of permit holders in Alaska's limited entry commercial fisheries has progressively increased from 40.9 in 1983 to 49.7 years in 2013. This paper explores these dimensions and the "graying of the fleet" in the context of the social processes of entry and exit in commercial fishing. As current permit holders approach retirement age and a decreasing number of young people obtain ownership-level fishing careers in Alaska's fisheries, the impacts of succession and entry choices on rural coastal communities become an increasingly pressing issue for managers and stakeholders. I will discuss initial themes and findings from ethnographic research in Kodiak, Old Harbor, and Ouzinkie, including: economic barriers for new entrants, fishery diversification limitations impacting upward mobility, retirement and exit considerations, power dynamics between harvesters and processors, and fishing as a livelihood and source of identity within coastal communities. A greater understanding of the human dimensions of ecological systems and the incorporation of well-being considerations into management decisions offers an opportunity to address sustainability as the future of fisheries evolves in Alaska.

Salmon Futures: Stakeholder-driven Salmon Management Scenarios Under Changing Environmental Conditions on the Kenai Peninsula

*Jamie Trammell, University of Alaska, Anchorage**
Meagan Krupa, University of Alaska, Anchorage

Understanding the adaptive capacity of individuals within natural resource management agencies is a key component of assessing the vulnerability of salmon to future environmental change. We seek to explore the adaptive capacity of natural resource agencies on the Kenai Peninsula by exploring the drivers and implications of different salmon abundance scenarios through participatory workshops with managers. We present here the initial results from the first workshop, which explores the various drivers responsible for changes in salmon abundance. Ranging from global to local, and biophysical to socioeconomic, these drivers are also linked to specific actors in the region. These complex interactions comprise the Kenai Peninsula's social-ecological system and determine its ability to react to change. Using a stakeholder-driven scenario framework, we aim to: 1) explore the adaptive capacity of natural resource agencies in the region by exploring and exposing managers to different but logically coherent salmon abundance scenarios; 2) build stakeholder confidence in the science of environmental change on the Kenai

Peninsula; and 3) develop a decision support tool that helps regional resource managers better understand their changing environment. We utilize and present the scenario framework as a platform for integrating hydrologic, landscape, and cultural change information into actionable decisions, crafted by the stakeholders, so that landscape change on the Kenai becomes more coordinated.

Broken Links: How Limited Entry, Markets, and Family Have Transformed Access to and Participation in Bristol Bay's Commercial Fisheries

*Jesse M. Coleman, UAF School of Fisheries & Ocean Sciences**
Rachel Donkersloot, Alaska Marine Conservation Council
Danielle J. Ringer, University of Alaska Fairbanks and Kodiak Seafood and Marine Science Center
Paula Cullenberg, University of Alaska Fairbanks and Alaska Sea Grant

Between 1980 and 2013, the number of Bristol Bay limited entry permit holders under the age of 40 has decreased by 47%. More than just a piece of demographic trivia, this statistic underscores the increasingly restricted opportunities for ownership-level commercial fishing careers available to young Bristol Bay residents. Our research team seeks to understand the perceived barriers to entry that exist for the next generation of commercial fishermen, and how entry processes have changed over time. We're using ethnographic research methods, including semi-structured interviews with new and experienced fishermen, and a survey of local students to elicit the attitudes held by young residents on commercial fishing in their communities. In this presentation, I will give background on limited entry in Bristol Bay, and discuss some of our results, including common interview themes of 1) family connections to the fisheries, 2) global seafood market dynamics, and 3) how permit and permit holder outmigration have changed young people's access to limited entry fisheries. As we continue the project, we hope to further untangle the complex, underlying issues that shape local fisheries participation and the sustainability of coastal communities in Bristol Bay.

Community impacts of Gear Bans in Alaska and Florida Commercial Fisheries

Philip A. Loring, School of Environment and Sustainability, University of Saskatchewan

In this paper I explore the political and community dimensions of parametric management in fisheries. I discuss two cases where parametric changes—specifically, gear bans—have been implemented or are proposed in response to conservation concerns: the commercial net ban enacted in Florida in 1995 and a proposed ban on set gill-nets in a portion of Alaska's Cook Inlet. The comparison provides an opportunity to explore the interplay of ecological goals and political goals and motivations of stakeholders. Lessons from the Florida net ban, which has arguably resulted in negative societal and ecological impacts, are informative to the Alaska case as it continues to unfold. In both cases, the gear bans have dramatic allocative consequences, but scientific evidence for their necessity is limited. These cases also show how ethical considerations are largely inseparable from the ecological aspects of managing fisheries, and that when communities grapple with the sustainability of fisheries they are also simultaneously seeking to define the socially acceptable uses of those resources. I suggest a set of questions that can be asked when proposing and implementing parametric changes to fisheries, including how those changes will impact social well-being and community resilience and how those impacts will be addressed. I

conclude by proposing food security as an explicit normative vision upon which more ethical and sustainable fisheries management can be achieved.

Weak Stock Salmon Management – Concurrent Session #17

Utility of Using Escapement Data Collected from Fish Weirs to Help Inform Inseason Salmon Management in the Kuskokwim River

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Zachary W. Liller, ADF&G Commercial Fisheries Division

Kuskokwim River salmon fisheries are managed to achieve escapement goals, but inseason management is challenged due to a lack of timely escapement information. Fish weirs are a common method used to monitor salmon escapement throughout the Kuskokwim River drainage; however, there is a considerable lag between the time when salmon exit the fishery and are first detected at weirs. As a result, weirs are often used as post-season reporting tools for evaluating inseason management decisions and achievement of escapement goals. Nevertheless, weir data are closely monitored inseason and Kuskokwim Area staff attempt to estimate end of season escapement using daily fish counts and historical escapement timing past the weir. The uncertainty associated with inseason weir escapement projections is often very high early in the escapement and improves greatly as more data becomes available. It is important that fisheries managers understand when weir escapement projections can be reliably incorporated into inseason management discussions and how much influence they should have. We discuss a simple inseason projection method for estimating end of season escapement from weir data and present a case study demonstrating both the challenges and utility of using weir data to inform inseason management.

Management Strategies That Span Weak and Strong Runs of Anchor River Chinook Salmon

Carol M. Kerkvliet, Alaska Department of Fish and Game Division of Sport Fish

Generations of anglers have started off their summer season sport fishing for Chinook salmon on the Anchor River. The Anchor River is a small, rocky, road accessible stream that runs through Anchor Point near Homer. The inriver and nearby marine fisheries have been heavily restricted throughout most of their history using time and area restrictions and conservative bag limits. Management of the fisheries can be broken into two time periods based on the method used to monitor escapement. From the 1950's – 2002, escapement was indexed using a combination of foot and aerial surveys during peak spawning after the fishery occurred. Sustainable escapement goals (SEG) were adopted and periodically modified based and these index counts. In 1999, in response to the guidelines established in the Sustainable Salmon Fisheries Policy (5 AAC 39.222) the Alaska Board of Fisheries (BOF) listed Anchor River Chinook salmon as a stock of "management concern". The listing occurred because the escapement index chronically failed to meet the lower bound of the SEG, and resulted in further restrictions. Since 2003, escapement has been estimated more reliably using a combination of a Dual-frequency IDentification SONar (DIDSON) and weir counts. This improved method allowed establishment of SEG's based on the actual escapement. It also allowed inseason escapement monitoring during which a range of run sizes were observed. The stock of "management concern" listing was rescinded, in response to the strong runs in 2003 and 2004, and inriver and nearby marine fisheries liberalized. In 2007, the inriver and nearby fisheries were again liberalized. The Anchor River inriver and nearby marine fisheries were progressively

restricted by the BOF and by EO in response to weak runs from 2009-2014. The strong 2015 run resulted in rescinding preseason restrictions. This presentation will focus on strategies used to manage Anchor River Chinook salmon during weak and strong runs.

Village Quotas Provide Small Harvest Opportunity for Kings on the Kuskokwim

Greg Roczicka, Orutsararmiut Native Council
William R. Bechtol, Association of Village Council Presidents

Chinook salmon have been a critical component of the culture and food resources of people along the Kuskokwim River for thousands of years. The primary inseason management tool for Kuskokwim Chinook is the Bethel Test Fishery, 90 miles upriver from the mouth. Formal assessment of drainage-wide returns is based on a run reconstruction model. However, model input is largely based on data collected late in, or after, the Chinook return. Since 1976, low returns occurred in 1986, 2000, and 2010–2013, with 2012 and 2013 being the lowest on record. Given low recent returns, a poor forecast, and management uncertainty coupled to statutory/regulatory limitations, ADF&G had few management tools in 2014 that could allow a nominal Chinook harvest earlier in the run, while meeting the drainage-wide escapement goal. Also in 2014, the Federal Subsistence Board made an ANICLA 804 determination that allowed village-based quotas for harvesting Chinook on federal waters. A pilot project, developed in lieu of a complete closure, was largely unsuccessful due to the small number of fish identified as a "safe" harvestable surplus (1,000 fish among eligible villages) and process uncertainty. In 2015, following negotiations with representatives of the newly formed Kuskokwim Inter-Tribal Fisheries Commission, a directed harvest of 7,000 Chinook was identified, with village allocations based on 20-year average harvest proportions. Other directed Chinook harvests were prohibited. This program, though still viewed with some uncertainty, was much more successful. Permits were issued through village representatives who were responsible for administration and timely harvest reporting. Albeit assisted by a late and/or protracted run, all escapement goals for Chinook salmon were met or exceeded for the first time since 2009. Equally notable, civil unrest and disobedience occurrences highly susceptible to escalation into violent confrontation were avoided. Thus village quotas provided a unique opportunity for a limited, controlled harvest.

Freshwater Habitat – Concurrent Session #18

Monitoring Wetlands and Amphibians in Yellowstone and Grand Teton National Parks: Can Monitoring Help us Predict Their Future?

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Andrew Ray, National Park Service
Blake Hossack, US Geological Survey

Wetland ecosystems are a natural resource of tremendous significance; they provide temporary storage of surface water that supports stream flow, sequester carbon and other nutrients, and offer valuable habitat to fish and wildlife. Even though wetlands constitute a small portion (3%) of the landscape in Grand Teton and Yellowstone national parks, they provide critical habitat for 38% of Yellowstone's 1,200 plants, 70% of Wyoming's 400 birds, and all native amphibians. However, wetlands in this region are drying as a consequence of warming temperature and declining precipitation patterns. We will discuss how wetlands are connected to annual temperature and

precipitation patterns in Grand Teton and Yellowstone and what this portends for amphibians. The US Geological Survey and the National Park Service's Greater Yellowstone Network have collected information on wetlands and amphibians at approximately 300 wetlands annually since 2005. We are able to use these long-term data to describe how wetland drying and amphibian occurrence are related to a changing climate. These data are fundamentally important to understanding current status and trends, but also forecasting the future of wetlands and amphibians on some of the nation's most protected lands.

Determinants of Sockeye Salmon Migration Timing at the Northern Edge of Their Distribution

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David C. Douglas, USGS Alaska Science Center

Climate change is profoundly affecting Arctic and Subarctic ecosystems. Anadromous salmon are particularly susceptible to changes in environmental conditions due in part to physiological challenges associated with spawning migration. Multiple mechanisms exist by which climate change may influence migrating salmon including altering migration cues from ocean or river conditions. Migration timing constrains the conditions experienced in the river during migration with potential implications for spawning success. We explored relationships between conditions in the ocean and river on annual run timing of adult Sockeye Salmon (Oncorhynchus nerka) in a subarctic watershed where low numbers of salmon have returned in recent years, and the start of the migration occurs as much as 10 days later in the summer. Colder air temperature and more sea ice coverage in May were associated with later river entry, as was cooler sea surface temperature in May and June. In situ river temperatures had a similar relationship with run timing, as colder river temperatures were related to delayed river entry. Documenting how migration timing has changed for Sockeye Salmon towards the northern end of their range provides a useful perspective on the determinants of salmon population dynamics in Arctic and Subarctic ecosystems.

Large Scale Spatial and Temporal Diet Patterns of Juvenile Salmonids (Oncorhynchus spp.) Rearing within a Large, Glacial Alaskan River

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Riverine landscapes consist of a mosaic of habitats that receive food subsidies from freshwater, terrestrial, and marine environments. The contributions of these resources to rearing Pacific salmon (Oncorhynchus spp.) can shift over time and space, altering the energy pathways that limit

fish production. Despite the need for understanding drivers of salmonid production, most riverine food web research has focused on small spatial scales and does not account for the broader heterogeneous nature of watersheds. This study aimed to determine large-scale patterns in contributions of freshwater, terrestrial, and marine food subsidies to juvenile Chinook and Coho salmon in the large, glacially influenced Susitna River, Alaska. We quantified diet patterns: (1) spatially, along a 169-km upstream to downstream continuum in the river and among predominant macrohabitat types, and (2) across seasons, using stable isotope and gut content analysis. Bayesian stable isotope mixing models indicated that juvenile salmonids were largely supported by freshwater-sourced prey regardless of spatial and temporal context. The relative contribution of marine-derived prey was greatest in the fall within tributary mouth and off-channel habitats, whereas terrestrial invertebrate prey were most important during mid-summer within all macrohabitat types sampled. No upstream to downstream diet pattern was apparent. These results highlight the relative importance of prey from various food resources, and provide large-scale spatial and seasonal context for the importance of pulsed marine and terrestrial prey subsidies to juvenile Chinook and Coho salmon. Understanding broad patterns and dynamics of food resource contributions to juvenile salmonids rearing in multiple freshwater habitats can assist in improved management decisions of stream salmonid populations, habitats, and the ecosystems from which their food originates. These results provide a baseline assessment to predict potential impacts from the Susitna-Watana Hydroelectric Project and other land-use or climate-driven changes.

Salmon Habitat Mapping for Landscape-scale Planning in the Matanuska-Susitna Basin

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David Albert,. The Nature Conservancy
Lee Benda, The Nature Conservancy
Dan Miller, The Nature Conservancy

Landscape-scale planning and prioritization for sustainable development, conservation, and restoration activities requires spatially explicit, landscape-scale information on the distribution and abundance of resources. Likewise, landscape-scale planning that seeks to prioritize protection of salmon habitats and salmon populations seeks spatially explicit information detailing the quality and quantity of these habitats and the distribution of fish abundance by species and life stage. To supplement the state of Alaska's Anadromous Waters Catalog (AWC) as a datasource for landscape-scale planning, we sought to better understand and describe the distribution and relative abundance of salmon and their habitats in the Matanuska-Susitna basin. This project compiled the best available spatially explicit information on salmon habitat and salmon abundance by species and life stage for the entire Mat-Su basin, including a synthesis of previously completed studies enumerating adult salmon spawning patterns. It also seeks to improve understanding of juvenile salmon rearing habitats by using locally derived salmon-habitat relationships and a NetMap terrain model to propose a qualitative model predicting distribution and relative abundance of coho, Chinook, and sockeye salmon rearing habitats across the Mat-Su Basin. Results showcase the diversity of habitats likely utilized by salmon throughout the basin, the abundance and locations of streams likely to produce anadromous fish that are currently not listed in the AWC, and research needs still required to properly document habitat use by all species and life stages. The results of this work are currently undergoing formal review by local stakeholders and being aligned with relevant, institutionalized datasets to support use of these new data in landscape-scale planning and prioritization efforts.

Linkages between landscapes, headwater streams and juvenile salmon rearing in the Kenai Lowlands, Alaska

Coowe M. Walker, Ryan S. King, Dennis F. Whigham, Mark Rains, Michael Callahan*

Headwater streams on the Kenai Peninsula provide critical rearing habitat for numerous salmonids. Our recent development of a validated flow-weighted slope (FWS) model for predicting juvenile salmonids in the Kenai Lowlands, showed that these headwater streams may support up to ¼ million salmonids in a wide range of size classes, and in numerous habitat types, with juvenile Coho Salmon and Dolly Varden reaching densities of >500 and 1300/km, respectively. We have conducted several studies on landscape linkages to headwater stream productivity, using the FWS model as a framework for Investigations. Our studies of headwater stream-groundwater interactions have shown that FWS correlates with numerous stream–temperature metrics. By integrating flow path length and flow path slope, the FWS also may serve as a potential indicator of groundwater discharge into headwater streams as well as water residence times along shallow lateral flow paths, which can greatly affect stream temperature. Other studies have revealed that carbon from peatlands is an important energy pathway in salmon-rearing headwater streams, and that ecological "hotspots" may occur where catchment cover of wetlands and alder, (a nitrogen - fixing shrub), are both relatively high. In such places, carbon and nitrogen inputs may synergistically enhance stream productivity. We have also clearly demonstrated the important coupling of riparian wetland vegetation to streams and have confirmed that juvenile salmonids travel between different headwater habitat types during their freshwater residence. Together, our results provide compelling new data for the conservation of a diversity of headwater stream habitats, especially including surrounding landscape elements that are linked to stream productivity.

New Perspectives on the Importance of Chinook Salmon Spawning in Headwater Tributaries of the Kuskokwim River

*Jordan M. Head, Alaska Department of Fish and Game**
Zachary W. Liller, Alaska Department of Fish and Game

Little is known about the quality of salmon spawning habitat in headwater tributaries of the Kuskokwim River, but recent information suggests that these areas may be more productive than previously thought. Chinook salmon that return to spawn throughout headwater tributaries of the Kuskokwim River are unique compared to fish spawning in other areas of the drainage. Much of what is known about Chinook salmon returning to the Kuskokwim River has been learned from tributary escapement monitoring projects and large-scale radio telemetry studies operated during years with above average run abundance and moderate exploitation during the early portion of the run. Consecutive years of low run abundance since 2010 has resulted in conservative management strategies and additional research focused, in part, on headwater Chinook salmon. Tagging studies conducted in 2014 and 2015 provided an opportunity to monitor upriver migration timing and spawning distribution of Kuskokwim River Chinook salmon during years of low abundance and very low exploitation. In this presentation, we will discuss recent improvements to our Chinook salmon escapement monitoring program and contrast migration timing and spawning distribution patterns under different run abundance and harvest regimes. Preliminary results indicate that Chinook salmon returning to headwater tributaries makes up a majority of the early portion of the run, and salmon escapement to upriver areas was considerably larger than expected during years with low exploitation. This new information may indicate that headwater habitats are highly productive and play a larger role in sustaining downriver fisheries than previously thought. This is

important for sustainable management of Kuskokwim River Chinook salmon, as fisheries managers may be able to affect escapement to headwater tributaries by adjusting the harvest timing.

Tracking Thermal Conditions of Alaska's Salmon Habitat Through Regional Water Temperature Monitoring Networks

*Sue Mauger, Cook Inletkeeper**
Tim Troll, Bristol Bay Heritage Land Trust

Recent warming in high latitude regions is changing Alaska's fresh waters, including earlier ice breakup, earlier loss of snowmelt contributions to stream flows, and increasing water temperature. For Pacific salmon, the timing of spawning, egg development, and movement to and from the marine environment is largely driven by temperature. With the rapidly warming climate, and recent studies projecting decreased salmon habitat elsewhere, collaborative partnerships are growing among federal and state agencies, non-governmental organizations and Native Tribes to collect water temperature data to assess regional-scale changes. The development of minimum data collection standards for Alaska creates an opportunity for rapid, but structured, growth in comparable stream temperature monitoring efforts in Alaska that can be used to understand current and future trends in thermal regimes. These trends can inform strategies for maintaining ecosystem resilience. Bristol Bay Heritage Land Trust and Cook Inletkeeper are providing coordination and technical assistance for the new Bristol Bay Regional Water Temperature Network designed to meet clearly defined short and long term objectives. Examples from Cook Inlet and Bristol Bay will be highlighted to identify challenges and lessons learned to assist in the development of more regional networks across Alaska.

POSTER SESSION ABSTRACTS

1. Interpretation of Essential Fish Habitat regulations in the United States

*Aileen M. Nimick, Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University**
Bradley P. Harris, Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University

In the United States the Magnuson Stevens Fisheries Conservation and Management Act mandates that federal commercial fisheries managers designate and protect Essential Fish Habitat (EFH). The statute requires that adverse impacts to EFH be minimized to the "extent practicable". Federal regulations define "adverse impacts" as those that reduce the quality and/ or quantity of EFH in a manner that is "more than minimal and not temporary". Neither the statute nor the Final Rule establish clear guidelines for what constitutes "minimal" or "temporary" and therefore regional fisheries councils are afforded broad scope for interpretation. This poster will highlight the similarities and differences between the regional councils' interpretations of the EFH regulations and consider the implications for Congress's intended protections. It will also provide examples of work our lab has been involved with to quantify benthic impacts of fishing.

2. High-seas movement and behavior of Chinook Salmon, elucidated with pop-up satellite tags

*Andrew C. Seitz, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences**
Michael B. Courtney, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences
Mark D. Evans, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences
Robert V. Walker, University of Washington High Seas Salmon Research Program (retired)
James Murphy, Alaska Fisheries Science Center, NOAA Fisheries

To examine the oceanic ecology of Chinook salmon, about which little is known, we are conducting a proof-of-concept study in which large, immature Chinook salmon are tagged with pop-up satellite archival transmitting tags in the Bering Sea. While externally attached to the fish, the tags measure and record ambient light (for daily geoposition estimates), depth and temperature data. On a pre-programmed date, the tags release from the fish, float to the surface of the ocean and transmit the recorded data to overhead satellites which are then retrieved by project investigators. Most tagged Chinook salmon have remained in the Bering Sea while occupying depths to 200 m and water temperatures from 4 to 13°C during summer and autumn. Based on temperature records, predation of Chinook salmon by salmon sharks occurs in the Bering Sea. One additional tagged Chinook salmon left the Bering Sea and transited across the Gulf of Alaska while occupying depths to 500 m and water temperatures between 3 and 9°C during winter. These data provide valuable information about regional oceanic ecology of Chinook salmon, which may be used in a variety of ways, such as for improving bioenergetics models, avoiding bycatch, and informing evaluation of high-seas salmon survey data.

3. Diet Analysis of Arctic Lampreys in the Bering Sea using Gene-Based Prey Identification

Annyssa Interrante, Andres Lopez, Katie Shink, Trent Sutton, and Jim Murphy

The diet of Arctic Lampreys (Lethenteron camtschaticum) during their marine life history phase is poorly known, therefore the aim of this study is to improve our understanding of the diet of L. camtschaticum from the Bering Sea. A combination of visual observations and genetic techniques were used to assess predator-prey relationships. The intestinal contents of 122 specimens sampled in 2014 were examined. Hard structures and prey fragments were removed for targeted examination. Prey species were identified by matching DNA sequences derived from direct sequencing of isolated prey fragments and from sequencing DNA pools isolated from homogenized intestinal contents. Initial results show that Pacific Cod (Gadus macrocephalus), Pacific Herring (Clupea pallasii) , Pacific Sand Lance (Ammodytes hexapterus), Capelin (Mallotus villosus), and several species of Salmon are important components of Arctic lamprey diets. Recovered hard structures include: fins/fin rays (55.5 %), vertebrae (40.6%), scales (22.7%), eggs (5.5%), and otoliths (0.8%). The presence of hard structures indicates that lamprey feeding events are commonly lethal to the prey. These findings expand our knowledge of Arctic Lamprey dietary habits, and brings into question previous assumptions of a primarily parasitic feeding behavior.

4. Effects of temperature regime on juvenile Chinook and Coho salmon growth in three geomorphologically distinct sub-basins of the Kenai River

Benjamin Meyer, Alaska Cooperative Fish and Wildlife Research Unit, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks
Daniel Rinella, Alaska Natural Heritage Program, University of Alaska Anchorage
Erik Schoen, Alaska Natural Heritage Program, University of Alaska Anchorage
Mark S. Wipfli, U.S. Geological Survey, Alaska Cooperative Fish and Wildlife Research Unit, Institute of Arctic Biology, University of Alaska Fairbanks

Changes in air temperature and precipitation as a result of ongoing climate warming in South-central Alaska will impact juvenile salmon freshwater rearing habitat differentially on the basis of local watershed conditions. However, the extent to which landscape and hydrological characteristics such as glacial and snowmelt input support resilience to changes such as rising water temperature is not well understood. Some south-central Alaskan salmon streams already experience water temperatures well above Alaska Department of Environmental Conservation's maximum thermal criteria of 15°C during summer months, however, the biological relevance of thermal criteria will vary by habitat, population, and watershed type. We selected three focal Kenai River tributaries – Beaver Creek, Russian River, and Ptarmigan Creek – to represent a spectrum of catchment types with differing potential levels of resiliency to climate change. Differences in elevation, precipitation, and valley slope produce a range of water habitat conditions and temperature profiles. Water temperature along with food resources are considered to be significant controls on the growth potential of juvenile salmon, however little is known about how temporal and spatial patterns in these variables influence growth of juvenile Salmon in Southcentral Alaska. In our initial field season of summer 2015, we collected diet samples and length/weight measurements from juvenile Chinook and Coho salmon along with water temperature data from throughout the three focal watersheds. Temperature, diet, and growth data are being incorporated into bioenergetics models that will allow us to determine whether growth rates of juvenile salmon are limited by food or temperature, and help inform whether current thermal criteria for these species are biologically accurate under the specific geomorphological conditions characteristic of the focal watersheds.

5. Utilization of Blood Plasma for Identifying Sex and Reproductive Status of Yelloweye Rockfish Subjected to Barotrauma and Recompression Events

Brittany J. Blain, ADF&G
Trent M. Sutton, UAF, SFOS

Discard mortality of rockfishes Sebastes spp. is a management concern along the west coast of North America. Although many rockfish species have exhibited the potential to survive following barotrauma injuries caused by forced decompression, it is unclear if barotrauma affects reproductive output. This study assessed whether non-lethal blood plasma indicators (i.e., vitellogenin and calcium2+) can be used as a potential tool to identify sex, maturity, and reproductive viability of Yelloweye Rockfish S. ruberrimus, captured from an isolated reef in Prince William Sound, Alaska, 1 – 2 years following one or more barotrauma events and recompression with a deepwater-release mechanism (DRM). Results from hematological sampling demonstrated that mature females can be discerned from males and immature individuals during oocyte development and immediately following parturition. However, it was not possible to discern between mature females whose oocyctes were developing and post-parturition. All mature female yelloweye rockfish captured (n = 16) in 2008 or 2009 were gravid or spent in 2010, indicating that there is no evidence that reproduction of yelloweye rockfish is affected 1 – 2 years following forced decompression and recompression with a DRM. These results provide fisheries managers with information on the use of DRMs as a tool for rockfish conservation and supports the importance of utilizing DRMs by sport anglers.

6. Chandalar River Chum Salmon (*Oncorhynchus keta*) Riverscape-Scale Salmon Habitat Assessment and Monitoring

Chelsea Clawson, Jeff Falke, Josh Rose, Aaron Martin, and Jordi Cristóbal

Fall chum salmon from the Chandalar River contribute significantly to the subsistence needs of communities along the Alaska portion of the Yukon River. The effects of climate change and increased mineral exploration activities have raised concerns among local community members and state and Federal fisheries managers. Chum salmon rely on river reaches with groundwater upwellings to facilitate egg development and juvenile growth throughout winter months. However, limited information is available on the relationship between spawning chum salmon and the spatial distribution of upwellings along the Chandalar River. We used a combination of aerial spawner and remote-sensing surveys, and on-the-ground habitat sampling to classify habitats, identify longitudinal patterns of groundwater upwellings, and estimate the distribution of spawning salmon along a 40-km reach of the Chandalar River. The categorical abundance of spawning salmon aggregations was estimated based on single and replicate aerial surveys during September 2013 and 2014, respectively. Aggregations ranged from one to two individuals to over 500 spawners, and high concentrations of spawners were located in the middle and lower portions of the study reach in side channels, sloughs, and along the main channel margin. Surface water temperatures were surveyed using a Forward-Looking Infrared Radar (FLIR) mounted to a fixed-wing aircraft during September 2014. Spatial variability in surface water temperatures indicating groundwater upwellings was apparent with temperatures ranging from 0.2-7.5^{0}C. Detailed on-the-ground physical habitat measurements (e.g., intragravel thermal regimes, hydraulic conductivity, specific conductance, and pH) were initiated during September 2015 in three channel types (primary, flood, and spring; N=11 sites) to quantify the magnitude of upwelling in concentrated spawning areas and assess baseline water chemistry. Our results will contribute towards development of a long-term monitoring plan for chum salmon and their spawning habitat in the Chandalar River and allow resource managers to better understand the effects of future climate and anthropogenic change in the region.

7. Assessing the potential for competition between Pacific Halibut (*Hippoglossus stenolepis*) and Arrowtooth Flounder (*Atheresthes stomias*) in the Gulf of Alaska

*Cheryl L. Barnes, University of Alaska Fairbanks**
Anne H. BeaudreauUniversity of Alaska Fairbanks
Mary E. Hunsicker, Northwest Fisheries Science Center

Pacific Halibut (Hippoglossus stenolepis) has supported important commercial, recreational, and subsistence fisheries in the Gulf of Alaska (GOA) for over a century. However, recent decreases in spawning biomass and size-at-age have generated concerns among those who depend upon and manage the resource. Intensified competition with an increasing Arrowtooth Flounder (Atheresthes stomias) population has been identified as one of many potential mechanisms for reduced productivity of Pacific Halibut. This has led to increased interest in evaluating trophic interactions among these groundfish predators as well as the prey species upon which they rely. To enhance our understanding about the potential for competition between Pacific Halibut and Arrowtooth Flounder, we assessed their overlap in resource use from bottom trawl survey data obtained by the NOAA Alaska Fisheries Science Center. Indices of spatial and dietary overlap were calculated by sub-region (i.e., western, central, and eastern GOA) and year (1984 to 2011). Variation in the degree of resource partitioning between Pacific Halibut and Arrowtooth Flounder related to environmental (e.g., sea surface temperature) and demographic (e.g., predator and prey biomass) data will also be assessed using generalized linear models. These analyses will provide a better understanding about the extent to which Pacific Halibut and Arrowtooth Flounder share resources and help pinpoint conditions in which interspecific competition may limit population-level productivity of Pacific Halibut.

8. Cumulative Impacts Assessment of Non-Fishing Stressors on Fish Habitat, Norton Sound, Alaska.

Chris V. Maio, University of Alaska Fairbanks
Matthew Balazs, University of Alaska Fairbanks
Job Noordeloos, University of Alaska Fairbanks

Harris, Bradley P. Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University
Sethi, Suresh, A. Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University
Despite recent advances in measuring and modeling adverse fishing impacts on benthic habitats, the linkages between anthropogenic and climate driven non-fishing stressors and essential fish habitat (EFH) remain largely understudied in Alaska. Further complicating this challenge is a need to understand stressors at multiple spatial and temporal scales. This information gap hinders the ability of fisheries managers to accurately assess cumulative impacts and prioritize actions to mitigate them. To address this gap in understanding, we developed a preliminary workflow for a cumulative assessment of non-fishing adverse impacts to EFH in Alaska. The pilot study is taking place within Norton Sound, along the eastern Bering Sea coastline. EFH for 12 commercially harvested species have already been mapped within Norton Sound, providing opportunity to overlay non-fishing related anthropogenic stressors directly with habitat for economically important species such as red king crab (Paralithodes camtschaticus). We apply geographic information system (GIS) technologies to collect, document, and map spatially explicit layers representing human and climate driven stressors on EFH. Over the course of the pilot project, 35 publically available data sources for mapping the distribution of non-fishing related activities were identified, resulting in the acquisition and documentation of hundreds of relevant GIS shapefiles.

Input data were organized into 10 categories of non-fishing activities (e.g. excavation, marine transportation, and temperature anomalies), providing ability to map individual-and cumulative stressors over the study area. However, each category was associated with a set of spatial, temporal, and empirical limitations. Key data gaps include limited spatial and temporal metadata associated with GIS layers, the scarcity and low resolution of climate data, and the paucity of empirical data necessary to accurately measure the impact and recovery time of individual stressor-habitat interactions. Future work includes application of these data to formal EFH impacts modelling to support cumulative effects analysis.

9. Morphological Variation of Introduced Brook Trout (*Salvelinus fontinalis*) in the Salmon Creek Watershed in Juneau, Alaska.

Henry M. Masters and Carolyn A. Bergstrom

Morphological variation within species has been associated with variable life histories and habitats, and is seen within groups of fishes such as stickleback (Gasterosteidae) and salmonids (Salmonidae). Salmonids have shown remarkable morphological variation with the onset of smoltification, such as increased growth in length relative to weight, which results in a more streamlined fish better suited for a migratory life history. Morphological and ecological divergence between non-migratory lake-stream pairs of three-spine stickleback have shown strikingly similar patterns across separate distinct lineages, an example of parallel evolution. This study investigates morphological variation within a lake-stream pair of brook trout (Salvelinus fontinalis). In the early 19th century, the Salmon Creek watershed dam was constructed in Juneau, Alaska and brook trout were planted both above and below the dam, giving rise to this lake-stream pair under investigation. Morphological variations among this lake-stream pair was investigated to better understand the selective and environmental pressures which each habitat regime imposes on its population. Field work was conducted over the summer of 2015 which included mark-recapture, scale samples, fin clips, and detailed photographs of each fish. Steam and lake sampling was balanced throughout the summer to avoid any biases, with a stream sample size of ns = 35 and a lake sample size of nL = 37. By better understanding the morphological variation within the Salmon Creek lake-stream pair of brook trout, we can better monitor the rate and degree of adaptation taking place in this introduced species, better detect outward migrating brook trout from the Salmon creek watershed, and provide a platform which future lake-stream pairs can be compared to further the investigation of parallel evolution within salmonids and fishes in general.

10. Spatial Distribution, Food Habits, and Energetics of Age-0 Walleye Pollock (*Gadus chalcogrammus*) and Pacific Cod (*Gadus macrocephalus*) During Summer in the Eastern and Central Gulf of Alaska

*Jamal, H. Moss, NOAA**
Marilyn, F. Zaleski, NOAA
Ron, A. Heintz, NOAA

Walleye pollock (Gadus chalcogrammus) and Pacific cod (Gadus macrocephalus) are commercially and ecologically important species in Alaska waters. Little is known about their ecology after transitioning from larvae to free swimming fish until settlement to nursery habitats in the eastern Gulf of Alaska. Differences in the distribution, diet, body size, and energetic status between the eastern and central Gulf of Alaska were investigated during summer months to better understand regional and interspecific differences in life history and ecology. No statistically significant differences in the regional or interspecific composition of prey in the diets of walleye pollock and

Pacific cod were detected. Body condition and total energy content of Pacific cod was greater than walleye pollock, however total energy content increased with length at a similar rate for both species. Walleye pollock inhabiting continental slope waters had higher energy stores relative to those inhabiting the continental shelf and basin, indicating an energetic advantage for individuals remaining off the shelf during summer months or potentially the advection of fish with higher energy reserves off of the shelf. Previous studies have documented the importance of energy stores for surviving winter and future studies should focus on understanding the mechanisms influencing lipid storage and somatic growth for walleye pollock and Pacific cod inhabiting the eastern and central Gulf of Alaska.

11. Fine-scale resource selection by Sockeye Salmon (*Oncorynchus nerka*) in groundwater-fed ponds, Bristol Bay, Alaska

*Jeff Falke, U.S. Geological Survey, Alaska Cooperative Fish and Wildlife Research Unit**
Jason Ching, Alaska Salmon Program, University of Washington
Morgan Sparks, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks
Curry Cunningham, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks
Peter Westley, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks

The reproductive success of salmon is influenced by numerous biological factors including size-at-maturity, ocean growth, and spawner densities. However, as the majority of mortality in salmon occurs during incubation, abiotic conditions may play a disproportionate role in the survival of individuals to the next generation. At fine-scales (e.g., within habitat units), research has focused on the preferences of salmon for specific spawning conditions (e.g., depth, velocity, substrate), yet the influence of habitat heterogeneity at these scales is less well understood. The overall goal of this pilot project was to determine the efficacy of techniques to quantify fine-scale resource selection by spawning sockeye salmon individuals and aggregations across three groundwater-fed ponds (Big Pond = 4300 m2; Grass Pond = 815 m2; Berg's Pond = 230 m2). Aquatic habitat characteristics (depth, surface and substrate temperature, conductivity, substrate type) were measured across a grid pattern every 3 m throughout each pond (N = 305 samples). Concurrent with habitat sampling, counts of spawning sockeye salmon were collected over 10 min using video from an HD camera mounted on an unmanned aerial vehicle at three heights (15, 25, 55 m). Habitat measurements and salmon counts were then georeferenced and associated with individual 3 m2 grid cells. Six random frames were sampled from the video to assess salmon detectability and variability in counts as a function of survey height and pond. The average and coefficient of variation of salmon counts within each grid cell were calculated, and the relationship between spawning sockeye salmon abundance, variability, and physical habitat was modeled using a geostatistical regression model that allows for spatial autocorrelation. In light of climate change and other anthropogenic changes to salmon ecosystems, characterization of the role of habitat heterogeneity, including water temperature, in salmon spawning dynamics should be a high priority.

12. Acoustic tagging of chum salmon in Norton Sound, AK

Jenefer Bell and Justin Leon*

Subdistrict 1 commercial and subsistence salmon management area in northern Norton Sound includes chum salmon stocks from several independent rivers for which available genetic markers cannot differentiate stock. Consequently, most marine harvests cannot be allocated to stock of origin and the level of harvest on individual stocks is unknown. To address these management challenges, a 2-year acoustic tagging study was initiated in marine waters of the subdistrict where fishery harvest occurs: the first year of chum salmon marine movement are presented. In June of 2015, receivers were deployed in 7 curtain arrays extending from shore to approximately 2 miles offshore to detect nearshore fish passage along the subdistrict coast. Additionally, receivers were placed in each of the main chum-bearing rivers of the subdistrict. A total of 273 fish were tagged from late June–late July of which 259 were chum salmon and 14 were sockeye salmon. Of the 273 fish tagged, 260 were detected by receivers for a tag detection success rate of 95%. In addition, 25 tagged fish (24 chum salmon and 1 sockeye salmon) were physically or visually recovered within the Norton Sound-Port Clarence and Kotzebue areas. Preliminary data analysis suggests that salmon captured in marine fishing waters of Subdistrict 1 are stocks of Subdistrict 1 origin as well as stocks originating throughout Norton Sound-Port Clarence and Kotzebue. Tracking movement of chum salmon using acoustic telemetry appears to be feasible in Norton Sound and an additional year will provide more insight into harvest potential of the salmon within the marine waters of Subdistrict 1.

13. Assessing the accuracy and uncertainty of Landsat derived stream temperatures for use in Chinook salmon (*Onchorhynchus tsawytscha*) habitat assessments on the Anchor River

*John A. Hagan, Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University**
Bradley P. Harris, Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University
Suresh A. Sethi, Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University

Temperature information derived from Landsat satellites may provide valuable insight into the temporal and spatial effects of global climate change on Alaska's freshwater ecosystems and in particular the recent declines in Chinook salmon (Onchorhynchus tshawytscha) runs. Alaska's Chinook salmon runs have decreased by more than 60 percent in the last decade, reaching the lowest level on record in 2010. These declines in Chinook salmon abundance remain unexplained. Griffiths and Schindler (2012) and numerous other workers have demonstrated that salmon survival during early life stages is strongly correlated with natal stream temperatures. However, monitoring water temperatures in Alaska's salmon rearing areas is particularly difficult due to the size and remoteness of salmon- producing watersheds. Landsat thermal imagery provides a synoptic landscape scale temperature information source that has been successfully used to predict stream temperatures, but which requires ground-truthing. In situ temperature data is being collected concurrently with the remotely sensed TIR images at twelve locations throughout the Anchor River watershed. Sampling began 1 June 2015, and will continue to 15 May 2016, to coincide with both Landsat 8 overflights, and historical Chinook salmon incubation, emergence periods and rearing times. A general linear model is used to examine the effects of stream width, pixel size and water depth on the mean differences in the TIR-based and in situ temperatures at each study location. This demonstrates the efficacy of Handcock et al.'s (2006) method for ground-truthing Landsat TIR in an Alaskan watershed. The resulting adjusted Landsat temperature data products are expected to greatly enhance the monitoring and forecasting of natal salmon stream thermal conditions and therefore will greatly benefit the body of Alaskan salmonid research.

14. Alaska Logbook - a mobile tool for field data collection, organization, management, and reporting

Jon Bonkoski, Ecotrust

Collecting field data in Alaska is hard enough with the logistical challenges and expense of working in the backcountry, so managing your data and creating regulatory reports should be as simple as possible. With an easy-to-use platform aimed at streamlining regulatory compliance, Alaska Logbook is a mobile application and website developed to collect, organize, manage, and report field data. It was developed to be a simple tool that provides process efficiencies. Our intention is to make the regulatory compliance aspects of fieldwork effortless. Logbook is built on free and open source platform called Formhub. This software was developed to work all over the world and can handle the lack of reliable technological infrastructure at the data collection site. This allows us to create easily deployable surveys that can work on mobile devices or through a desktop web browser. Alaska Logbook is free and open-access for all users. We have kept adaptability and accessibility as part of our core principles and we are using an agile development process with frequent feedback cycles to ensure users remain the focus. From the start, Alaska Logbook has been shaped by user need and feedback. The initial phase of Alaska Logbook has focused on Fisheries Resource Permit compliance and Anadromous Waters Catalog nominations; however, additional survey modules are in development, including Water Quality Monitoring and customizable research surveys. We are also exploring data sharing and networking features to foster collaboration within the research community

15. Genetic diversity of Arctic lamprey (*Lethenteron camtschaticum)* populations in the Yukon River drainage

Katie G. Shink and J. Andres Lopez*

Genetic relationships among Arctic lamprey populations in major Alaskan river drainages are unknown. Documenting these relationships is critical to inform management practices, and to build our understanding of the biology of a poorly studied species. The overarching goal of this study is to assess the patterns of gene flow and degree of genetic differentiation among Arctic lamprey populations in the Yukon River drainage. To accomplish this goal, we have initiated an assessment of gene flow patterns using genotypes from nine microsatellite markers. Lamprey tissue samples were collected from four sites along the Yukon drainage: the East Fork of the Andreafsky River (n = 40), the Gisasa River (n = 40), the Chena River (n = 40), and the lower Yukon River (n = 20). To date, we have successfully amplified and genotyped six loci in all four populations. Preliminary analyses based on allele frequencies indicate high levels of gene flow and little genetic variation among Yukon River lamprey populations. The dominant allele observed at each of the 6 loci was the dominant allele in all four populations. A maximum of five alleles were recovered at 2 loci (Lspn_088 and Lspn_044). Expected heterozygosities ranged from 0.141 – 0.753. Further analysis will determine the significance of observed allele frequencies between populations.

16. Distribution and Movement Rates of Chinook Salmon *Onchorhynchus tshawystcha* in the Stikine River based on Radio Telemetry

*Kristin R. Neuneker, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks**
Jeff Falke, U.S Geological Survey, Alaska Cooperative Fish and Wildlife Research Unit
Troy Jaecks, Alaska Departement of Fish and Game, Division of Sport Fish, Douglas
Phil Richards, Alaska Department of Fish and Game, Division of Sport Fish, Douglas
Peter Etherton, Fisheries and Oceans Canada, Yukon Territory

The Stikine River and its tributaries in southeastern Alaska and western British Columbia are important producers of wild Chinook Salmon, Onchorhynchus tshawystcha that are targeted in both U.S and Canadian fisheries. In order to better understand the spawning distribution, dropout rates and migration rates of this population, a radio telemetry study was conducted from May-August 2015. Particular interest was in how successful fish were at moving past a recent natural landslide that created a velocity barrier on the Tahltan River B.C., a major spawning tributary and Tahltan First Nations fishing location. Adult salmon ≥ 660 mm MEF migrating upriver were tagged with radio telemetry tags (N=301). Fish were captured using a drift gillnet with 18.4 cm mesh size fished for a minimum of 480 min/d. Tagged fish were comprised of 206 females and 95 males, with the peak tagging day on June 3rd (N=14 fish captured). Stationary data logging towers were placed at eight locations spanning approximately 218 kilometers along the river, and three aerial surveys were conducted to assess the habits of these fish. Aerial surveys located tagged individuals in spawning habitats on Andrew Creek, Iskut River, Verett Creek, Christina Creek, Chutine River and Tahltan River. Fish with tags never detected by the downstream-most tower were assumed to have left the system (13%), and individuals took an average of 2.3 days to move upstream between two stationary towers located approximately 34 km apart. Information from this project can be used to validate and inform current mark-recapture studies and escapement estimates and help fisheries managers set more accurate harvest limits for Chinook salmon. In the 2016 field season we will be collecting additional telemetry data from the Stikine River, incorporating telemetry information from the Taku River, and investigating the relationship between salmon condition, measured using bioelectrical impedance analysis, and movement patterns.

17. Seasonal variability in ocean acidification in Kachemak Bay and lower Cook Inlet Alaska

Kristine Holderied, NOAA Kasitsna Bay Laboratory
Angela Doroff, Kachemak Bay National Estuarine Research Reserve
Dominic Hondolero, NOAA Kasitsna Bay Laboratory
Natalie Monacci, University of Alaska Fairbanks

The productive estuarine waters of Kachemak Bay and lower Cook Inlet Alaska support larval, juvenile and adult life stages of many species of forage fish, finfish, groundfish, and shellfish and increasing ocean acidification in the northern Gulf of Alaska has the potential to adversely impact these species both directly and indirectly through food web processes. Subarctic estuaries experience high variability in both physical oceanography and seawater chemistry and this variability must be characterized to understand both potential species vulnerabilities and the capacity to detect long-term changes in OA in coastal waters. The chemical properties of Kachemak Bay and lower Cook Inlet waters are influenced by seasonally varying freshwater runoff from precipitation, snowpack melt and glacier melt, intermittent upwelling of ocean waters from the adjacent Gulf of Alaska, and biologically-driven processes including plankton blooms. We present initial results from ongoing small boat surveys to quantify seasonal and spatial variability in oceanography, estuarine pH and carbonate chemistry in Kachemak Bay and lower Cook Inlet, with a focus on the effects of seasonal changes in freshwater inputs and estuary-ocean exchange. Water samples have been collected over two years from both surface and near-bottom locations, in conjunction with oceanographic measurements made with conductivity-temperature-depth (CTD) profilers. The study goals are to: 1) provide baseline data to assess current and future impacts of OA on marine species in estuarine waters; 2) assess linkages in OA conditions between the bay, inlet and adjacent Gulf of Alaska shelf; and 3) help determine the need for and guide the location of potential future OA monitoring systems.

18. Exploring Habitat Information to Improve the Aleutian Island Pacific Cod (*Gadus macrocephalus*) Stock Assessment

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Bradley P. Harris, Fisheries Aquatic Science & Technology Laboratory at Alaska Pacific University
Sarah R. Webster, Fisheries Aquatic Science & Technology Laboratory at Alaska Pacific University

Pacific cod (Gadus macrocephalus) migrate within and between the Eastern Bering Sea (EBS), Aleutian Islands (AI), and the Gulf of Alaska (GOA); recent research indicates discrete stocks in the EBS and AI. The Pacific cod resource in the combined EBS and AI region (BSAI) had been managed as a single unit since 1977. In 2014-2015 separate harvest specifications were set for the two areas. Abundance trends of AI Pacific cod appear to be decreasing. The NPFMC Groundfish Plan Teams and the Science and Statistical Committee have asked the stock assessment authors to develop an age-structured model of the AI Pacific cod. However, there is a temporal and spatial mis-match between the AI Pacific cod stock assessment survey and the commercial fishery. The survey uses standardized trawl sampling and is conducted in the summer, while the fishery is prosecuted with trawl, longline, pot, and jig gear primarily in the winter. This project uses available habitat information (depth, slope, rugosity, ect.) and season-specific commercial Pacific cod catches to determine the temporal and spatial differences in commercial vs. survey perspectives with an eye towards the impacts of gear type and areas sampled/fished.

19. Attention all Fish Squeezers! A New Compact and Waterproof Fish ID Book: A Handy Field Guide to the Nearshore Marine Fishes of Alaska

Scott W. Johnson, NMFS AFSC retired
Darcie Neff, NMFS AFSC contractor
*Mandy R. Lindeberg, NMFS AFSC**

We compiled this photo-rich guide as a tool to help all user groups identify nearshore marine fishes of Alaska without going through extensive taxonomic keys in the field. This guide culminated from 17 years (1998-2014) of research on the importance of the nearshore marine environment to fishery resources in Alaska. Our sampling efforts took us throughout the state of Alaska where we captured almost 750,000 fish in 1,142 beach seine hauls. Over the years we have taken thousands of photos of all species and life stages represented in our catches. The guide includes key photos of life-history stages (larvae to adults) captured and other useful information (e.g., diagnostic characteristics, distribution, and habitat use) on 113 fish species. Our guide is not meant to replace the many excellent identification guides available to researchers, but is intended to supplement these other guides with a portable and waterproof photo catalog to aid in fish identification in the field. The photographic richness of our handy field guide, in combination with the online Nearshore Fish Atlas of Alaska, provide researchers, managers, and the public with a unique and comprehensive synopsis on the nearshore marine fishery resources of Alaska. If you're a fish biologist or an outdoor enthusiast in Alaska, you should download a copy of this handy field. Google it or search on the NOAA Fisheries Alaska Fisheries Science Center website. Free printed field guides are available upon request.

20. Escapement estimation of Buskin River coho radio telemetry

Peter H. Westley, UAF
*Michelle E. Stratton, ADFG**

This poster provides an overview of recently initiated research to better estimate escapement of coho salmon in the Buskin River on Kodiak Island, Alaska. Escapement estimation has been routinely plagued by chronic flood and drought events that compromise fish counts at a weir in the lower part of the watershed. The ultimate goal of this project aims to use radio telemetry and traditional tagging methods to track the movements of coho salmon and by doing so provide information that will increase the efficiency of escapement estimates. The overarching objective of the study is to estimate the proportion of fish entering the river that migrate through a weir at the outlet of Buskin Lake and into the upper watershed. The continued use of only the upper weir compared to the lower is preferable as the former is not prone to flooding. The proportion of fish that migrate to the upper watershed, measured over years, will allow expansion of reliable upper weir counts to total escapements. The study will also track fish that use other parts of the watershed besides the mainstem river below the upper weir. As an added benefit, our data will provide insight into migration timing and spawning location, sources of instream mortality, and better understand migratory behavior more generally (e.g., the extent to which males move more than females). Results of a first pilot study (which at the time of abstract submission is still on-going) and plans for 2016 and 2017 will be presented.

21. Predicting Sockeye Salmon (Oncorhynchus nerka) hatch timing by incorporating natural variability into an existing model

*Morgan M. Sparks, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks**
Peter H. Westley, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks
Jeff A. Falke, U.S. Geological Survey, Alaska Cooperative Fish and Wildlife Research Unit
Milo D. Adkison, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks

A powerful example of local adaptation in salmonid fishes is revealed in the relationship between spawn timing and the temperature regime incubating embryos experience at the spawning site. In light of climate change, an important tool for understanding the potential for adaptation is the predicted response of phenology as it relates to changes in early life history developmental temperatures. Because temperature is the primary factor driving development in juvenile salmonids, experienced temperature can be incorporated into existing empirical statistical models to predict hatch and emergence timing with a high degree of certainty. However, experiments investigating the relationship between temperature and developmental rate have been conducted with constant temperature regimes and thus current models for predicting phenology only incorporate average experienced temperatures. Because specific hatch timing is often not known for wild populations, predicting the average temperature over the entire incubation temperature regime can be difficult. This poster presents work that extends an existing empirical model to incorporate more realistic daily average temperature in place of constant temperature over the course of incubation. The new model allows users to predict hatch timing without the need to estimate average temperature over the course of incubation and appropriately accounts for average daily temperature and each day's respective contribution towards development. We apply the extended model to multiple Bristol Bay Sockeye Salmon populations that spawn in different habitat types (e.g., lake beaches, ponds, streams) across temporal and spatial scales to predict hatch timing under experienced and predicted temperature regimes. Additionally, we are currently conducting a

laboratory experiment that exposes Sockeye Salmon embryos to constant and variable temperature regimes to truth our model, as well as measure population and family effects as they relate to early life history phenology in Sockeye Salmon.

22. Inseason application of radio telemetry data for management of Kuskokwim River Chinook salmon

*Nicholas J. Smith, Alaska Department of Fish and Game**
Zachary W. Liller, Alaska Department of Fish and Game

Radio telemetry has been a powerful tool used by fisheries researchers to elucidate movement, distribution, travel time, and run timing of Pacific salmon returning to natal rivers. Inriver telemetry investigations commonly rely on stationary telemetry towers positioned throughout the drainage to record fish movement. Post-season results from radio telemetry studies have provided fisheries managers with critical information needed to successfully manage migrating salmon species. Information includes knowledge of upriver travel time, swim speed, and distribution for fish traveling among harvest areas. However, post-season data analysis does not provide any benefit to management during the season in which they were collected. By using semi-automated data processing techniques, radio telemetry data collected inseason can be analyzed efficiently and travel time, swim speed, and distribution results distributed to area managers on a timely schedule. In 2015, a mark-recapture study for Chinook salmon using radio telemetry techniques was conducted on the Kuskokwim River. A total of 623 fish were implanted with radio tags downriver from Bethel, AK. Fish were tracked during their upriver spawning migration using10 mainstem stationary telemetry towers. Telemetry data was collected weekly and processed inseason for area management staff, as well as for presentation at weekly Kuskokwim River Salmon Management Working Group meetings. Data summaries included distribution, swim speed, and travel time for groups of fish traveling among harvest areas. Weekly updates of tagged Chinook salmon movement and distribution patterns proved valuable for fisheries managers, who need to be able evaluate the potential impact of a fishery opening to ensure that adequate escapement is achieved in diverse mixed-species fisheries. By knowing the location and timing of migrating Chinook salmon inseason, managers were able to open or close fishing areas to allow for the conservation of Chinook salmon, while still providing subsistence fishing opportunities for other salmon and whitefish species.

23. Development and implementation of long-term effectiveness monitoring on a priority Sockeye system in Southeast Alaska.

Lydia C. Johnson, Tatoosh School
Jon Bonkoski, Ecotrust
*Peter M Chaillé, Tatoosh School**

The Tatoosh School's Luck Project uses curriculum-integrated protocols and practices to engage undergraduate researchers in long-term ecological restoration effectiveness monitoring in the Luck watershed on Prince of Wales Island. In 2015 we completed year one of a long-term monitoring effort (up to 720 top undergraduate students total, 15 years). Protocols and practices are being field-tested, peer-reviewed, and adjusted as needed to ensure they will work well for students and practitioners over the long run. Planned 2012-2014 and implemented in 2015, the Luck Creek restoration project includes in-stream and riparian habitat restoration across 2.5 miles of Luck Creek tributaries above Luck Lake, large wood addition in six alluvial fans in the watershed, and wood collection to support restoration work. Though heavily impacted by timber management

activity, the Luck system is home to seven species of salmonid: sockeye, coho, pink, and chum salmon, steelhead and cutthroat trout, and Dolly Varden char. These populations support a range of wildlife species, including wolves and bear, as well as the subsistence, commercial, and sport fisheries of nearby communities. The Forest Service's scope of in-stream and floodplain work in the watershed spurred an unprecedented level of engagement in restoration planning by local and regional stakeholders, and a concomitant adaptive response from the USDA Forest Service. This back-and-forth is encouraging and exciting; the project is a ripe case study for long term, curriculum-integrated ecological and socioeconomic effectiveness monitoring. Tatoosh School staff and students, in partnership with Ecotrust, launched the Luck project, collecting pre- and post-restoration data at 37 points along the East Fork of Luck Creek, with four sets to date. These data provide a foundation on which to measure and interpret (through new tools and outreach mechanisms) the effects of restoration efforts and will provide unique insights into the impacts of these efforts over the long-term.

24. Assessing the prevalence and load of the parasite *Ichthyophonus* in Alaska Groundfish

*Sioned E. Sitkiewicz, Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University**
Bradley P. Harris, Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University
Sarah R. Webster, Fisheries, Aquatic Science & Technology Laboratory at Alaska Pacific University

Ichthyophonus, a non-specific fungus-like protozoan fish parasite, has caused epizootic events among economically important fish stocks including herring and salmon, and can result in reduced growth, stamina, and overall fish health. We investigated the prevalence and load of the parasite Ichthyophonus in Pacific halibut (Hippoglossus stenolepis) during 2012 -13 and found that about 25% of the 563 fish we sampled in lower Cook Inlet were infected. The parasite infected heart tissues, was never found in liver, spleen or kidney tissues and was more prevalent in older fish. We developed a Pepsin digestion assay to assess the degree of the infection and found that load varied widely among infected fish with 6 to 1,245 Ichthyophonus schizonts per gram of heart tissue. This assay allowed for the rapid collection of tissues for Ichthyophonus testing as they can be sampled without aseptic methods and can be frozen. Interestingly, our findings did not support the hypothesis that reduced halibut size-at-age may be caused by Ichthyophonus. The new phase of this work will begin in the Spring of 2016 and aims to: 1) further refine the Pepsin digestion technique to improve Ichthyophonus spore detection , 2) expand sampling to include Pacific cod and pollock, and 3) expand sampling to include the ports of Valdez, Whittier, and Seward in addition to Homer, AK.

25. Evaluation of Growth and Survival on the Recruitment of Chinook Salmon in two Southeast Alaska Rivers

Stephanie A. Berkman, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, Fisheries Division
Trent M. Sutton, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, Fisheries Division
Milo D. Adkison, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, Fisheries Division

Chinook Salmon *Oncorhynchus tshawytscha* support many important fisheries throughout Alaska. In Southeast Alaska, highly variable recruitment and declines in productivity and abundance have created economic and cultural hardships for many communities. As a result, there is a need to better characterize productivity and abundance trends for Chinook Salmon stocks. This study will

address those needs by evaluating the importance of freshwater and marine processes on female Chinook Salmon recruitment to spawning age in the Stikine and Chilkat rivers (Southeast Alaska) using long-term scale archive samples, adult abundance estimates, and smolt data sets. These different data sets will allow for the assessment of growth and survival on recruitment within individual stocks by following cohorts from freshwater through marine residence until they return to their natal river as reproductively mature adults. Preliminary analyses on the environmental and biological factors influencing downstream smolt migration of Chinook Salmon in the Chilkat River show that run strength is significantly correlated with water depth (cm), water temperature (oC), daily mean smolt fork length (mm), and daily average smolt body condition. There is a positive linear relationship between mean smolt fork length and Julian date of migration where, on average, smaller fish were present at the start of the run while larger fish were more prevalent at the end of the run. This trend is likely due to later migrating fish having a longer growing period in freshwater. This evaluation will allow for the development of more accurate and reliable forecasts for Chinook Salmon stocks in the region, as well as assist in management decisions and setting escapement goals in these two Southeast Alaska rivers.

26. The need for eradication of the invasive aquatic *Elodea* in Alaska

Aditi Shenoy, Amy Larsen, Heidi Kristensen, Nick Lisuzzo, and Trish Wurtz

Elodea spp. is an aggressive non-native invasive aquatic plant that has become established in waterbodies in southcentral and interior Alaska. The introduction of Elodea to non-native waters has severely altered aquatic ecosystems throughout Europe, Australia, New Zealand, Japan and North America. Elodea infestations in Alaskan waterbodies can be expected to increase sedimentation, displace native vegetation, reduce biodiversity, increase ambush cover for fish predators, and degrade sensitive fish habitat. Due to the high density of wetlands in Alaska, and the heavy use of boats and airplanes to access these ecosystems, Elodea poses an enormous threat to the integrity of aquatic ecosystems throughout Alaska. Once established it can lead to a deterioration of fish and aquatic habitat, recreational boating, fishing and hunting opportunities as well as increased management costs. A coordinated statewide effort to eradicate Elodea is currently underway. Using the Kenai Peninsula Elodea invasion response model, interior Alaska stakeholders are working together towards eradicating Elodea from local area waterbodies - Chena Slough, Chena Lakes, the Chena River and now, Totchatket Slough, downstream of Nenana. On-going and completed tasks include public outreach and education, regulatory permit applications, and an early detection, rapid response (EDRR) survey of the Tanana River and its associated sloughs and wetlands after discovery of Elodea on the Totchaket Slough, a popular hunting area downstream of Nenana.

WEDNESDAY NOV 4

Wednesday		
Large Conference Room	**Seminar Room**	**Lab Classroom**
Welcome intro to conference		
Plenary Speaker- Jim Lichatowich (8:20-9:05)		
break into sessions (5 min)		
Advances in Fisheries Science and Technology: Van Alen Advances in Fisheries Science and Technology: Musselwhite Advances in Fisheries Science and Technology: Harris	Wild Alaska Salmon- a unifying force for connecting Alaskan lives: Hauser Wild Alaska Salmon- a unifying force for connecting Alaskan lives: Swanton Wild Alaska Salmon- a unifying force for connecting Alaskan lives: Blake	Juvenile fish movement and habitat: Martin Juvenile fish movement and habitat: Bradley Juvenile fish movement and habitat: Ashline
BREAK 10:10-10:30		
Advances in Fisheries Science and Technology: Pegus Advances in Fisheries Science and Technology: Stahl Advances in Fisheries Science and Technology: O'Brien Advances in Fisheries Science and Technology: Bladwin-Schaeffer Advances in Fisheries Science and Technology: Maxwell	Wild Alaska Salmon- a unifying force for connecting Alaskan lives: Laukitis Wild Alaska Salmon- a unifying force for connecting Alaskan lives: Lankard Wild Alaska Salmon- a unifying force for connecting Alaskan lives: Barker Wild Alaska Salmon- a unifying force for connecting Alaskan lives: Sanders Wild Alaska Salmon- a unifying force for connecting Alaskan lives: Carothers	Juvenile fish movement and habitat: Mauger Juvenile fish movement and habitat: Sellmer Juvenile fish movement and habitat: Schoen Juvenile fish movement and habitat: Walsworth
lunch on own 12:10-13:30	Past President's Lunch (Past-Presidents only, buffet) 12:10-13:30	NPRB Lunch (buffet for pre-registered) 12:10-13:30
Advances in Fisheries Science and Technology: Dann Advances in Fisheries Science and Technology: Brennan Advances in Fisheries Science and Technology: Habicht Advances in Fisheries Science and Technology: Markis Flatfish Biology; Julie Nielsen Flatfish Biology; Craig S. Rose	Wild Alaska Salmon- a unifying force for connecting Alaskan lives: Holen Wild Alaska Salmon- a unifying force for connecting Alaskan lives: Vick and Stevens Wild Alaska Salmon- a unifying force for connecting Alaskan lives: DISCUSSION Using Education and Communication to Improve Fisheries Management and Conservation: Mueller Using Education and Communication to Improve Fisheries Management and Conservation: Harrington Using Education and Communication to Improve Fisheries Management and Conservation: Thompson	North Slope fish populations, habitat, and fisheries: Torniven North Slope fish populations, habitat, and fisheries: Leppi North Slope fish populations, habitat, and fisheries: Courtney North Slope fish populations, habitat, and fisheries: Brown North Slope fish populations, habitat, and fisheries: Laske North Slope fish populations, habitat, and fisheries: Klobucar
BREAK 15:30-15:50		
Flatfish Biology; Maggie Nga Chan Flatfish Biology; Jane Sullivan Flatfish Biology; Sarah Webster	Using Education and Communication to Improve Fisheries Management and Conservation: Barker Using Education and Communication to Improve Fisheries Management and Conservation: Matlock Using Education and Communication to Improve Fisheries Management and Conservation: Devaney Using Education and Communication to Improve Fisheries Management and Conservation: Molyneaux Using Education and Communication to Improve Fisheries Management and Conservation: DISCUSSION	Arctic Marine Ecology;Jen Marsh Arctic Marine Ecology;Alyssa Frothingham Arctic Marine Ecology;Sarah J. Apsens Arctic Marine Ecology;Kelly Walker
Women in Fisheries Session 5:00-6:20		committee meetings as necessary (5:00-6:30)
Poster Social 6:30-8:00 AIOVC (appetizers provided)		
Social at AJ's Steakhouse sponsored by Cook InletKeeper		

THURSDAY NOV 5

Thursday		
Large Conference Room	**Seminar Room**	**Lab Classrrom**
Welcome notes, updates, schedule changes, etc.		
Plenary Speaker- Stephanie Schmidt (8:20-9:05)		
break into sessions (5 min)		
Quantitative approaches to future fisheries problems;Cory Graham Quantitative approaches to future fisheries problems;Curry J. Cunningham Quantitative approaches to future fisheries problems;Kyle Shedd	Ecosystem-based management in Alaska's Fisheries: opportunities and challengesIntroduction Ecosystem-based management in Alaska's Fisheries: opportunities and challenges;Phillip R. Mundy Ecosystem-based management in Alaska's Fisheries: opportunities and challengesDiana Stram	Probing long-term datasets to detect shifts in shellfish productivity;David Scheel Probing long-term datasets to detect shifts in shellfish productivity;Dominic Hondolero Probing long-term datasets to detect shifts in shellfish productivity;Jan Rumble
BREAK 10:10-10:30		
Quantitative approaches to future fisheries problems;Jared E Siegel Quantitative approaches to future fisheries problems;Jason R. Neuswanger Quantitative approaches to future fisheries problems;Joshua Mumm Quantitative approaches to future fisheries problems;Katie Sechrist Quantitative approaches to future fisheries problems;Suresh Sethi	Ecosystem-based management in Alaska's Fisheries: opportunities and challenges;Gordon H. Kruse Ecosystem-based management in Alaska's Fisheries: opportunities and challenges;Timothy Walsworth Ecosystem-based management in Alaska's Fisheries: opportunities and challenges;Caroline Brown Ecosystem-based management in Alaska's Fisheries: opportunities and challenges;Daniel Schindler Ecosystem-based management in Alaska's Fisheries: opportunities and challenges;William Deacy	Probing long-term datasets to detect shifts in shellfish productivity;Ken Goldman Probing long-term datasets to detect shifts in shellfish productivity;Maria Wessel Probing long-term datasets to detect shifts in shellfish productivity;mike booz Probing long-term datasets to detect shifts in shellfish productivity;Wiley Evans Probing long-term datasets to detect shifts in shellfish productivity: DISCUSSION
Business Lunch 12:10-13:30 (Large Conference Room pizza provided)	**lunch on own, 12:10-1:30**	
Quantitative approaches to future fisheries problems;T. Scott Smeltz	Ecosystem-based management in Alaska's Fisheries: opportunities and challenges; Pat Walsh Ecosystem-based management in Alaska's Fisheries: opportunities and challenges;Philip Joy	Speed talks: 7 min x 6 talks
Contributed Papers: Huntsman Contributed Papers: McConnell Contributed Papers: Larsen	session: Volunteer Opportunities in Fisheries 14:15-16:00	Continuing Education: Web Development 14:15-16:15
BREAK 14:50-15:10		
Contributed Papers: McCarthy Contributed Papers: Stuby Contributed Papers: Cathcart	session: Volunteer Opportunities in Fisheries 14:15-16:00	Continuing Education: Web Development 14:15-16:15
5K run 4:45-5:45 (shuttle provided from Brewery endpoint back to Best Western)		
Banquet 6:30-10:00 Land's End Resort (Shuttle provided)		

FRIDAY NOV 6

Friday		
Large Conference Room	**Seminar Room**	**Lab Classroom**
Welcome notes, updates, schedule changes, etc.		
Plenary Speaker- Jim Magdanz (8:20-9:00)		
break into sessions (5 min)		
Ecology, Life History, and Population Dynamics of Fishes in Estuarine and Nearshore Marine Habitats; Katharine Miller Ecology, Life History, and Population Dynamics of Fishes in Estuarine and Nearshore Marine Habitats; Katie Howard Ecology, Life History, and Population Dynamics of Fishes in Estuarine and Nearshore Marine Habitats; Brianna Dailey Pierce	Sustainability and Well-being in Alaska Fisheries: Courtney Carothers Sustainability and Well-being in Alaska Fisheries; Danielle Ringer Sustainability and Well-being in Alaska Fisheries; E. Jamie Trammell	Freshwater Habitat; Adam Sepulveda Freshwater Habitat; Michael Carey Freshwater Habitat; Kristin Rine
BREAK 10:10-10:30		
Ecology, Life History, and Population Dynamics of Fishes in Estuarine and Nearshore Marine Habitats; Vanessa R. von Biela	Sustainability and Well-being in Alaska Fisheries; Jesse Coleman Sustainability and Well-being in Alaska Fisheries Philip Loring	Freshwater Habitat; Christine Woll Freshwater Habitat; Coowe Walker
Invasive Species; Adam Sepulveda Invasive Species; westley Invasive Species; Kristine Dunker Invasive Species; Ora Russ Invasive Species; Stewart	Weak Stock Salmon Management; Brittany J. Blain Weak Stock Salmon Management; Carol Kerkvliet Weak Stock Salmon Management; William R. Bechtol	Freshwater Habitat; Jordan Head Freshwater Habitat; Sue Mauger
Best Student Oral and Poster Presentation AWARDS 12:30-100		
boxed lunches for all!	Enviro Concerns Committee lunch (boxed) 1:00-2:30	Student-Mentor Lunch (boxed) 1:00-2:30
M/V Tiglax tour 2:30-4:00 (shuttle provided)		