On-Time Public Comment List
Work Session
October 15–16, 2014

On-Time Public Comment List
Work Session
October 15–16, 2014

Grant Fairbanks
P. O. Box 370
Bethel, Alaska 99559
May 13, 2014

August 18, 2014

Chairman Karl Johnstone
Alaska Board of Fisheries
Alaska Department of Fish and Game
Boards Support Section
P.O. Box 115526
Juneau, AK 99811---5526

Dear Chairman Johnstone,

I am writing to you as a long-time resident on the Kuskokwim River. I have lived many years in Bethel and on my homestead on the Holitna River, a major tributary to the Upper Kuskokwim.

Kuskokwim king salmon are in trouble. I'm writing this letter, and attaching an Agenda Change Request, to request that you review and address the serious conservation, management and allocation concerns with king salmon on the Kuskokwim River.

We need assurance that conservative, risk-adverse management actions will be taken to insure the recovery of this vital subsistence resource. This has not been the case recently. King salmon have failed to reach escapement goals in many of the tributaries of the Kuskokwim for the four years prior to 2014 assumption of federal management of Chinook on the lower river. In 2013, when other regions took special precautions to protect weak Chinook salmon runs, in-season management errors on the Kuskowim lead to over-harvest, and resulted tributary escapements throughout the drainage being well below the bottom end of the escapement goal range of set by the Department and reviewed by the BOF in 2012. The Comm. Fish Div. Kuskokwim manager publically apologized for the errors in a post-season public meeting in Bethel, stating"...when we look at the results of escapement I failed miserably in my job last summer. I apologize for that."

I light of these long standing conservation problems, it was not a surprise that the Federal Subsistence Board, at its April 17, 2014 meeting, unanimously approved a special action request from the Napaskiak Traditional Council that initiated federal in-season management of Chinook stocks. Implementing section 804 of ANILCA, the Federal Subsistence Board authorized action limited harvesting surplus Chinook salmon to federally qualified subsistence users within the boundary of the Yukon Delta NWR.

There have also been long standing concerns that Dept. actions have not provided for a fair or equitable allocation of kings among users across the watershed. There is a single ANS determination for Chinook Salmon for all communities along the 900 mile long Kuskokwim River. A review of harvest data will show that fishers in the upper portions of the watershed have had significantly less harvesting opportunities, during periods of severe restrictions, compared to harvesters in the lower portion of the watershed. I request that the Board re-evaluate the ANS determination for Chinook salmon within the Kuskokwim River drainage and consider establishment of ANS amounts for major sub-sections of the river to create "nested" ANS determinations. Such action is necessary to help ensure that all segments within the river have a fair and equitable opportunity to harvest available surpluses.

The Alaska Board of Fish (BOF) is guided by statute to provide subsistence fishing opportunities among all qualified residents. Sometimes, however, the surplus available for harvest is less than the Amounts Necessary for Subsistence (ANS) – as formally established by the BOF – and the essential subsistence needs of all qualified subsistence harvesters needs cannot be met.

AS 16.05.258, referred to as "Tier II", is an allocation system that is triggered when there is insufficient harvestable surplus to satisfy all subsistence needs. This system also distinguishes and identifies those individuals most dependent on a particular fish stock or wildlife population among all subsistence users. Tier II gives priority to users based on: 1) customary dependence, 2) proximity to the stock or population and 3) availability of alternative resources. Clearly, we have reached the point where applying this process to Kuskokwim kings should be considered.

I understand that one-time or short-term shortages may not warrant an immediate Tier II designation. However, the Kuskokwim King Salmon stock has now experienced four consecutive years of harvests below ANS. There is no reasonable biological evidence that this situation will change any time soon. I understand that implementing Tier II would not be easy, nor should it be considered the only or best option.

I request that the Board consider <u>all</u> actions that will protect both the fish and equitable subsistence harvest opportunities for all residents of the Kuskokwim, per the attached Agenda Change Request. This could include crafting a very conservative management plan, establishing village quotas or individual permits, or any other actions that effectively address documented conservation problems and fair allocation. Without effective and timely board action, unified salmon management may remain a distant goal.

The Kuskokwim River Salmon Management Working Group should be partners in the discussions. These volunteer stakeholders and participants have been very involved during very difficult times while king populations have been low, requiring conservative actions. They have the local knowledge and understanding of the fishery that is needed to craft solutions to the king salmon conservation and allocation issues on the Kuskokwim.

Thank you for your consideration.

Respectfully,

Grant Fairbanks

Grant Fairbanks

Attached: AK BOF - Agenda Change Request

CC. Kuskokwim Salmon Management Working Group Co-Chairs
Regional Supervisor, ADFG- Commercial Fisheries Division, AYK Region

August 2, 2014

Janet Armstrong Schlagel
POB 714
Dillingham, AK 99576

Curt Armstrong
POB 898
Dillingham, AK 99576

In 1954, our dad, Richard Armstrong, went to the Libby's cannery at Koggiung (Graveyard Point) looking for work. They were not hiring, but he had the extremely good fortune to meet Albert Davies, the winter watchman at the cannery. Al was retiring in the fall and said that if Dad would help him fish the remainder of the season, he could have his site (Tract A on the attached map). It was the only site on the front beach at that time, the closest being Ray and Pomela O'Neil's sites (Tracts J & K).

Dad brought his good friend Lyle Smith back the next year (1955), and together they "staked" the first four sites. The Armstrong and Smith families have been anchored there since.

Our brother Ross and I (Curt) started fishing with Dad in 1971. On September 3, 1978, Ross was killed in a midair at Merrill Field.

The following season (1979), Mom and our sisters, who had been fishing our grandmother's site on South Naknek beach, moved to Graveyard Point. Dad had, for a long time, recognized that there was room for another site and with the additional people and permits, we established the upper site (north of Tract A) in 1980.

In July of 2012, Trooper Quist told us that the upper site is outside the district according to GPS coordinates. We spent about two hours discussing with him the traditional marker locations, the severe erosion that is affecting many of the sites on the East beach, and the general history of the beach. We also discussed resolutions of this matter.

That fall, Curt talked briefly with Slim Morsted at ADF&G, who was busy preparing for the December 2012 Board of Fisheries meeting in Naknek. Additionally, Curt had a very informative discussion concerning Board procedures and options with Susie Jenkins-Brito, who was the Board's support representative at the time. Curt decided the Board of Fisheries, rather than the troopers, should resolve the matter and the Board's agenda for that meeting was already set.

In the spring of 2013, Curt talked with Slim Morsted about the option to address the immediate problem through emergency order. He did not feel it was necessary to do that so we planned to address this issue at the Board of Fisheries December 2015 Bristol Bay meeting.

That summer we went to our camp and set up as we have every year since 1980, and we fished all three sites normally. No trooper visit occurred that year. We assumed the issue would next be addressed at the Board's December 2015 meeting in Naknek.

This spring (2014), we obtained DNR leases for these sites.

On July 26, 2014 Trooper Wittkop arrived on scene and spent about three hours checking licenses, permits, buoy and GPS numbers. The next day he and Trooper Quist made two helicopter trips to issue a fishing-in-closed-water misdemeanor citation on our upper site and to warn us that we could not fish the inside 25 fathoms on Dad's original 1954 site.

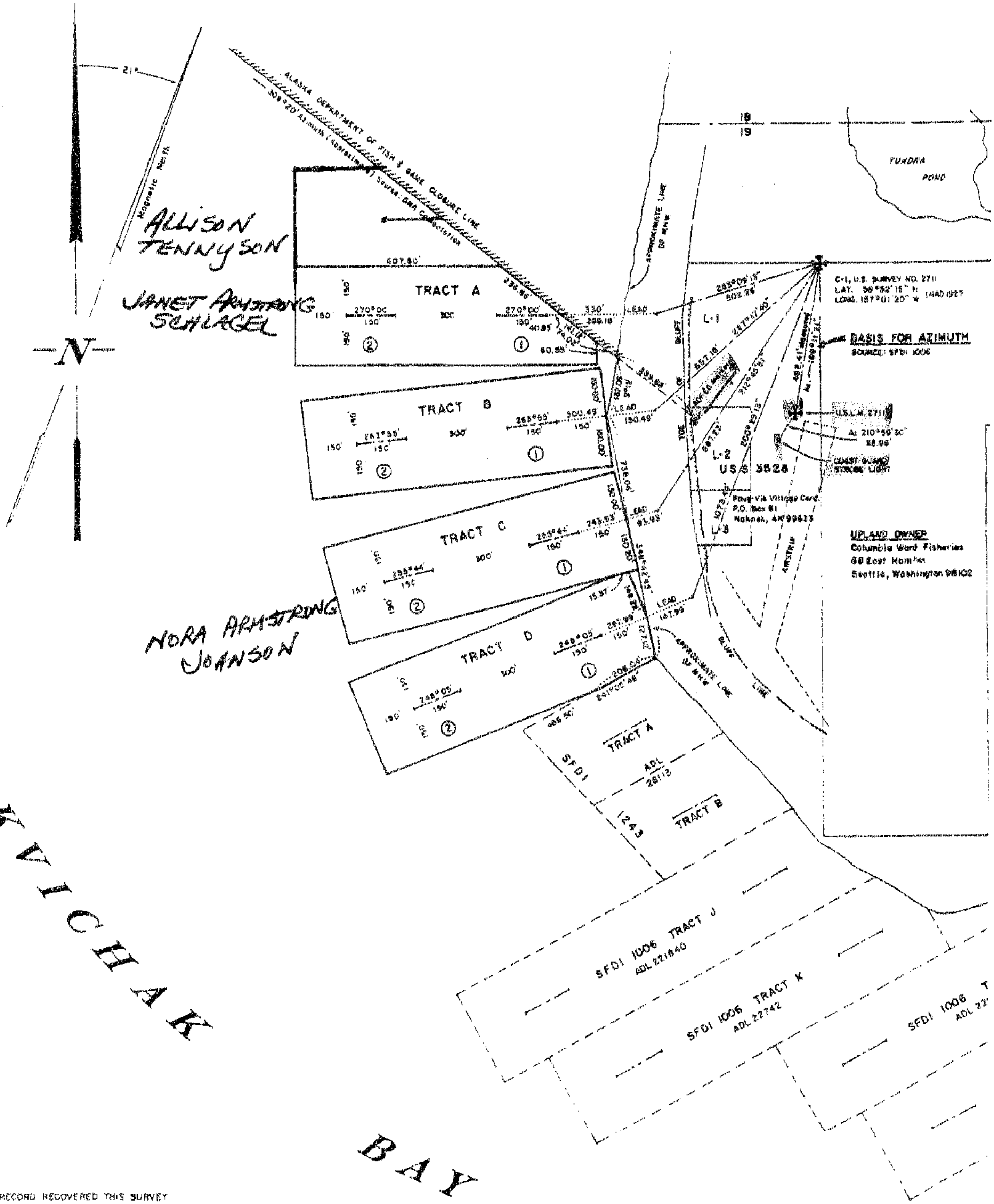
We feel that this issue cannot wait until the December 2015 Bristol Bay regularly scheduled meeting and we all hope you will agree to grant this ACR.

Thank you very much for your consideration,

Janet Armstrong Schlagel

Curt

Curt Armstrong



ɪEND

ɪLM MONUMENT OF RECORD RECOVERED THIS SURVEY
ɪDF&G BOUNDARY MARKER
ɪOAST GUARD STROBE LIGHT
ɪET NUMBER
TRACT BOUNDARY
AZIMUTH TIE LINE
NET IN TRACT
LEAD LINE, X-MARK INDICATES ANCHOR
ADF&G CLOSURE LINE

Sites in 1954

Marker Locations

August 1, 2014

I fish, along with members of my family, the Armstrongs from Dillingham, at Graveyard Point in the Kvichak District in Bristol Bay. My Dad, Richard Armstrong, started fishing there in the mid 1950's, on the second site from the marker. He started fishing the marker site in the early 1980's.

Two years ago, the troopers shut down the marker site, stating that their GPS numbers indicated that the site is outside of the district. This past spring, both sites, plus an additional site, were approved by the DNR. This summer, a trooper landed in his helicopter and cited my sister, Allison Jennyson, for fishing in closed waters on the marker site. He also said that the second site (which again, has been fished since the 1950's) was partially out of the district, allowing us to only fish the outside twenty-five fathoms.

We have been reduced to only fishing half of the gear that we have historically fished. I can't understand why, after having fished these sites legally for years, they are now considered to be out of the district. If the GPS coordinates truly reflect where the original markers were, the sites should be legal. Erosion is also a problem in the area of

our sites, and is affecting not only our sites, but others on the beach as well.

This is a four generation family operation that includes myself, my siblings, our children and grandchildren. We rely on the income that these sites provide. It is a tremendous hardship to have our fishing operation cut in half.

I appreciate any consideration that you can give to this matter.

Sincerely,

Nora Armstrong Johnson
Dillingham, Ak.
(907) 843-1586

Louise Bauman
PO Box 1758
Nome, AK 99762

Date: June 9, 2014

To: Alaska Board of Fish

Re: Alaska Board of Fish Staffing, June 2014

My maternal grand-parents moved to Nome in the mid 1900's after outbreaks of disease in epidemic proportions throughout Alaska. In Nome, our livelihood depended on hunting and the harvest of the Seward Peninsula and the Bering Sea at summer camp. The families worked together as a team to hunt, fish and harvest plants and berries storing the yield for winter.

Dinnertime we cooked our catch, portioning food and allotting duties among family members. Some were involved in the hunting, some in the watering, and others in the preparation of dinner. All were thankful for the gift of food at the end of the day. Sharing our food and helping one another with the various roles and responsibilities, this was how we harvested the sustenance of land and sea for our livelihood.

My name is Louise Bauman. In February 2013 I was nominated to the National Society of Leadership and Success, Sigma Alpha Pi for the Alaska Chapter. Sigma Alpha Pi is a leadership honor society available to limited students at the University. I was selected because of my academic accomplishment and potential for leadership and success. Soon after this nomination circumstances caused me to have a change of direction in my studies. I chose the UAF program of "Applied Business" at the UAF School of Community and Technical College. In January, 2014, I received a letter from the University of Alaska Fairbanks Chancellor, Brian Rogers placing me on the Chancellors Honors list ranking with the scholars who have established the reputation of the University of Alaska Fairbanks.

In my coursework, I understand how our economy is impacted by global influences and foreign investors and competition from foreign companies. When American business compete against foreign companies, impacts the stability of the United States economy and American businesses as a whole. Businesses depend on the United States government for protection in domestic investments and abroad.

In present times the stability of the public access to natural resources of the oceans to sustain food harvests for winter food supplies is being compromised. The art of fishing has changed little over the course of man's existence. Though there are several methods for fishing, each method has been tried in nearly every area of the world. Types of fish, methods, boats, processing, the trade / commerce, and the fishermen themselves are some of the many aspects of fishing that played an important role in providing for fish as food on the table.

Presently, the local fisherman are experiencing problems with access to this public resource of fish creating a state of uncertainty for fish species indigenous to these waters. This comes at expense to the

public's investment in future harvest of a public resource. This is a problem for which many subsistence fisherman and woman have testified about at this June, 2014 meeting in Nome.

Another problem for rural Alaska has been dust control methods which includes use a proprietary formula, which means its contents are secret. Calcium chloride is an alternative to water and chemicals, and is commonly used. It's also commonly the focus of complaints that it leaves a salty taste on subsistence foods like berries and drying fish so many villages still rely on spraying water on unpaved roads. (Dust Devil, Aurora) One of the chemical properties of calcium chloride is that it becomes soluble only in temperatures of 20 degrees Celcium which is 68 degree Fahrenheit. This temperature in rural Alaska is for only several weeks of the year. So the Calcium chloride remains present in the environment. Another function and use of Calcium Chloride is animal sterilization of male animals. (Wiki) So this chemical washes out into the rivers, streams. Oceans, and waters of the environment where it is used for dust control. This method of dust control is in use in extremely high volumes of tonnage. This should also be added as a concern to the other existing problems of access to our foods, animals and renewable resources.

In conclusion, I am seeking to add to the staffing issues of depletion of our natural resources to include how various chemicals including Calcium Chloride may impact our fish and other marine species in Rural Alaska

NSEDC NORTON SOUND ECONOMIC DEVELOPMENT CORPORATION

Serving the fisheries of the Bering Strait Region

Brevig Mission Diomede Elim Gambell Golovin Koyuk Nome Saint Michael Savoonga Shaktoolik Stebbins Teller Unalakleet Wales White Mountain

September 12, 2014

Mr. Karl Johnstone, Chairman
Alaska Board of Fisheries
Alaska Department of Fish and Game
Boards Support Section
P.O. Box 115526
Juneau, AK 99811-5526

Re: Agenda Change Requests (ACR) 4 & 5 – Norton Sound Red King Crab Winter Commercial Fishery

Dear Chairman Johnstone,

Norton Sound Economic Development Corporation (NSEDC) requests that the Alaska Board of Fisheries (BOF) accept Agenda Change Requests (ACRs) 4 and 5 to be heard at an upcoming winter BOF meeting. Both requests deal with the management of the winter commercial Norton Sound red king crab fishery and the allocation between the summer and winter commercial fisheries. While these items are out of cycle, changes in the fishery over the last two winters necessitate that the issues be examined now. We believe these ACRs meet the criteria to be accepted and added the BOF's agenda.

As the Community Development Quota (CDQ) group for the region, NSEDC is actively involved in the Norton Sound red king crab fishery in multiple roles: 1) NSEDC is the primary seafood buyer and processor in the region through its subsidiary, Norton Sound Seafood Products. 2) NSEDC is also a major contributor to research on Norton Sound red king crab through its Fisheries Research and Development division.

During the last two winters the Norton Sound red king crab winter commercial fishery has seen its largest two winter harvests on record. This in large part is driven by the current high price for crab, and there is no indication that the market and interest by fishermen will decline any time soon. This increased harvest has raised allocative and conservation issues within the management of the fishery.

The current winter harvest levels may force the Alaska Department of Fish and Game (ADF&G) to make an allocative decision in order to meet federal guidelines related to the Allowable Biological Catch (ABC) and Over Fishing Limit (OFL) before the next regular shellfish board meeting. There are currently no guidelines to direct ADF&G on whether to restrict the winter or summer fishery first when harvest limits are approached or reached. This is an allocative decision that should be decided by the BOF and not left to ADF&G. The BOF process is the correct venue for stakeholders to give their input and work on a compromise on how to determine allocations between the summer and winter fisheries.

It is also appropriate, at this time, for the BOF to examine the winter season dates due to the increased participation and harvest in the winter fishery. Additionally, the North Pacific Fishery Management Council (NPFMC) will now set the ABC and OFL in February, several months earlier than its previous schedule. The NPFMC's change in timing also merits a review of the current winter regulatory season.

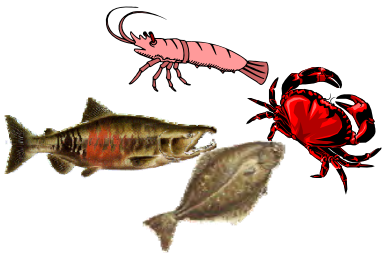
At this time NSEDC does not have a position on how the crab harvest should be allocated between the summer and winter fishery, nor on any specific date changes for the winter season. However, the schedule change by the NPFMC coupled with the dramatic increase in commercial harvest during the winter, and its likely continuation, necessitate that guidance be provided by the BOF to address the resultant allocative and conservation implications.

Sincerely,

Tyler Rhodes
Chief Operations Officer

cc: Janis Ivanoff, NSEDC CEO
Wes Jones, NSEDC FR&D Director

Southeast Alaska Fishermen's Alliance
9369 North Douglas Highway
Juneau, AK 99801
Phone: 907-586-6652 Email: seafa@gci.net
Fax: 907-523-1168 Website: http://www.seafa.org



September 19, 2014

Alaska Dept. of Fish and Game
Boards Support Section
PO Box 115526
Juneau, AK 99811

RE: October Work-session Comments

Dear Chairman Johnstone and Board of Fish Members,

Southeast Alaska Fishermen's Alliance (SEAFA) is a multi-gear/multi-species membership based organization. We represent our 300+ members involved in the salmon, crab, and shrimp fisheries in Southeast, Yakutat and Cordova and longline fishermen in Southeast and the Gulf of Alaska.

We support the adoption of ACR 27 submitted by ADF&G for consideration at the first available meeting (Prince William Sound – Dec. 2014). We believe ACR 27 meets the criteria for consideration out of cycle. Until the Legislature adjourned on April 20th after the proposal deadline it was not known that the statutes authorizing the guide services licensing the recordkeeping would not be repealed or extended. ACR 27 meets the criteria because regulations need to be changed, readopted and corrected to reflect the changes in statute.

It is important to the State of Alaska to continue a charter business registration and reporting requirements. Timely reporting of charter harvest is important in the sustainable management of Alaska's fishery resources and is particularly important in regards to the federal management of pacific halibut.

The Federal Halibut Charter program is based upon the premise of having a business license/registration program in place and more importantly the requirement for a logbook in which the charter client must sign the logbook by regulation to acknowledge that his or her name, license number and number of halibut retained are recorded correctly.

Sincerely,

Kathy Hansen
Executive Director

Sponsored by: Assemblymember Colver
Adopted: 09/16/14

MATANUSKA-SUSITNA BOROUGH
RESOLUTION SERIAL NO. 14-098

A RESOLUTION OF THE MATANUSKA-SUSITNA BOROUGH ASSEMBLY REQUESTING THAT THE ALASKA BOARD OF FISHERIES (BOF) HOLD THE 2017 UPPER COOK INLET BOARD OF FISHERIES MEETING IN ANCHORAGE, ALASKA; AND REQUESTING THAT THE PROVISIONS MADE TO THE CENTRAL DISTRICT MANAGEMENT PLAN TO ALLOW PASSAGE OF SALMON TO THE NORTHERN DISTRICT BE MAINTAINED AT LEAST UNTIL THE NEXT REGULARLY SCHEDULED UPPER COOK INLET BOARD MEETING.

WHEREAS, the city of Anchorage represents a neutral meeting location and has ample facilities and accommodations to host large gatherings; and

WHEREAS, having the 2017 BOF meeting in Anchorage will provide a level playing field where board members and the public may interact without undue influence and pressure; and

WHEREAS, such an environment will provide board members an opportunity to focus on important economic and conservation decisions that will have a direct impact on Upper Cook Inlet salmon fisheries; and

WHEREAS, ACR 20 (Agenda Change Request) is scheduled to come before the BOF at their October 15 - 16, meeting in Juneau; and

WHEREAS, changes made by the BOF to the Central District Drift Management Plan at the 2014 Upper Cook Inlet meeting appears to have increased returns to Northern District waters as

returns of Coho Salmon to the Knik Arm drainages are the largest in the last six years; and

WHEREAS, bag limits for Coho Salmon were increased by Emergency Order during the 2014 summer season; and

WHEREAS, such evidence suggests that the changes made to the Central District Drift Management Plan have increased salmon returns to Northern District waters; and

WHEREAS, it will be valuable to the Board to have three years of return data in which to assess this regulatory change designed as a conservation measure.

NOW, THEREFORE, BE IT RESOLVED, that the Assembly, requests the Alaska Board of Fisheries hold the 2017 Upper Cook Inlet Board of Fisheries meeting in Anchorage, Alaska.

BE IT FURTHER RESOLVED, that the Alaska Board of Fisheries is encouraged to reject ACR 20, as there is no justification to take up the matter outside of cycle as the provisions made to the Central District Management Plan appear to have had a positive impact on Northern District salmon returns.

ADOPTED by the Matanuska-Susitna Borough Assembly this 16 day of September, 2014.

LARRY DeVILBISS, Borough Mayor

ATTEST:

LONNIE R. McKECHNIE, CMC, Borough Clerk

(SEAL)

PASSED UNANIMOUSLY: Sykes, Beck, Arvin, Colligan, Salmon, Colver, and Halter

United Cook Inlet Drift Association

43961 K-Beach Road, Suite E ● Soldotna, Alaska 99669 ● (907) 260-9436 ● fax (907) 260-9438 ● info@ucida.org ●

Date: September 15, 2014

Addressee: Glenn Haight, BOF Executive Director
Alaska Department of Fish and Game
Boards Support Section
P.O. Box 115526
Juneau, AK 99811-5526

RE: Catch and Release Mortality

Dear BOF Members,

Two new scientific papers were published this year concerning predicted mortality of captured and released (C & R) sockeye salmon and recovery of wild, mature salmon after an exhaustive exercise and air exposure stressor.

The following is a brief summary of each of these studies:

1. Observable impairments predict mortality of captured and released sockeye salmon at various temperatures. Volume 2, 2014. Marika Kirstin Gale, et al.

   A. Females in the warmest water (19°c – 66°F) had the greatest mortality (50%) after a simulated C & R event.

   B. Catch & release (C &R) included air exposure of less than two minutes was associated with equilibrium loss and depressed ventilation.

   C. Higher hematocrit and plasma (blood) lactates and lower hemoglobin concentrations were also present and were significant factors that predicted the 50% mortality rates within 24 – 48 hours after a C & R event.

2. Comparative Biochemistry and Physiology, Part A 173 (2014) 7-16. Michael R, Donaldson, et al.

   A. Exhaustive stress and air exposure resulted in increased blood ion cortisol, lactate and depressed estradiol (sockeye only), all associated with high (50%) rates within 24 – 48 hours.

   B. Pink salmon recorded a higher magnitude stress response for blood plasma variables.

   C. Sockeyes exhibited high and more variable genetic expression to exhaustive stress and air exposure.

Summary:

- A better understanding and application of sockeye and pink salmon to exhaustive, stressful and air exposure events will help in the development of appropriate management activities that can reduce C & R mortality associated with encounters.

Sincerely,

Roland Maw

Roland Maw, PhD
UCIDA Executive Director

ecojustice

PRV & HSMI summary of facts

Aquaculture can transfer diseases with potentially serious negative consequences to wild species:

> "I therefore conclude that the potential harm posed to Fraser River sockeye salmon from salmon farms is serious or irreversible. Disease transfer occurs between wild and farmed fish, and I am satisfied that salmon farms along the sockeye migration route have the potential to introduce exotic diseases and to exacerbate endemic diseases that could have a negative impact on Fraser River sockeye."
>
> — Cohen Commission Final Recommendations, Vol. 3, page 6, column 1

What is piscine reovirus (PRV)?
Piscine reovirus was discovered in 2010 and is thought to cause a severe infectious fish disease known as Heart and Skeletal Muscle Inflammation (HSMI).[1]

What is Heart and Skeletal Muscle Inflammation (HSMI)?
HSMI is an infectious disease syndrome first observed in farmed Atlantic salmon in a single fish farm in Norway in 1999. There are now 419 farms infected with HSMI in Norway.

Not all fish that develop HSMI die from the disease. Farm salmon with the disease, HSMI, are seen lying on their sides on the bottom of the net cage still alive, but too weak to move.[2] Farm fish with HSMI may recover, but wild salmon with HSMI would be extremely vulnerable to predation if found lying on their side, on the seafloor.

The relationship between PRV and HSMI
In 2010 scientists at Columbia University, and from Norway, identified the piscine reovirus as potential causative agent of HSMI.[1]

The symptoms of HSMI occur 5-9 months after seawater transfer.[3] Therefore, smolts leaving a hatchery infected with PRV would not appear sick. Not all fish that test positive for PRV develop the disease HSMI. In fish farms, the PRV positive fish appear to develop HSMI after entering the net pen - perhaps due to the addition of another external factor such as stress.[5]

PRV is a durable virus, meaning it is tough to damage, increasing the chance of it moving with currents and infecting other fish.

Piscine reovirus is contagious and appears able to transfer from farmed to wild fish

PRV has spread rapidly through Norwegian farms:

ecojustice

1999 – first noticed[1]
2002 – 41 farms infected[6]
2007 – 162 farms infected[6]
2010 – 419 farms infected[1]

Salmon caught in the Broughton Archipelago in 2008 and frozen for research purposes tested negative for PRV[7]. In 2012, fish from the same region tested positive for the virus.

The scientists that uncovered the association between PRV and HSMI warned: "it is urgent that measures be taken to control PRV ... due to the potential for transmission to wild salmon populations."[1] He cautions that "if the potential hosts [fish] are in close proximity it goes through them like wildfire"[8].

The strain of PRV found recently in both farmed and wild fish in B.C. is very close to the strain found in Norway. As all viruses mutate over time, the published evidence to date suggests that the strain of PRV detected in wild and farmed salmon in 2012 was recently introduced – likely around 2007 into Pacific coastal waters. The results of this analysis were published in 2013 in the Virology Journal.[4]

The results of recent unpublished testing by British Columbia's provincial pathologist suggest that historical samples of persevered fish have tested positive for PRV. That sampling did not include a whole genome analysis. Thus, it is not possible compare these historical tests to the Norwegian strain.

In conclusion:
Given what we already know about PRV and HSMI, it is imperative that we proceed with caution and take steps to isolate fish infected with PRV from healthy wild salmon populations.

This must start by keeping fish infected with PRV out of the ocean.

---

[1] Palacios G, Lovoll M, Tengs T, Hornig M, Hutchison S, Hui J, Kongtorp RT, Savji N, Bussetti AV, Solovyov A, Kristoffersen AB, Celone C, Street C, Trifonov V, Hirschberg DL, Rabadan R, Egholm M, Rimstad E, Lipkin WI: 2010 Heart and skeletal muscle inflammation of farmed salmon is associated with infection with a novel reovirus. *PLoS One* 2010, 5:e11487. http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0011487

[2] Ferguson, H.W., Kongtorp, R.T., Taksdal, T., Graham, D., Falk, K. 2005 An outbreak of disease resembling heart and skeletal muscle inflammation in Scottish farmed salmon, *Salmo salar* L., with observation on myocardial regeneration. *Journal of Fish Disease* 28, 119-123. www.ncbi.nlm.nih.gov/pubmed/15705157

[3] Løvoll, M., Wiik-Nielsen, J., Søren, G., Wiik-Nielsen, C. R., Kristofferson, A.B., Faller, R., Poppe, T., Jung, J., Pedamallu, C., S., Nederbragt, A. J., Meyerson, M., Rimstad, E., Tengs, T. 2010. A novel totovirus and piscine reovirus (PRV) in Atlantic salmon (*Salmo salar*) with cardiomyopathy syndrome (CMS). *Virology Journal*. 7: 309 http://www.virologyj.com/content/7/1/309

[5] Finstad, Ø. W., K. Fal, M. LØvol, E. Øystein, E. Rimstad. 2012 Immunohistochemical detection of piscine reovirus (PRV) in hearts of Atlantic salmon coincide with the course of heart and skeletal muscle inflammation (HSMI). *Veterinary Research*, 43:27. www.ncbi.nlm.nih.gov/pubmed/22486941

ecojustice

[6] Garseth ÅH, Fritsvold C, Opheim M, Skjerve E, Biering E. 2012. Piscine reovirus (PRV) in wild Atlantic salmon, Salmo salar L., and sea-trout, Salmo trutta L., in Norway. *Journal Fish Disease*. http://www.ncbi.nlm.nih.gov/pubmed/23167652

[7] Saksida, S.M., Marty, G.D., Jones, S.R., Manchester, C.L., Diamond, C.L., Bidulka, J., St-Hilaire, S. 2012. Parasites and hepatic lesions among pink salmon, Oncorhynchus gorbuscha (Walbaum), during early seawater residence. *Journal of Fish Diseases*. 35 137-151 http://www.ncbi.nlm.nih.gov/pubmed/22233513

[8] http://www.wired.com/wiredscience/2010/07/salmon-disease-identified

[4] Kibenge M., Iwamoto T., Wang Y., Morton A., Godoy M., Kibenge F. 2013. Whole-genome analysis of piscine reovirus (PRV) shows PRV represents a new genus in family Reoviridae and its genome segment S1 sequences group it into two separate sub-genotypes. Virology Journal 2013, 10:230. http://www.virologyj.com/content/10/1/230

Conservation Physiology

Volume 2 • 2014 10.1093/conphys/cou029

SEB Society for Experimental Biology

Research article

Observable impairments predict mortality of captured and released sockeye salmon at various temperatures

Marika Kirstin Gale[1,*], Scott G. Hinch[1], Steven J. Cooke[2], Michael R. Donaldson[1,3], Erika J. Eliason[1,2], Ken M. Jeffries[1,4], Eduardo G. Martins[1,2] and David A. Patterson[5]

[1]Pacific Salmon Ecology and Conservation Laboratory, Department of Forest and Conservation Sciences, University of British Columbia, 2424 Main Mall, Vancouver, British Columbia, Canada V6T 1Z4
[2]Fish Ecology and Conservation Physiology Laboratory, Ottawa-Carleton Institute of Biology and Institute of Environmental Sciences, Carleton University, Ottawa, Ontario, Canada K1S 5B6
[3]Department of Natural Resources and Environmental Sciences, University of Illinois at Urbana-Champaign, 1102 S. Goodwin Ave., Urbana, IL 61801, USA
[4]Anatomy, Physiology & Cell Biology, School of Veterinary Medicine, University of California, Davis, One Shields Avenue, Davis, CA 95616, USA
[5]Cooperative Resource Management Institute, Fisheries and Oceans Canada, School of Resources and Environmental Management, Simon Fraser University, TASC 1 - Room #8405, 8888 University Drive, Burnaby, British Columbia, Canada V5A 1S6

***Corresponding author:** Science Division, Freshwater Fisheries Society of British Columbia, 34345 Vye Road, Abbotsford, British Columbia, Canada. Tel: +1 604 855 4720. Email: marika.gale@gmail.com

Migrating adult sockeye salmon frequently encounter commercial and recreational fishing gear, from which they may be landed, escape or be intentionally released. In this experiment, migratory adult sockeye salmon were exposed to simulated capture–release in fresh water, including 3 min of exhaustive exercise and 60 s of air exposure at three ecologically relevant water temperatures (13, 16 and 19°C) to understand how thermal and capture–release stressors may interact to increase mortality risk. Water temperature and sex were the factors that best predicted 24 and 48 h survival, with females in the warmest temperature group experiencing the greatest mortality. Capture–release treatment including air exposure was associated with equilibrium loss and depressed ventilation rates at release; the probability of fish surviving for 24 h after simulated capture–release was >50% if the duration of equilibrium loss was <2 min or ventilation frequency was >1 breath s^{-1}. Higher haematocrit and plasma lactate as well as lower mean cell haemoglobin concentration and plasma sodium and chloride 30 min after simulated capture–release were also significant predictors of 24 h survival. Together, the results demonstrate that simple observations that are consistent with physiological disturbance can be used as predictors for post-release short-term survival for sockeye salmon. The markedly higher post-stressor mortality observed in females demonstrates that managers should consider sex-specific variation in response to different fisheries interactions, particularly in the face of climate change.

Key words: Fisheries, mortality, stress, temperature

Editor: Craig Franklin

Received 21 February 2014; Revised 11 June 2014; Accepted 15 June 2014

Cite as: Gale MK, Hinch SG, Cooke SJ, Donaldson MR, Eliason EJ, Jeffries KM, Martins EG, Patterson DA (2014) Observable impairments predict mortality of captured and released sockeye salmon at various temperatures. *Conserv Physiol* 2: doi:10.1093/conphys/cou029.

Introduction

In most fisheries, some fish escape or are released from gears, but the survival of these non-retained fish is highly uncertain. Volitional releases are typically based on the premise that fish are returned to the water in a manner such that they survive and reproduce (Wydoski *et al.*, 1976). However, mortality does occur, with estimates ranging from zero to almost 100% across different fisheries (Muoneke and Childress, 1994; Chopin and Arimoto, 1995; Davis, 2002; Bartholomew and Bohnsack, 2005; Arlinghaus *et al.*, 2007). Mortality is highly context dependent (Cooke and Suski, 2005) and varies by species, anatomical hooking location, capture depth, hook, bait or gear types, air exposure, life-history stage and/or size, handling and water temperature, with water temperature being a common feature in most studies (reviewed by Muoneke and Childress, 1994; Davis, 2002; Arlinghaus *et al.*, 2007). A recent review of the role of water temperature in capture–release fisheries revealed a paucity of knowledge about the effects of ecologically relevant high temperatures on the mortality and impairment of released fish (Gale *et al.*, 2013).

In British Columbia's Fraser River, sockeye salmon (*Oncorhynchus nerka*) are of particular interest in terms of capture–release at high temperatures. Fraser River summer water temperatures have increased by ~2°C in the past 60 years, and in the last decade sockeye salmon have encountered the highest Fraser River water temperatures ever recorded (Patterson *et al.*, 2007). This is significant because Fraser River sockeye salmon stocks have adapted their aerobic capacity to be optimized at thermal environments historically experienced (Farrell *et al.*, 2008; Eliason *et al.*, 2011), and their physiological functioning becomes impaired at water temperatures beyond their optimum (Farrell, 2009). In years of high river temperatures, some late-run stocks have experienced en route migration mortalities of up to 90% (Cooke *et al.*, 2004, Hinch *et al.*, 2012).

Fraser River sockeye salmon are a highly valued resource. For example, out of the estimated total run size of 30 million in 2010 (DFO, 2011b), 10 million were caught by commercial fishers (DFO, 2011a), 1.2 million by aboriginal groups (DFO, 2010a) and 300 000 by recreational anglers (DFO, 2010b). For these fishing sectors, there are few estimates of how many fish are caught but escape gear prior to landing; however, large proportions of fish are seen on spawning grounds bearing the characteristic scars from their encounters with fishing gears (e.g. gill-net wounds and hook wounds; Clarke *et al.*, 1994). A similar phenomenon has been observed for Alaskan sockeye salmon (Baker and Schindler, 2009). Almost 33% of Fraser River sockeye caught by recreational anglers in 2010 were reported to be released (DFO, 2010b). Many of these fishery encounters occur during a particularly difficult portion of the adult life history, because fish have just transitioned from cool salt water to warm fresh water, ceased feeding, and must achieve remarkable feats of metabolic performance to ascend the river. Presently, we know little about the consequences of capture encounters on released or escaped sockeye salmon, particularly when they are experiencing thermal stress. The exceptions are a similar experiment to the present study, where capture stress caused summer-run sockeye salmon to exhibit greater physiological impairment in warmer water temperatures than in cooler ones (Gale *et al.* 2011), and a recent study (Robinson *et al.*, 2013) in which Fraser River sockeye that were exhausted following fishing simulations were exposed to facilitated recovery techniques. These authors conducted their work at two temperatures and revealed that facilitated recovery failed to reduce mortality.

Currently, in-season harvest adjustments are made by managers using highly uncertain and complex statistical models that predict the proportion of each run timing group that will be likely to perish en route as a result of forecasted water temperatures (e.g. Macdonald *et al.*, 2010; Cummings *et al.*, 2011). These models, designed to increase the probability of achieving spawning escapement goals, do not explicitly account for release mortality and/or the interaction of fish and fishing gear at warmer temperatures. Therefore, reducing the uncertainty in this management system by being able more accurately to predict and account for release and escape mortality at different temperatures can assist in the management of this important economic, cultural and ecological resource.

We simulated capture and release of adult sockeye salmon in a laboratory, which involved exhaustive exercise and air exposure at three different temperatures relevant to migrating Fraser River fish. These temperatures included a cool historic average (13°C), a moderate current average near the optimum for aerobic scope (16°C) and a current high near the critical thermal maximum for aerobic scope (19°C; Farrell *et al.*, 2008). We investigated the following hypotheses: (i) equilibrium and ventilation would be impaired following capture–release as stressors were incrementally added (i.e. exhaustive exercise, air exposure and higher water temperatures); (ii) physiological disturbances (i.e. changes in blood plasma ions and metabolites) would increase following capture–release as those stressors were incrementally added; and (iii) mortality would be highest in groups with the greatest cumulative stressors (i.e. fish exhaustively exercised and air exposed at the warmest temperature). We used our results to predict the probability of individual survival following capture–release using physiological metrics.

Materials and methods

Study animals and facility

We intercepted adult sockeye salmon in British Columbia's Harrison River, a tributary of the Fraser River, located ~125 km east of Vancouver (Fig. 1). These sockeye salmon were captured by beach seine, 15–18 September 2008, while completing their spawning migration, and belonged to the Weaver Creek population. Fish were individually dip-netted from the seine net, transferred to tanks (1000 l) mounted on

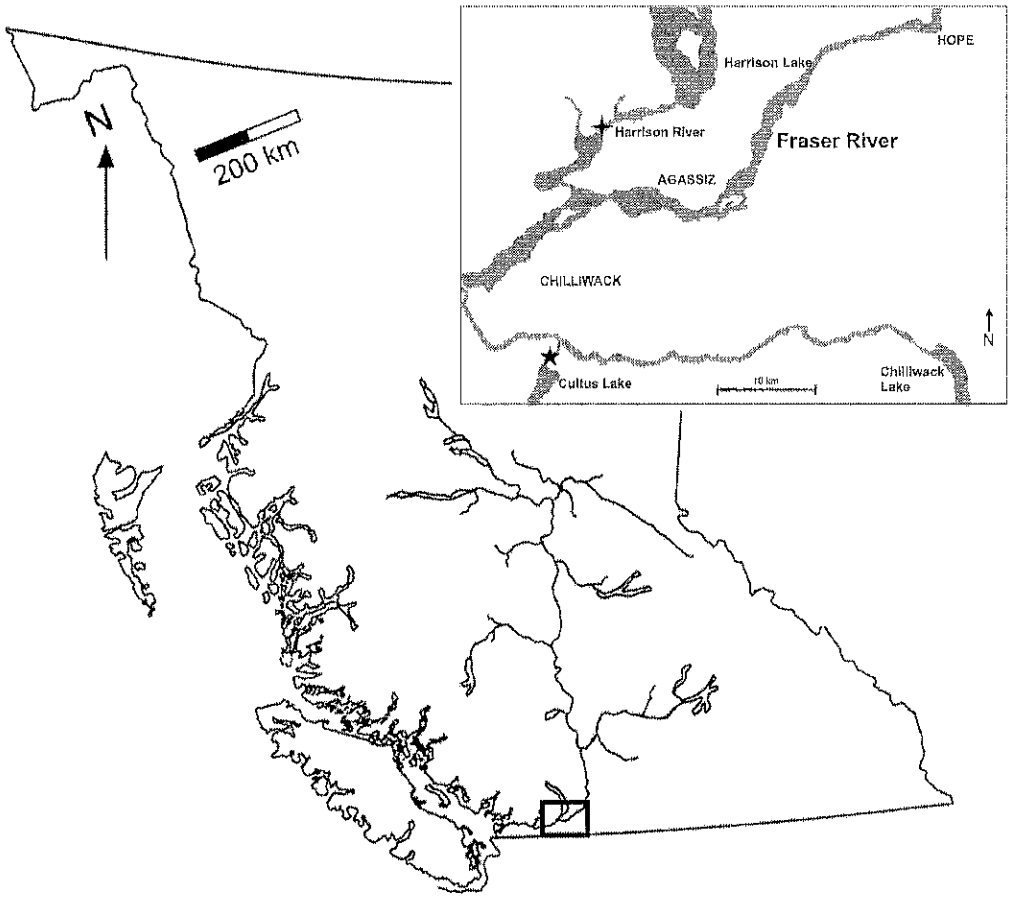


Figure 1: British Columbia and the Fraser River, which drains almost one-third of the province. Inset is the study area, with the cross marking the fish capture site on the Harrison River, and the star marking the Cultus Lake Salmon Research Laboratory, where experiments took place.

trucks and then transported (~45 min) to the Cultus Lake Salmon Research Laboratory (Cultus Lake, BC, Canada). Upon arrival, each sockeye salmon was sampled for adipose fin tissue in order to determine population identification. At this time, PIT tags (full-duplex Passive Integrated Transponder tags, ~8.5 mm × 2 mm size, 134.2 kHz; Biomark Inc., Boise, ID, USA) were injected by 12 gauge needle into the coelomic cavity for individual identification. No anaesthesia or wound closure was necessary for this procedure. Fish were then introduced to a large (20 000 l, 6 m diameter) artificial holding pond fed continuously with ultraviolet-sterilized (~40 l min^{-1}; LS-Permabead Filtration System, Integrated Aqua Systems Inc., Escondido, CA, USA) 9°C water drawn from nearby Cultus Lake. On 22 September 2008, after receiving DNA results indicating the stock identity of each fish, 54 of 106 Weaver Creek sockeye salmon (a late-run stock) were moved into nine smaller (1400 l) aquaria (six or seven fish per tank) maintained at 11°C for 24 h. After this period of recovery from transport stress (based on previous experience with this species), we began increasing the water temperature (maximum rate, 0.2°C h^{-1}) until experimental temperatures were achieved (three tanks each at 13, 16 and 19°C). A minimum of 12 h elapsed prior to initiating experimental fishing simulations. Although that time period may appear short, previous field work on sockeye salmon has revealed that they experience massive thermal variation over short temporal scales during homeward migration (e.g. >10°C over 24 h; Drenner *et al.*, 2014). Due to logistical constraints, the experimental treatments were applied in two consecutive rounds, with 54 fish in the first round of the experiment, after which they were removed from the treatment tanks and placed back in the large holding ponds to allow for the experiment to be run on another 52 fish. The two rounds were pooled for analyses.

Experimental protocol

After all fish had been maintained at their treatment temperatures for a minimum of 12 h, they were randomly assigned to one of three simulated capture–release treatments, resulting

in a full-factorial design using three levels of temperature and three levels of capture–release stress. The lowest magnitude stressor involved handling only, in which individuals were netted from their holding tank, identified using a hand-held PIT reader (Biomark Inc.) and transferred to one of the treatment tanks (at the experimental temperature for each fish) and monitored for 30 min. This treatment was designed as a non-capture control for handling effects other than those employed in the two simulated capture–release treatments. The capture–release stressor included stimulating fish to burst swim for 3 min by manual chasing. This technique involved three experimenters standing around the perimeter of the treatment tank, leaning over and splashing vigorously behind the fish or gently touching its tail, and has been used extensively in angling simulation and exercise experiments (Milligan, 1996; Kieffer, 2000). The third treatment, capture plus air exposure, involved the capture–release stressor described above followed by gently lifting fish out of the water using a soft mesh dip-net to air expose them for 60 s.

Both groups of capture-stressed fish were blood sampled 30 min after the instigation of chasing. Blood was collected via caudal venipuncture while holding fish supine in a foam-lined trough supplied with flowing water. Transfer to the trough and blood sampling occurred quickly (<1 min) in order to reduce the influence of sampling stress on physiological test results (Cooke *et al.*, 2005, 2013). Fish were also marked by anchor tag and sampled at this time for a small gill sample (3 mm from the distal end of five to 10 filaments on the first gill arch on the left side of the fish) and 3 mm muscle punch for gene expression analysis in a separate experiment (Donaldson, 2012). These biopsy procedures have been previously shown to cause no alteration of behaviour or survival in adult sockeye salmon (e.g. Cooke *et al.*, 2005). No anaesthesia was used (as per Cooke *et al.*, 2005) given that fish were easy to handle when in a supine position with constant flow of aerated water. Moreover, anaesthesia would have introduced yet another potential physiological challenge from which fish would have to recover, which could confound experiments. Ventilation rates for all fish were counted immediately after introducing fish to the treatment tank, immediately after capture–release treatment with/without air exposure, and again before blood and tissue sampling (30 min later). Fish were also monitored for the presence or absence of the ability to maintain dorsoventral equilibrium post-capture–release, as well as the duration of this impairment. After sampling, fish were returned to their holding tanks. Overall, 47 female and 50 male sockeye salmon completed the experiment. Sockeye salmon that died prior to the simulated capture–release treatment were excluded from analyses.

Fish were monitored hourly for the duration of the experiment. Dead fish were removed from the tanks, and moribund fish (i.e. those that had lost equilibrium and demonstrated erratic or absent swimming behaviour) were removed and euthanized by cerebral concussion to comply with animal care protocols. Moribund fish were considered as 'mortalities' for analyses. All surviving fish were sampled 48 h after capture–release treatments. All experimental procedures were conducted with approval from the University of British Columbia Animal Care Committee (#A08-0388) and in accordance with guidelines set forth by the Canadian Council on Animal Care.

Laboratory protocols and assays

Stock identification was determined for all individual fish using DNA analyses (Beacham *et al.*, 2004) and confirmed by analyses of scales. All 97 sockeye salmon used in the analysis were from the late-run Weaver Creek stock. Haematocrit was quantified on whole blood using microcapillary tubes centrifuged at 10 000*g* for 2 min. The remaining blood was centrifuged at 7000*g* for 6 min, and plasma was stored at −80°C until further analysis. Plasma was subsequently analysed for cortisol, lactate, glucose, osmolality, chloride, sodium and potassium, as described by Farrell *et al.* (2001). Briefly, plasma analysis was conducted using the following instruments: cortisol, Neogen ELISA with Molecular Devices Spectramax 240pc plate reader; lactate and glucose, YSI 2300 Stat Plus analyzer; osmolality, Advanced Instruments 3320 freezing-point osmometer; chloride, Haake Buchler digital chloridometer; and sodium and potassium, Cole-Parmer, model 410 single-channel flame photometer. Haemoglobin was measured using a hand-held haemoglobin meter (HemoCue 201+, Angelholm, Sweden) following the protocol and calibration procedure described by Clark *et al.* (2008).

Statistical analysis

All statistical analyses were performed using the R Statistical Package (R Development Core Team, 2008). Three-way ANOVA was used to detect differences in the responses of males and females to temperature and capture–release treatment. In the absence of a sex effect, two-way ANOVA was used to compare the duration of equilibrium loss, ventilation rates and individual plasma indices between capture–release treatment and temperature groups (including a temperature × capture–release treatment interaction), using log-transformations to reduce heteroscedasticity when necessary. Welch's *t*-tests were performed *post hoc* to determine where significant differences occurred. Pearson's χ^2 tests were used to evaluate differences in the frequency of equilibrium loss between treatment groups. Significance for all analyses was evaluated at the level of $\alpha = 0.05$, and multiple comparisons were corrected for using the false-discovery rate method, where each comparison is evaluated against the critical significance level, equal to the false-discovery rate of 0.05 multiplied by the number of the comparison divided by the total number of comparisons (Curran-Everett, 2000).

Survival analysis was performed using the 'survival' library (Therneau 2012) in R. Time to death (in hours over 48 h post-treatment) was analysed as a function of temperature, simulated capture–release treatment, sex and combinations of these (including two-way interactions). A model with no effects (i.e. intercept only) was also fitted to the time-to-death

data. The 48 h time period was chosen for examination based on visualization and preliminary analyses of the survival results; mortality occurring after this period of time was considered to be unrelated to experimental treatments, instead occurring presumably due to the stressors of captivity and natural senescence. Model selection was carried out using the bias-corrected Akaike information criterion (AICc). According to this criterion, the model with the lowest AICc value is the most parsimonious one describing the data, and other models differing from this one in <2, 4–7 and >10 units (delta.AICc) are regarded as having substantial, considerably less and essentially no support from the data, respectively (Burnham and Anderson, 2002). The AICc weight of the models was also computed, and can be interpreted as the probability of a given model in the set being the most parsimonious one to describe the data (Burnham and Anderson, 2002). To account for model selection uncertainty, model-averaged mortality over time was computed using the AIC weight of the models included in a 95% confidence set for the best model (Burnham and Anderson, 2002). This resulted in a weighted combination of eight models being used to calculate model-averaged mortality.

Total osmolality values for four fish were unable to be determined by assay; therefore, the values were estimated using a linear regression that included the concentration of the major osmolites that contribute to total osmolality, resulting in the following equation:

$$\text{osmolality} = (0.8) \times ([\text{lactate}] + [\text{glucose}] + [\text{sodium}] + [\text{chloride}] + [\text{potassium}]) + 73.1$$

where $n = 92$, $r^2 = 0.70$ and $P < 0.0001$.

Logistic regression was used to test whether 24 h mortality (binary response) could be predicted by the fish's physiology (haematocrit, haemoglobin, plasma lactate, glucose, chloride, sodium and potassium concentration 30 min post-treatment), ventilation rate (opercular beats per minute) and duration of equilibrium loss (in seconds) immediately after release. These regressions were conducted separately for each of the above-mentioned variables and did not take into account the capture–release treatments (i.e. simply evaluated whether variability in physiological parameters, ventilation rate and equilibrium were associated with mortality regardless of the treatment). The fit of each model to the mortality data was assessed using the le Cessie–van Houwelingen–Copas goodness-of-fit tests implemented in the R library 'rms' (Harrell, 2013). The test computes a global goodness-of-fit test statistic based on the unweighted sum of squares of residuals (Harrell, 2001). The test has the advantage of being more powerful and not dependent on the choice of cut-off points for groups of predictions that is needed for the more commonly used Hosmer–Lemeshow test (Hosmer *et al.*, 1997). Given that logistic regression models were fitted separately to a number of predictor variables, multiple testing adjustments to critical values were done using the false-discovery rate method described previously (Curran-Everett, 2000).

Results

Observed impairments

Observed impairment was related to the combination of treatments applied. Air-exposed fish were more likely to lose equilibrium than non-air-exposed fish (Pearson $\chi^2 = 74.41$, $P < 0.00001$). For those fish that lost equilibrium after capture–release (31 of 32 air-exposed fish, three of 33 capture–release-only fish and none of 33 non-capture-treated fish), there was a significant effect of the temperature × treatment interaction on the duration of equilibrium loss (ANOVA: $F_{2,31} = 11.15$, $P = 0.002$). The longest equilibrium loss was observed in air-exposed fish at the warmest temperature. Ventilation rates measured after fish were transferred to the treatment tank were higher for 16 and 19°C fish than for 13°C fish (ANOVA: $F_{2,86} = 4.53$, $P = 0.014$). Immediately after simulated capture–release, temperature effects were no longer evident, but air-exposed fish were ventilating significantly more slowly than non-air-exposed fish (ANOVA: $F_{2,86} = 4.67$, $P = 0.012$).

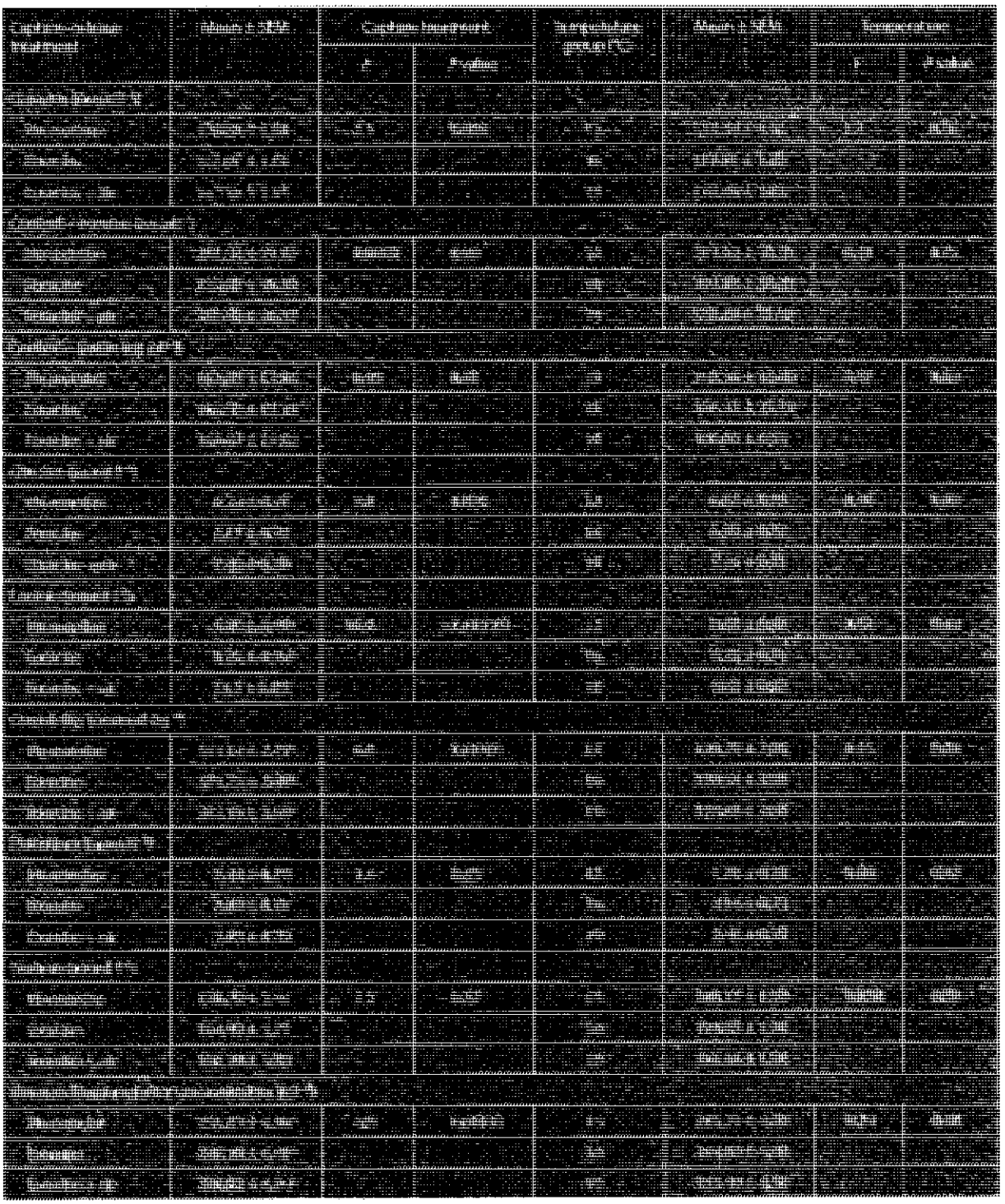
Blood chemistry

Blood chemistry disturbances 30 min post-capture–release were more strongly associated with simulated capture–release (i.e. exhaustive exercise) and air exposure than water temperature. Simulated capture–release significantly elevated plasma lactate concentration (Table 1; Welch's $t = 5.62$, $P < 0.0001$), with air exposure exacerbating this elevation (Table 1; Welch's $t = 2.89$, $P = 0.005$). Total osmolality was likewise increased by capture–release (Table 1; Welch's $t = 2.97$, $P = 0.004$) and air exposure (Table 1; Welch's $t = 2.5$, $P = 0.015$). Mean cell haemoglobin concentration (MCHC) was lowered by capture–release treatment (Table 1; Welch's $t = 2.7$, $P = 0.009$), but air exposure did not further depress MCHC (Table 1). Haematocrit tended to be higher in capture–release-treated individuals than in control fish, while haemoglobin concentration was similar among groups (Table 1). Water temperature had no effect on any plasma or blood variable we measured at 30 min (ANOVA: $P > 0.1$). Plasma glucose was not affected by capture–release treatment (Table 1). Plasma cortisol was higher for females than males, but capture–release treatment had no effect on cortisol levels for either sex (Table 1). Plasma chloride, sodium and potassium were also not different among capture–release treatment groups (Table 1). Blood chemistry tests were repeated on surviving fish at 48 h post-capture–release, at which time no effect of capture–release or temperature was detectable after correcting for multiple comparisons (data not shown).

Survival analysis

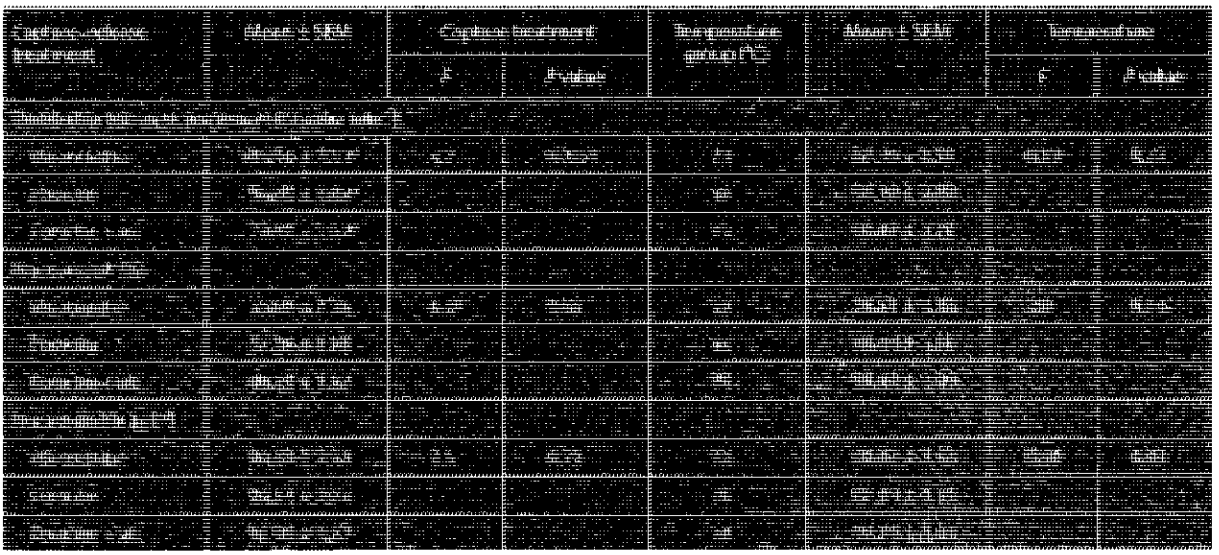
Forty-eight hours after capture–release, the greatest mortality was observed in the 19°C groups exposed to capture–release with and without air exposure (four fish or 40% in each group). No mortality was observed in the 16°C capture–release group in the first 48 h. Intermediate mortality was observed in the 13°C control group (one fish or 7%), the 13°C

Table 1: Mean (±SEM) plasma constituent concentrations for each capture-stressor group and temperature treatment group, measured from sockeye salmon 30 min after the application of a simulated capture–release stressor at 13, 16 or 19°C



(Continued)

Table 1: Continued



The *F* and *P* values for two-way ANOVA are presented ($n = 32 \pm 1$ for treatment groups and $n = 33 \pm 4$ for temperature groups), with bold text indicating significance after false-discovery rate correction for multiple comparisons. Significant differences between groups were evaluated *post hoc* with Welch's *t*-tests (also see Results section), and are indicated by different superscript letters.

Table 2: Experimental factors of the top eight models (95% confidence set) predicting 48 h mortality of experimental sockeye salmon

Models are ranked by increasing order of the bias-corrected Akaike information criterion (AICc) value, and the model with the lowest AICc is the most parsimonious one describing the data; delta.AICc is the difference in AICc between a given model and the top-ranked model; weight.AICc gives the probability of a given model in the set being the most parsimonious one describing the data; and *K* is the number of parameters in the model.

capture–release air-exposed group (one fish or 9%), the 16°C control and capture–release air-exposed group (three fish or 30% each), the 19°C control group (three fish or 33%) and the 13°C capture–release group (four fish or 36%). The most parsimonious model describing the cumulative mortality data to 48 h included the effects of temperature and sex (Table 2). Similar models with various combinations of capture–release treatment, temperature and sex (and their interactions) were weakly supported by the data (i.e. delta.AICc >3). Model-averaged mortality estimates (and observed mortality) 48 h after treatment were greater for females than males, and were greater at 19°C than at 13 and 16°C for both sexes (Fig. 2). Most of the mortality occurred within the first 24 h.

Predicting mortality using physiological indices

Logistic regression demonstrated that higher lactate, cortisol and haematocrit, and lower glucose, sodium, chloride, potassium and mean cell haemoglobin concentrations 30 min after capture–release treatment significantly predicted mortality to 24 h (Fig. 3). Likewise, slower ventilation rates and more prolonged equilibrium loss after capture–release treatment significantly increased the probability of mortality to 24 h (logistic regression; Fig. 4). Fish that regained equilibrium in <130s or fish that were ventilating at >62 breaths min^{-1} after release had a >50% probability of surviving 24 h after treatment (Fig. 4).

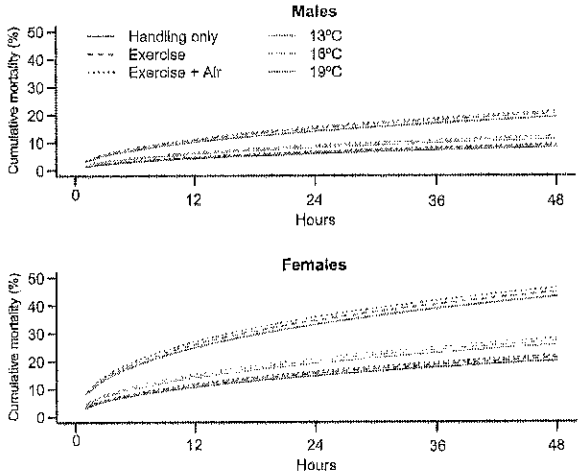


Figure 2: Curves of cumulative mortality over time (48 h) of female and male sockeye salmon after simulated capture–release treatment. The mortality curves are model-averaged estimates based on the 95% confidence set for the best model (see Table 2) that were calculated to account for model selection uncertainty. Blue lines indicate 13°C, yellow lines 16°C and red lines 19°C temperature treatments. Line style indicates the simulated capture–release treatment.

Discussion

Annually, tens to hundreds of thousands of Fraser River sockeye salmon are intentionally released from angling gear (DFO, 2010b), and even more encounter net gears and escape by their own struggle. The demonstrable impacts on late-run salmon physiology and survival, from the simulated capture–release scenarios described herein, can be used to help reduce the current uncertainty regarding the fitness consequences to these non-retained sockeye salmon from in-river fisheries at different temperatures. This study is the first to examine how blood chemistry and observable physiological indices, such as equilibrium loss and ventilation rates, can be predictive of mortality after capture and release of sockeye salmon, and it is one of the few studies to investigate the combined effects of capture–release stress, thermal stress and air exposure on Pacific salmon post-release survival (e.g. an associated study examining summer-run sockeye salmon; Gale *et al.*, 2011).

As predicted, ventilation rate and equilibrium were most severely impaired in fish that experienced exhaustive exercise and air exposure at high temperatures. Our results suggest that air exposure increases mortality risk in sockeye salmon by two different mechanisms. First, air exposure frequently causes fish to lose equilibrium (e.g. Gingerich *et al.*, 2007; Thompson *et al.*, 2008), leaving them more vulnerable to secondary capture or predation (e.g. Danylchuk *et al.*, 2007; Raby *et al.*, 2014). This is a considerable risk in the Fraser River, where commercial, First Nations and recreational fishers are prolific, and large populations of predators (i.e. harbour seals, bears and raptors) target returning salmon. Second, air exposure was also associated with depressed ventilation rates (as described by Gale *et al.*, 2011), which can cause decreased respiratory gas exchange; oxygen deprivation by air exposure could result in an impaired ability to correct oxygen deficits incurred during anaerobic exercise. Our results further confirmed the findings of Gale *et al.* (2011) in that elevated temperatures resulted in greater ventilatory impairment in sockeye salmon, which is particularly troubling considering that excess post-exercise oxygen consumption is greatest for fish in warm water (Lee *et al.*, 2003). Elevated temperatures, even in the absence of air exposure, also increased the duration of equilibrium loss (Gale *et al.*, 2011). Despite these physiological impairments, we were not able to demonstrate that greater capture–release stressors directly contributed to lower survival.

We were able to show that the risk of mortality was related to physiological measures of individual fish made after capture–release, and these relationships suggest that it is possible to judge whether captured fish should be released. In order for mortality predictions to be practical for use by fishers, they must involve easily observable metrics, with clear thresholds for established unacceptable risk levels. Ventilatory frequency and duration of equilibrium loss are both easy to observe and quantify, and require no specific expertise to evaluate. Therefore, managers could recommend or mandate (notwithstanding some potential compliance and enforcement challenges) the release of fish above a specific threshold probability of survival and the retention of any fish that had a lesser probability of survival. These types of guidelines could aid fishers in making decisions that would best maintain a healthy fish population. For example, we found that fish that regained equilibrium in <130s or fish that were ventilating at a rate >62 breaths min^{-1} after release had a >50% probability of surviving 24 h after treatment. A simple 2 min rule of thumb for equilibrium loss (or 1 breath s^{-1} rule of thumb for ventilation rate) could be used to infer >50% 24 h survival after release. Interestingly, these impairments were transient for most fish (30 of the 32 fish that lost dorsoventral equilibrium after capture–release appeared recovered within 300 s of release, and ventilation rates had returned to pre-capture levels by the next evaluation 30 min post-capture), but were still predictive of 24 h mortality. Management agencies frequently recommend holding fish until they have recovered orientation and swimming ability, presumably to protect them while they are particularly vulnerable to capture by predators. This research suggests that managers need to be cognizant that fish that are more substantially impaired prior to release (even if recovered to a vigorous state) will still have higher post-release mortality than fish that recover quickly or fish that were not impaired at all.

We successfully used manual chasing with and without air exposure to elicit a physiological stress response similar to that experienced by sockeye salmon migrants encountering fishing gear (Young *et al.*, 2006; Donaldson *et al.*, 2010a), while eliminating the physical injury incurred by these encounters. By omitting injuries sometimes incurred from hooks or

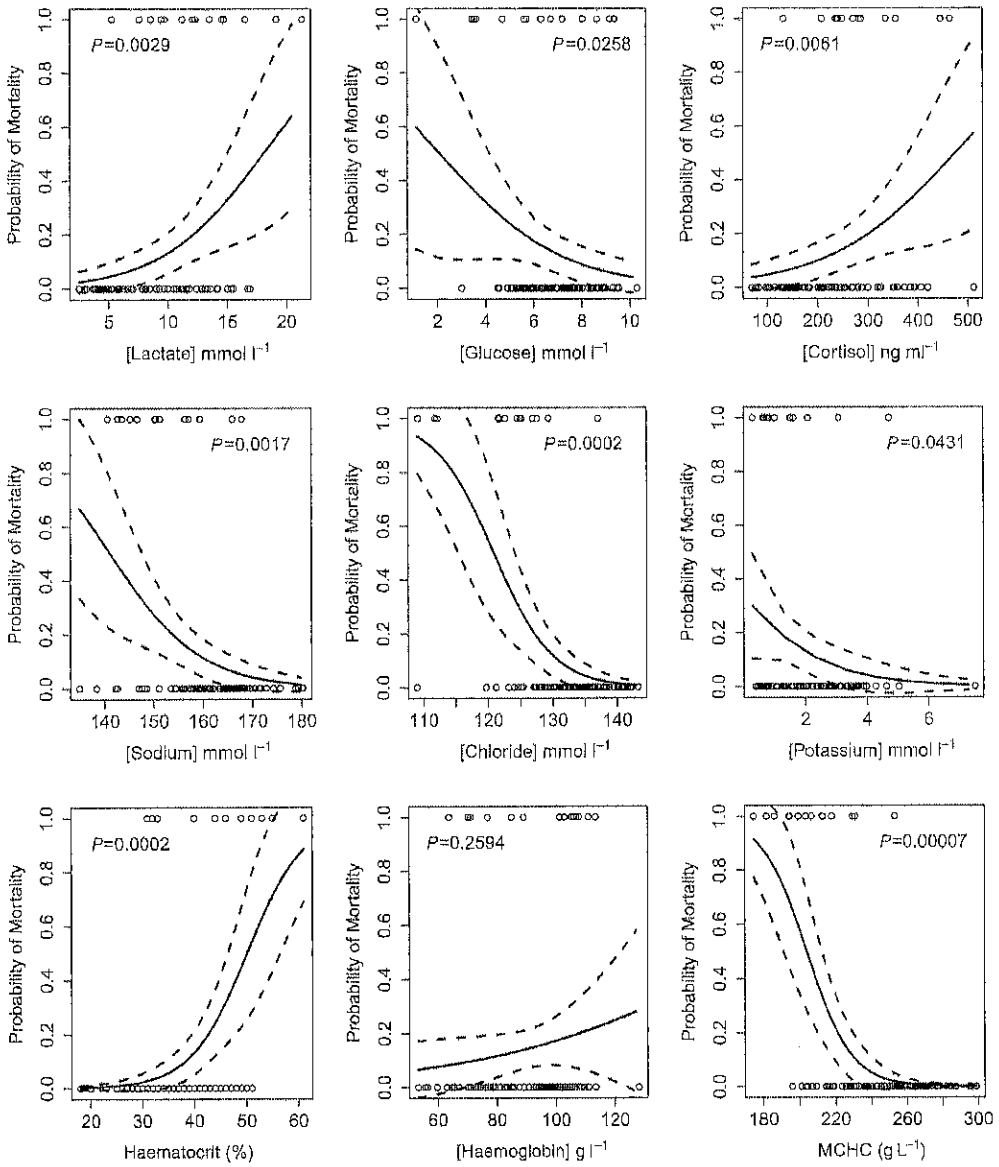


Figure 3: Fitted logistic regression curves of 24 h mortality as a function of blood and plasma parameters measured after capture–release treatment. The logistic regression was conducted for each variable separately and did not take into account capture–release treatment. Continous and dashed lines denote, respectively, mortality estimates and 95% confidence intervals. Open circles denote observed fate of the fish after 24 h, with zero denoting survival and one denoting mortality. All models except that for haemoglobin are significant when evaluated at a critical level corrected for multiple testing.

net entanglement from our protocols, we were able to evaluate how physiological disturbances alone may affect survival. Our capture–release treatment resulted in 74% higher plasma lactate than in non-capture–release-treated fish, while air-exposed fish had lactate levels 120% higher than non-capture–release-treated fish. Lactate build-ups occurred due to increased glycolytic flux and a corresponding lactacidosis. These results are consistent with other experiments on Pacific salmon using identical capture–release simulation techniques (Donaldson *et al.*, 2010b; Gale *et al.*, 2011). Capture–release treatment resulted in a significant decrease of MCHC compared with non-capture–release-treated fish (driven by a non-significant elevation in haematocrit, with no associated changes in haemoglobin concentration). This is likely to be due to erythrocytic swelling secondary to the adrenaline response resulting from capture stress (Nikinmaa, 1982). Also

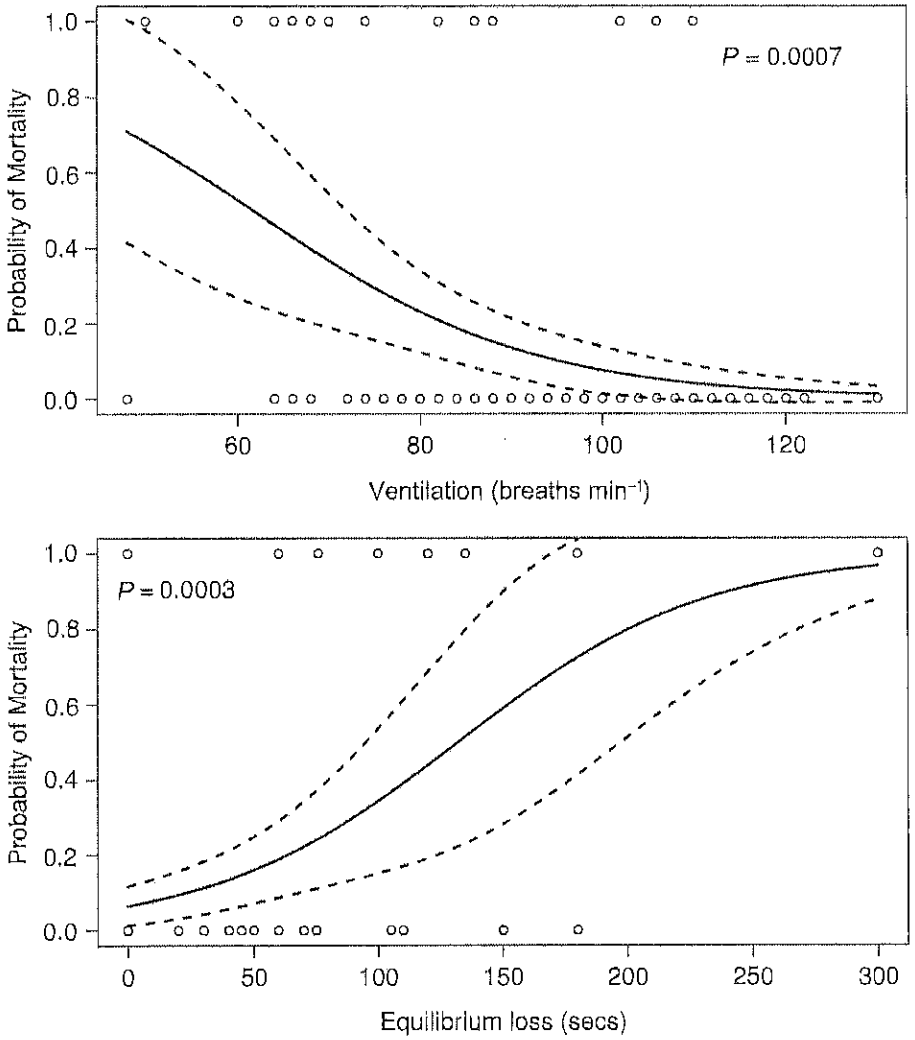


Figure 4: Fitted logistic regression curves of 24 h mortality as a function of ventilation rate (top) and duration of equilibrium loss (bottom) measured after capture–release treatment. The logistic regression was conducted for each variable separately and did not take into account capture–release treatment. Continuous and dashed lines denote, respectively, mortality estimates and 95% confidence intervals. Open circles denote observed fate of the fish after 24 h, with zero denoting survival and one denoting mortality. Both models are significant when evaluated at a critical level corrected for multiple testing.

consistent with our previously published work using simulated capture–release on summer-run sockeye salmon (Gale *et al.*, 2011), we detected no effects of temperature on the blood chemistry parameters measured 30 min after capture–release treatment.

Consistent with our hypothesis, temperatures approaching the critical maximum increased catch-and-release mortality; however, we were surprised to find that sex was a more significant predictor of survival to 48 h than was capture–release treatment. While mortality 48 hours post-treatment was highest in the 19°C air-exposed group, the survival model including temperature and sex was a far more parsimonious fit than any of the models including capture–release treatment. Our finding that females suffered higher mortality than males was consistent with other studies on sockeye salmon, both wild migrants and captured individuals held in laboratory conditions (Crossin *et al.*, 2008; Cooperman *et al.*, 2010; Jeffries *et al.*, 2012). These results suggest that adult females experiencing secondary stressors may be at greater risk of failing to complete their migration and successfully spawn, which could have substantial repercussions on fitness. The lack of significant capture–release treatment effect indicates that capture–release involving a brief strenuous exercise and air exposure

may not significantly increase the risk of morrality for sockeye salmon over and above handling alone. However, our finding that the physiological impairments resulting from our simulated capture–release treatments were associated with higher mortality risk suggests that sub-lethal impacts also need to be considered. Studies of capture–release on other species have shown that capture–release stressors and air exposure frequently cause elevations in blood chemistry stress parameters and result in behavioural and other impairments (e.g. Ferguson and Tufts, 1992; Davis and Parker, 2004; Arlinghaus and Hallermann, 2007). In order to understand female mortality of released or escaped sockeye salmon better, researchers could focus on the interaction of temperature and capture–release stress on females specifically.

Generally, capture–release mortality increases at warmer temperatures (reviewed by Gale *et al.*, 2013); however, the present study is the first to show how thermal and capture–release stress may combine to increase mortality risk to released or escaped sockeye salmon. The consequences of this finding with regard to managing sockeye salmon and other fisheries are troubling in a climate-warming scenario. Recent research has shown that sockeye salmon in the Fraser River may be adapted to survive and perform optimally at a narrow range of water temperatures coinciding with historical averages for each genetically and geographically distinct population (Farrell *et al.*, 2008; Eliason *et al.*, 2011). Sockeye salmon are already experiencing temperatures that often exceed their critical thermal maximum in the Fraser River (Patterson *et al.*, 2007; Eliason *et al.*, 2011), which is associated with a high level of migration mortality (Cooke *et al.*, 2004; Hinch and Martins, 2011). Moreover, the Fraser River is expected to continue on this warming trajectory into the future (Ferrari *et al.*, 2007), and this is likely to have consequences for future viability of this valued group of fish (Hague *et al.*, 2011; Martins *et al.*, 2011; Reed *et al.*, 2011). Resource managers are very limited in their ability to stop the increase in water temperature, but they can regulate or make recommendations regarding the other two stressors that we examined, i.e. capture–release stress and air exposure.

Our finding that individual blood and plasma chemistry indicators can predict survival is a promising step towards improving our understanding of post-release mortality for sockeye salmon. Elevated plasma lactate, cortisol, sodium and chloride are consistent with elevated stress (Wendelaar Bonga, 1997), and were all associated with higher probability of mortality within the first 24 h after capture–release. Lactate anions enter the blood from the muscle tissue after anaerobic exercise and are associated with intracellular acidosis. Extreme intracellular acidosis has been suggested to be a causal factor in fish dying after exercise (Wood *et al.*, 1983). Our logistic regression model suggested that sockeye salmon had a >50% probability of mortality within 24 h when plasma lactate concentrations exceeded 18 mmol l^{-1}. Migrating sockeye salmon caught by tangle net (Donaldson *et al.*, 2010a), purse seine (Cooke *et al.*, 2008) or beach seine (Clark *et al.*, 2010) may experience similar elevated plasma lactate levels. We detected an association between decreased plasma glucose concentrations and increased mortality risk, which was surprising because blood glucose levels generally increase with stress (Wendelaar Bonga, 1997). We propose that rather than indicating a less-stressed state, the lower glucose concentration could be indicative of fish in poor condition mounting a reduced stress response. An alternative explanation is that severe exercise and/or stress can lead to hepatic glycogen depletion and associated declines in plasma glucose (hypoglycaemia) such as those observed here, particularly over longer time periods (Polakof *et al.*, 2010). The trend of higher haematocrit but equal haemoglobin in capture–release-treated individuals suggests that the depressed MCHC may be a result of erythrocytic swelling. On average, plasma chloride and sodium concentrations 30 min after treatment were similar to conspecifics sampled after river capture (Clark *et al.*, 2010) and ~15–20% higher compared with quiescent sockeye salmon held in laboratory conditions (Sandblom *et al.*, 2009). Our logistic regression models found that fish with relatively low sodium and chloride ion concentrations 30 min after treatment had a lower probability of surviving 24 h. This is consistent with other research on sockeye salmon demonstrating that chloride values below 120 mmol l^{-1} were associated with increased mortality (Jeffries *et al.*, 2011). Overall, it appears that fish responded physiologically to our treatment protocols in a similar manner to wild migrants caught in various gears, and that several physiological parameters consistent with a generalized stress response were predictive of mortality. In general, the patterns in blood parameters following capture–release were consistent with field results, suggesting the potential transferability of these results to real fisheries, and demonstrating the value of controlled laboratory experiments (Cooke *et al.*, 2013).

Researchers have begun developing novel ways to predict the survival of released fish, perhaps the most promising of which are reflex impairment indices (Davis and Ottmar, 2006; Davis, 2007, 2010). Our study is one of the first to examine how similar observed impairment metrics can be used in Pacific salmon in order to predict mortality (for another example, see Raby *et al.*, 2012). We found that both duration of equilibrium loss and ventilation rate after capture–release treatment were highly significant mortality predictors. Ventilatory frequency has been used in other species to indicate and measure stress responses (e.g. Mock and Peters, 1990; White *et al.*, 2008); however, some caution the utility of this metric because it may not reflect the severity of the stressor (Barreto and Volpato, 2004). Nonetheless, our experiment showed that extreme stressors caused a depression in ventilation rate that was highly predictive of same-day fate in sockeye salmon.

In conclusion, the present study demonstrates that while individual sockeye salmon vary in their responses to simulated capture–release stressors, exhaustive exercise coupled with air exposure at high temperatures can result in a greater mortality risk for released fish than for those not exposed to simulated capture–release. Females were particularly sensitive to stressors, demonstrating the need for management strategies that acknowledge and address inter-sexual variation

(Hanson *et al.*, 2008). A better understanding of the physiological predictors of capture–release mortality of sockeye salmon at different temperatures can be used to inform management of the potential consequences of different management actions. Accurate release mortality estimates in various thermal conditions could be applied to total mortality estimates for Fraser sockeye and increase the probability of achieving spawning escapement goals.

Acknowledgements

We gratefully acknowledge Kim Charlie, Alvin Charlie, Travis Phair, Wayne Peters, Fred Paul II, Dana Charlie, Floyd Point, Burt Charlie and Casmire Charlie of the Chehalis First Nation for their fishing expertise and efforts. We would like to thank Vanessa Ives, Jessica Carter, Lisa Thompson, Merran Hague and D'Arcy McKay of the Environmental Watch Program – Fisheries and Oceans Canada, for performing all laboratory assays and assisting in the field. We also thank the staff of Cultus Lake Salmon Research Laboratory – Fisheries and Oceans Canada, particularly Bryan Smith, as well as Mike Lapointe and Steve Latham from the Pacific Salmon Commission, and the staff of the Molecular Genetics Laboratory at the Pacific Biological Station – Fisheries and Oceans Canada. Field assistance from Jenn Burt, Tim Clark, Kim Hruska, Lucas Pon, David Roscoe and especially Andrew Lotto was instrumental in this project.

Funding

This work was supported by the University of British Columbia, and by Natural Sciences and Engineering Research Council of Canada (NSERC) Strategic and Discovery Grants to S.G.H. and S.J.C. M.K.G. was supported by an NSERC CGS-M scholarship, the Kathleen and Sheldon Rothwell Fellowship, the Mary and David MacAree Fellowship and the Faculty of Forestry (UBC). S.J.C. is also supported by the Canada Research Chairs program.

References

Arlinghaus R, Hallermann J (2007) Effects of air exposure on mortality and growth of undersized pikeperch, Sander lucioperca, at low water temperatures with implications for catch-and-release fishing. *Fisheries Manag Ecol* 14: 155–160.

Arlinghaus R, Cooke SJ, Lyman J, Policansky D, Schwab A, Suski C, Sutton SG, Thorstad EB (2007) Understanding the complexity of catch-and-release in recreational fishing: an integrative synthesis of global knowledge from historical, ethical, social, and biological perspectives. *Rev Fish Sci* 15: 75–167.

Baker MR, Schindler DE (2009) Unaccounted mortality in salmon fisheries: non-retention in gillnets and effects on estimates of spawners. *J Appl Ecol* 46: 752–761.

Barreto RE, Volpato GL (2004) Caution for using ventilatory frequency as an indicator of stress in fish. *Behav Process* 66: 43–51.

Bartholomew A, Bohnsack JA (2005) A review of catch-and-release angling mortality with implications for no-take reserves. *Rev Fish Biol Fisher* 15: 129–154.

Beacham TD, Lapointe M, Candy JR, McIntosh B, MacConnachie C, Tabata A, Kaukinen K, Deng LT, Miller KM, Withler RE (2004) Stock identification of Fraser River sockeye salmon using microsatellites and major histocompatibility complex variation. *T Am Fish Soc* 133: 1117–1137.

Burnham KP, Anderson DR (2002) Model Selection and Multimodel Inference: A Practical Information-theoretic Approach. Ed 2. Springer, New York.

Chopin FS, Arimoto T (1995) The condition of fish escaping from fishing gears—a review. *Fish Res* 21: 315–327.

Clark TD, Eliason EJ, Sandblom E, Hinch SG, Farrell AP (2008) Calibration of a hand-held haemoglobin analyser for use on fish blood. *J Fish Biol* 73: 2587–2595.

Clark TD, Sandblom E, Hinch SG, Patterson DA, Frappell PB, Farrell AP (2010) Simultaneous biologging of heart rate and acceleration, and their relationships with energy expenditure in free-swimming sockeye salmon (*Oncorhynchus nerka*). *J Comp Physiol B* 180: 673–684.

Clarke WC, Hinch SG, Lapointe M, Williams IV, Bradford M (1994) Report of the enroute mortality team, 1994 Fraser River investigation. Report prepared for the Fraser River Sockeye Public Review Board.

Cooke SJ, Suski CD (2005) Do we need species-specific guidelines for catch-and-release recreational angling to effectively conserve diverse fishery resources? *Biodivers Conserv* 14: 1195–1209.

Cooke SJ, Hinch SG, Farrell AP, Lapointe MF, Jones SRM, Macdonald JS, Patterson DA, Healey MC, Van Der Kraak G (2004) Abnormal migration timing and high en route mortality of sockeye salmon in the Fraser River, British Columbia. *Fisheries* 29: 22–33.

Cooke SJ, Crossin GT, Patterson DA, English KK, Hinch SG, Young JL, Alexander RF, Healey MC, Van der Kraak G, Farrell AP (2005) Coupling non-invasive physiological assessments with telemetry to understand inter-individual variation in behaviour and survivorship of sockeye salmon: development and validation of a technique. *J Fish Biol* 67: 1342–1358.

Cooke SJ, Hinch SG, Crossin GT, Patterson DA, English KK, Healey MC, Macdonald JS, Shrimpton JM, Young JL, Lister A *et al.* (2008) Physiological correlates of coastal arrival and river entry timing in late summer Fraser River sockeye salmon (*Oncorhynchus nerka*). *Behav Ecol* 19: 747–758.

Cooke SJ, Donaldson MR, O'Connor CM, Raby GD, Arlinghaus R, Danylchuk AJ, Hanson KC, Hinch SG, Clark TD, Patterson DA *et al.* (2013) The physiological consequences of catch-and-release angling: perspectives on experimental design, interpretation, extrapolation, and relevance to stakeholders. *Fisheries Manag Ecol* 20: 268–287.

Cooperman MS, Hinch SG, Crossin GT, Cooke SJ, Patterson DA, Olsson I, Lotto AG, Welch DW, Shrimpton JM, Van der Kraak G (2010) Effects of experimental manipulations of salinity and maturation status on

the physiological condition and mortality of homing adult sockeye salmon held in a laboratory. *Physiol Biochem Zool* 83: 459–472.

Crossin GT, Hinch SG, Cooke SJ, Welch DW, Patterson DA, Jones SRM, Lotto AG, Leggatt RA, Mathes MT, Shrimpton JM *et al.* (2008) Exposure to high temperature influences the behaviour, physiology, and survival of sockeye salmon during spawning migration. *Can J Zool* 86: 127–140.

Cummings JW, Hague MJ, Patterson DA, Peterman RM (2011) The impact of different performance measures on model selection for Fraser River sockeye salmon. *N Am J Fish Manage* 31: 323–334.

Curran-Everett D (2000) Multiple comparisons: philosophies and illustrations. *Am J Physiol Regul Integr Comp Physiol* 279: R1–R8.

Danylchuk SE, Danylchuk AJ, Cooke SJ, Goldberg TL, Koppelman J, Philipp DP (2007) Effects of recreational angling on the post-release behavior and predation of bonefish (*Albula vulpes*): the role of equilibrium status at the time of release. *J Exp Mar Biol Ecol* 346: 127–133.

Davis MW (2002) Key principles for understanding fish bycatch discard mortality. *Can J Fish Aquat Sci* 59: 1834–1843.

Davis MW (2007) Simulated fishing experiments for predicting delayed mortality rates using reflex impairment in restrained fish. *ICES J Mar Sci* 64: 1535–1542.

Davis MW (2010) Fish stress and mortality can be predicted using reflex impairment. *Fish Fish* 11: 1–11.

Davis MW, Ottmar ML (2006) Wounding and reflex impairment may be predictors for mortality in discarded or escaped fish. *Fish Res* 82: 1–6.

Davis MW, Parker SJ (2004) Fish size and exposure to air: potential effects on behavioral impairment and mortality rates in discarded sablefish. *N Am J Fish Manage* 24: 518–524.

DFO (2010a) Fisheries and Oceans Canada First Nations' Lower Fraser River Catch Reports, Sockeye 2010. Fisheries and Oceans Canada. http://www.pac.dfo-mpo.gc.ca/fm-gp/fraser/docs/abor-autoc/LFReports/2010LFASK.pdf for First Nations numbers.

DFO (2010b) Fraser River Mainstem Recreational Fishery Catch & Effort Estimates, 1984 to 2010. Fisheries and Oceans Canada. http://www.pac.dfo-mpo.gc.ca/fm-gp/fraser/docs/rec/creelsurveyPDFs/FraserSummary.pdf.

DFO (2011a) 2010 Salmon Summary. Fisheries and Oceans Canada. http://www.pac.dfo-mpo.gc.ca/fm-gp/species-especes/salmon-saumon/fisheries-peches/stats-donnees-eng.htm.

DFO (2011b) State of the Pacific Ocean 2010. Canadian Science Advisory Secretariat, Science Advisory Report 2011/32. http://www.dfo-mpo.gc.ca/Library/344311.pdf.

Donaldson MR (2012) Understanding the consequences of fisheries-related stressors on adult migrating Pacific salmon. PhD thesis. University of British Columbia, Vancouver. cIRcle: UBC's Digital Repository: Electronic Theses and Dissertations (ETDs) 2008+, http://hdl.handle.net/2429/42472.

Donaldson MR, Hinch SG, Patterson DA, Farrell AP, Shrimpton JM, Miller-Saunders KM, Robichaud D, Hills J, Hruska KA, Hanson KC *et al.* (2010a) Physiological condition differentially affects the behavior and survival of two populations of sockeye salmon during their freshwater spawning migration. *Physiol Biochem Zool* 83: 446–458.

Donaldson MR, Clark TD, Hinch SG, Cooke SJ, Patterson DA, Gale MK, Frappell PB, Farrell AP (2010b) Physiological responses of free-swimming adult coho salmon to simulated predator and fisheries encounters. *Physiol Biochem Zool* 83: 973–983.

Drenner SM, Hinch SG, Martins EG, Robichaud D, Thompson LA, Patterson DA, Cooke SJ, Thomson RE (2014) Variable thermal experience and diel thermal patterns of homing sockeye salmon in coastal marine waters. *Mar Ecol Prog Ser* 496: 109–124.

Eliason EJ, Clark TD, Hague MJ, Hanson LM, Gallagher ZS, Jeffries KM, Gale MK, Patterson DA, Hinch SG, Farrell AP (2011) Differences in oxygen-limited thermal tolerance among sockeye salmon populations. *Science* 332: 109–112.

Farrell AP (2009) Environment, antecedents and climate change: lessons from the study of temperature physiology and river migration of salmonids. *J Exp Biol* 212: 3771–3780.

Farrell AP, Gallaugher PE, Fraser J, Pike D, Bowering P, Hadwin AKM, Parkhouse W, Routledge R (2001) Successful recovery of the physiological status of coho salmon on board a commercial gillnet vessel by means of a newly designed revival box. *Can J Fish Aquat Sci* 58: 1932–1946.

Farrell AP, Hinch SG, Cooke SJ, Patterson DA, Crossin GT, Lapointe M, Mathes MT (2008) Pacific salmon in hot water: applying aerobic scope models and biotelemetry to predict the success of spawning migrations. *Physiol Biochem Zool* 81: 697–708.

Ferguson RA, Tufts BL (1992) Physiological effects of brief air exposure in exhaustively exercised rainbow trout (*Oncorhynchus mykiss*): implications for "catch and release" fisheries. *Can J Fish Aquat Sci* 49: 1157–1162.

Ferrari MR, Miller JR, Russell GL (2007) Modeling changes in summer temperature of the Fraser River during the next century. *J Hydrol* 342: 336–346.

Gale MK, Hinch SG, Eliason EJ, Cooke SJ, Patterson DA (2011) Physiological impairment of adult sockeye salmon in fresh water after simulated capture-and-release across a range of temperatures. *Fish Res* 112: 85–95.

Gale MK, Hinch SG, Donaldson MR (2013) The role of temperature in the capture and release of fish. *Fish Fish* 14: 1–33.

Gingerich AJ, Cooke SJ, Hanson KC, Donaldson MR, Hasler CT, Suski CD, Arlinghaus R (2007) Evaluation of the interactive effects of air exposure duration and water temperature on the condition and survival of angled and released fish. *Fish Res* 86: 169–178.

Hague MJ, Ferrari MR, Miller JR, Patterson DA, Russell GL, Farrell AP, Hinch SG (2011) Modelling the future hydroclimatology of the lower Fraser River and its impacts on the spawning migration survival of sockeye salmon. *Glob Change Biol* 17: 87–98.

Hanson KC, Gravel MA, Graham A, Shoji A, Cooke SJ (2008) Intersexual variation in fisheries research and mangement: when does sex matter? *Rev Fish Sci* 18: 421–436.

Harrell FE Jr (2001) Regression Modeling Strategies. Springer Science & Business Media, New York. 568 pp.

Harrell FE Jr (2013) rms: Regression Modelling Strategies. R package version 4.0-0.

Hinch SG, Martins EG (2011) A review of potential climate change effects on survival of Fraser River sockeye salmon and an analysis of interannual trends in en route loss and pre-spawn mortality. Cohen Commission Technical Report. Vancouver, BC. 2011. http://epe.lac-bac.gc.ca/100/206/301/pco-bcp/commissions/cohen/cohen_commission/ LOCALHOS/EN/FINALREPORT/INDEX.HTM.

Hinch SG, Cooke SJ, Farrell AP, Miller KM, Lapointe M, Patterson DA (2012) Dead fish swimming: a review of research on the early migration and high premature mortality in adult Fraser River sockeye salmon (*Oncorhynchus nerka*). *J Fish Biol* 81: 576–599.

Hosmer DW, Hosmer T, Le Cessie S, Lemeshow S (1997) A comparison of goodness-of-fit tests for the logistic regression model. *Stat Med* 16: 965–980.

Jeffries KM, Hinch SG, Donaldson MR, Gale MK, Burt JM, Thompson LA, Farrell AP, Patterson DA, Miller KM (2011) Temporal changes in blood variables during final maturation and senescence in male sockeye salmon (*Oncorhynchus nerka*): reduced osmoregulatory ability can predict mortality. *J Fish Biol* 79: 449–465.

Jeffries KM, Hinch SG, Martins EG, Clark TD, Lotto AG, Patterson DA, Cooke SJ, Farrell AP, Miller KM (2012) Sex and proximity to reproductive maturity influence the survival, final maturation, and blood physiology of Pacific salmon when exposed to high temperature during a simulated migration. *Physiol Biochem Zool* 85: 62–73.

Kieffer JD (2000) Limits to exhaustive exercise in fish. *Comp Biochem Physiol A Mol Integr Physiol* 126: 161–179.

Lee CG, Farrell AP, Lotto A, Hinch SG, Healey MC (2003) Excess post-exercise oxygen consumption in adult sockeye (*Oncorhynchus nerka*) and coho (*O. kisutch*) salmon following critical speed swimming. *J Exp Biol* 206: 3253–3260.

Macdonald JS, Patterson DA, Hague MJ, Guthrie IC (2010) Modeling the influence of environmental factors on spawning migration mortality for sockeye salmon fisheries management in the Fraser River, British Columbia. *T Am Fish Soc* 139: 768–782.

Martins EG, Hinch SG, Patterson DA, Hague MJ, Cooke SJ, Miller KM, Lapointe MF, English KK, Farrell AP (2011) Effects of river temperature and climate warming on stock-specific survival of adult migrating Fraser River sockeye salmon (*Oncorhynchus nerka*). *Glob Change Biol* 17: 99–114.

Milligan CL (1996) Metabolic recovery from exhaustive exercise in rainbow trout. *Comp Biochem Physiol A Physiol* 113: 51–60.

Mock A, Peters G (1990) Lysozyme activity in rainbow trout, *Oncorhynchus mykiss* (Walbaum), stressed by handling, transport and water pollution. *J Fish Biol* 37: 873–885.

Muoneke MI, Childress WM (1994) Hooking mortality: a review for recreational fisheries. *Rev Fish Sci* 2: 123–156.

Nikinmaa M (1982) Effects of adrenaline on red cell volume and concentration gradient of protons across the red cell membrane in the rainbow trout, *Salmo gairdneri*. *Mol Physiol* 2: 287–297.

Patterson DA, Macdonald JS, Skibo KM, Barnes DP, Guthrie I, Hills J (2007) Reconstructing the summer thermal history for the lower Fraser River, 1941 to 2006, and implications for adult sockeye salmon (*Oncorhynchus nerka*) spawning migration. Canadian Technical Report of Fisheries and Aquatic Sciences. Cultus Lake, BC, Fisheries and Oceans Canada.

Polakof S, Skiba-Cassy S, Choubert G, Panserat S (2010) Insulin-induced hypoglycaemia is co-ordinately regulated by liver and muscle during acute and chronic insulin stimulation in rainbow trout (*Oncorhynchus mykiss*). *J Exp Biol* 213: 1443–1452.

R Development Core Team (2008) R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. http://www.R-project.org/.

Raby GD, Donaldson MR, Hinch SG, Patterson DA, Lotto AG, Robichaud D, English KK, Willmore WG, Farrell AP, Davis MW *et al.* (2012) Validation of reflex indicators for measuring vitality and predicting the delayed mortality of wild coho salmon bycatch released from fishing gears. *J Appl Ecol* 49: 90–98.

Raby GD, Packer JR, Danylchuk AJ, Cooke SJ (2014) The understudied and underappreciated role of predation in the mortality of fish released from fishing gears. *Fish Fish* 15: 489–505.

Reed TE, Schindler DE, Hague MJ, Patterson DA, Meir E (2011) Time to evolve? Potential evolutionary responses of Fraser River sockeye salmon to climate change and effects on persistence. *PLoS One* 6: e20380. doi:10.1371/journal.pone.0020380.

Robinson KA, Hinch SG, Gale MK, Clark TD, Wilson SM, Donaldson MR, Farrell AP, Cooke SJ, Patterson DA (2013) Effects of post-capture ventilation assistance and elevated water temperature on sockeye salmon in a simulated capture-and-release experiment. *Conserv Physiol* 1: doi:10.1093/conphys/cot015.

Sandblom E, Clark TD, Hinch SG, Farrell AP (2009) Sex-specific differences in cardiac control and hematology of sockeye salmon (*Oncorhynchus nerka*) approaching their spawning grounds. *Am J Physiol Regul Integr Comp Physiol* 297: R1136–R1143.

Therneau T (2012) A package for survival analysis in S. R package version 2.36-14.

Thompson LA, Cooke SJ, Donaldson MR, Hanson KC, Gingerich A, Klefoth T, Arlinghaus R (2008) Physiology, behavior, and survival of angled and air-exposed largemouth bass. *N Am J Fish Manage* 28: 1059–1068.

Wendelaar Bonga SE (1997) The stress response in fish. *Physiol Rev* 77: 591–625.

White AJ, Schreer JF, Cooke SJ (2008) Behavioral and physiological responses of the congeneric largemouth (*Micropterus salmoides*) and smallmouth bass (*M. dolomieu*) to various exercise and air exposure durations. *Fish Res* 89: 9–16.

Wood CM, Turner JD, Graham MS (1983) Why do fish die after severe exercise? *J Fish Biol* 22: 189–201.

Wydoski RS, Wedemeyer GA, Nelson NC (1976) Physiological response to hooking stress in hatchery and wild rainbow trout (*Salmo gairdneri*). *T Am Fish Soc* 105: 601–606.

Young JL, Hinch SG, Cooke SJ, Crossin GT, Patterson DA, Farrell AP, Van der Kraak G, Lotto AG, Lister A, Healey MC *et al.* (2006) Physiological and energetic correlates of en route mortality for abnormally early migrating adult sockeye salmon (*Oncorhynchus nerka*) in the Thompson River, British Columbia. *Can J Fish Aquat Sci* 63: 1067–1077.

VIROLOGY JOURNAL

RESEARCH Open Access

Whole-genome analysis of piscine reovirus (PRV) shows PRV represents a new genus in family *Reoviridae* and its genome segment S1 sequences group it into two separate sub-genotypes

Molly JT Kibenge[1†], Tokinori Iwamoto[1†], Yingwei Wang[2], Alexandra Morton[3], Marcos G Godoy[4,5,6] and Frederick SB Kibenge[1*]

Abstract

Background: Piscine reovirus (PRV) is a newly discovered fish reovirus of anadromous and marine fish ubiquitous among fish in Norwegian salmon farms, and likely the causative agent of heart and skeletal muscle inflammation (HSMI). HSMI is an increasingly economically significant disease in Atlantic salmon (*Salmo salar*) farms. The nucleotide sequence data available for PRV are limited, and there is no genetic information on this virus outside of Norway and none from wild fish.

Methods: RT-PCR amplification and sequencing were used to obtain the complete viral genome of PRV (10 segments) from western Canada and Chile. The genetic diversity among the PRV strains and their relationship to Norwegian PRV isolates were determined by phylogenetic analyses and sequence identity comparisons.

Results: PRV is distantly related to members of the genera *Orthoreovirus* and *Aquareovirus* and an unambiguous new genus within the family *Reoviridae*. The Canadian and Norwegian PRV strains are most divergent in the segment S1 and S4 encoded proteins. Phylogenetic analysis of PRV S1 sequences, for which the largest number of complete sequences from different "isolates" is available, grouped Norwegian PRV strains into a single genotype, Genotype I, with sub-genotypes, Ia and Ib. The Canadian PRV strains matched sub-genotype Ia and Chilean PRV strains matched sub-genotype Ib.

Conclusions: PRV should be considered as a member of a new genus within the family *Reoviridae* with two major Norwegian sub-genotypes. The Canadian PRV diverged from Norwegian sub-genotype Ia around 2007 ± 1, whereas the Chilean PRV diverged from Norwegian sub-genotype Ib around 2008 ± 1.

Background

The newly discovered piscine reovirus (PRV) belongs to the family *Reoviridae*, subfamily *Spinareovirinae* [1], probably in a new reovirus genus that is equally distant to the genera *Orthoreovirus* and *Aquareovirus* [2], although with 10 genome segments, PRV is like members of the genus *Orthoreovirus* and unlike the genus *Aquareovirus* with 11 segments. The *Orthoreovirus* genus can be divided into the fusogenic and non-fusogenic orthoreoviruses based on the ability of the fusogenic orthoreoviruses to induce cell-cell fusion during infection resulting in syncytium formation [3] by virtue of possession of a fusion-associated small transmembrane (FAST) protein [4]. Whereas the non-fusogenic orthoreoviruses, *Mammalian Orthoreovirus* (MRV), are not clinically significant [5], the fusogenic orthoreoviruses *Nelson Bay virus* (NBV) [6] and *Baboon Orthoreovirus* (BRV) [7] that infect primates, *Avian Orthoreovirus* (ARV) [8] that infect birds, and *Reptilian Orthoreovirus* (RRV) [9] that infect reptiles, have been shown to cause significant and often fatal disease. Most recently, PRV has been shown

* Correspondence: kibenge@upei.ca
†Equal contributors
[1]Department of Pathology and Microbiology, Atlantic Veterinary College, University of Prince Edward Island, 550 University Ave., Charlottetown, PEI C1A 4P3, Canada
Full list of author information is available at the end of the article

to be more closely related with recognized orthoreoviruses than with recognized aquareoviruses, and does not encode a FAST protein and is therefore non-fusogenic [10].

PRV is associated with heart and skeletal muscle inflammation (HSMI) [2]; an emerging disease of marine-farmed Atlantic salmon [11], first recognized in 1999 in western Norway [12] and subsequently in Scotland [13]. PRV has also been detected by real-time reverse transcription quantitative polymerase chain reaction (RT-qPCR) at a low prevalence in wild Atlantic salmon *"S. salar"* [2] and in certain marine fish species (Atlantic herring *"Clupea harengus"*, Capelin *"Mallotus villosus"*, Atlantic horse mackerel *"Trachurus trachurus"*, and Great silver smelt *"Argentina silus"*) along the coast of Norway [14]. PRV was also detected in 3% of anadromous trout (sea-trout) *"Salmo trutta"* tested, but not in anadromous Arctic char *"Salvelinus alpinus"* [15]. PRV is ubiquitous in Norwegian salmon farms [16,17], but there is a significant increase in the viral load and tissue distribution during outbreaks of HSMI [2,18]. The virus can be propagated in the GF-1 cell line [19], derived from the tissue of orange-spotted grouper, *Epinephelus coioides* [20], and cardiac and skeletal muscle pathology typical of HSMI can be reproduced in naïve Atlantic salmon by experimental inoculation with the supernatant from cell culture passaged PRV [19]. Most recently, it has been reported that serum enzymes creatine kinase and lactate dehydrogenase, associated with cardiac injury in humans [21], are significantly correlated with HSMI histopathology in Atlantic salmon [22]. Other reports doubt the pathogenicity of PRV, describing PRV as an opportunistic virus [23,24] or non-pathogenic virus [15]. The virus has been detected in marine-farmed Atlantic salmon in Chile [25,26]. There is anecdotal evidence that it is also present in farmed Atlantic salmon and wild Pacific salmon in British Columbia-Canada [27], where 75% of 300 farm salmon reportedly tested positive for PRV [27] but no sequence information was reported.

The PRV genome comprises at least 10 dsRNA segments including three large (L), three medium (M), and four small (S) size-class RNA genome segments [2]. To date only two "isolates", both from marine-farmed Atlantic salmon from Norway, have been sequenced on all 10 genomic segments by high-throughput pyrosequencing of clinical samples: Reovirus sp. Salmo/GP-2010/NOR from HSMI [2], and CMS PRV from a CMS outbreak [24]. However, only the Salmo/GP-2010/NOR sequences are accessible from the GenBank Database (GenBank accession numbers GU994013-GU994022). The coding assignments of genomic segments S1 and S4 initially reported to encode proteins with no identified homologs in orthoreoviruses and aquareoviruses [2], were recently shown to be reversed such that S1 encodes the major outer capsid protein, Outer clamp protein (σ3 and VP7 in MRV and aquareoviruses, respectively), and S4 encodes the virus attachment protein, Outer fiber protein (σ1 in MRV, which is absent in aquareoviruses) [10]. A further complication is that several sequences of Norwegian PRV isolates were deposited in the GenBank database as S4 sequences [18,28] but correspond to S1 sequences [2, this study], and sequences of the remaining 9 genomic segments for these virus isolates have not been reported.

The sequence data available for PRV strains are limited, with no genetic information on this virus outside of Norway, and none from wild fish despite the economical impact of HSMI on salmon aquaculture and the potential for transmission of PRV to wild salmon populations or from wild salmon to farmed salmon.

The primary goal of the present study was to determine the genetic diversity among PRV strains detected in tissue samples obtained from fish in western Canada, and in Chile, and their relationship to known Norwegian PRV sequences. We also attempted to sequence the complete genomes of three "isolates", two Canadian and one Chilean to obtain more information about the taxonomic assignment of PRV.

Results and discussion

Amplification and sequencing of cDNA of genomic segments of PRV from fish samples

Piscine reovirus was readily detected by RT-qPCR during testing at the Atlantic Veterinary College laboratory in fish tissue samples from western Canada, and at the ETECMA diagnostic laboratory in fish tissue samples from Chile (data not shown). Consistent with observations elsewhere [2,18], PRV is ubiquitous in marine-farmed salmon. PRV was consistently detected in gill tissue, identifying the gills as suitable target tissue and likely a primary transmission route for PRV. This is consistent with *Orthoreovirus*, which are commonly isolated from enteric and respiratory tract tissues [1].

Ten samples from western Canada with either low Ct values or unique case histories, host species, and sampling times listed in (Additional file 1: Table S1a) were selected for amplification and cloning of cDNA of viral genome segments. Four additional samples for which the 3′ portion of genome segment L1 had been PCR-amplified during the original testing for PRV (Table 1), were included in the analysis of PRV sequences.

Figure 1 shows the RT-PCR amplification and sequencing strategy used for the PRV genome segments, based on Canadian "isolate" 358. The new PRV nucleotide sequences (Additional file 2: Table S2) are available through the GenBank database [29]. The complete PRV genome (10 segments) was amplified from 2 of 10 samples. Additional partial or full-length sequences were

Table 1 List of new piscine reovirus (PRV) "isolates" from Canada and Chile

PRV "isolate"	Fish species	Source
23	Atlantic salmon	Farmed, Canada
163	Atlantic salmon	Farmed, Canada
167	Atlantic salmon	Farmed, Canada
177	Atlantic salmon	Farmed, Canada
185	Atlantic salmon	Farmed, Canada
196	Atlantic salmon	Farmed, Canada
209	Atlantic salmon	Farmed, Canada
321	Atlantic salmon	Farmed, Canada
333	Cutthroat trout	Wild, Canada
340	Cutthroat trout	Wild, Canada
358	Atlantic salmon	Farmed, Canada
371	Atlantic salmon	Farmed, Canada
468	Chum salmon	Wild, Canada
480	Steelhead trout	Farmed, Canada
CGA337	Atlantic salmon	Farmed, Chile
CGA558	Atlantic salmon	Farmed, Chile
CGA8857	Atlantic salmon	Farmed, Chile
CGA280-5	Atlantic salmon	Farmed, Chile

also obtained on PRV genomic segments L1 (12 samples), L2 (1 sample), L3 (2 samples), M1 (4 samples), M2 (2 samples), M3 (4 samples), S1 (4 samples), S2 (3 samples), S3 (1 sample), and S4 (1 sample). PRV sequences were obtained from four different western Canada fish species (Atlantic salmon "*Salmo salar*", Cutthroat trout "*Oncorhynchus clarkii*", Steelhead trout "*Oncorhynchus mykiss*", and Chum salmon "*Oncorhynchus keta*") (Table 1 and Additional file 2: Table S2). Failure to amplify transcripts from all PRV positive samples was attributed to variation in viral loads. It has been reported that fish are capable of reducing the viral load by the end of the production cycle [18]. The differences in RT-PCR amplification could be due to differences between the PRV "isolates". It is also possible that variations in transcription levels of different virus genes, and efficiency of PCR of the different targets contributed to the inability to amplify all 10 genome segment transcripts in some of the samples.

Among the Chilean PRV positive samples, 6 fish individually sampled from the same farm with low Ct values were selected for amplification of all 10 viral genome segments; sequences from one of these samples was used in the analysis. These were all fish kidney samples, which had significantly lower Ct values (Additional file 1: Table S1b) compared to the fish gill samples from Canada (Additional file 1: Table S1a). Three additional sequences on PRV genomic segments L3 (3 samples) and S1 (2 samples) were already available and were included in the analysis, for a total of 4 Chilean PRV "isolates" (Table 1 and Additional file 2: Table S2).

(Additional file 2: Table S2) shows the nucleotide and amino acid sequence identities of the new PRV isolates when compared to the single Norwegian PRV isolate, Salmo/GP-2010/NOR (GenBank accession numbers GU994013-GU994022). The largest nucleotide sequence differences between Canadian and Norwegian PRV strains are on segments M2 and S1 (96-97% sequence identity). However, at the amino acid sequence level, our analysis shows that Canadian and Norwegian PRV strains are most divergent in the S1 encoded proteins, the major outer capsid protein (Outer clamp protein) and the non-structural protein p13, and the S4 encoded virus attachment protein (Outer fiber) [10]. The difference on the S4 protein is very interesting as it consists of a variable region of 18 residues at the C-terminus. This work is the first report of genomic analysis of PRV strains detected in tissue samples obtained from fish outside of Norway, extending the current geographical range of the characterized virus to both North and South America.

The PRV conserved terminal nucleotide sequences

Conserved terminal nucleotide sequences are useful for reovirus classification [1]. Palacios *et al.* [2] reported the complete genome sequence of the Norwegian PRV isolate Salmo/GP-2010/NOR including the conserved nucleotides at the 5′ end and the 3′ end of the genome (5′-GAUAAA/U------UCAUC-3). Table 2 compares these conserved terminal sequences to those of members of the *Orthoreovirus* and *Aquareovirus* genera. The conserved nucleotides 5′-GAUAAA/U were present at the 5′ ends in all the positive strands of each of the 10 genome segments of PRV, and are unique to PRV, whereas the 3′ conserved termini UCAUC-3′ are also conserved between PRV, and the *Orthoreovirus* and *Aquareovirus* genera (Table 2).

The PRV protein profile deduced from whole-genome sequence analysis

In the present study, the major open reading frames (ORFs) in the 10 PRV genomic segments, identified based on the first methionine of the ORF, vary in length from 315 codons in S4 to 1,290 codons in L2. The lengths of the non-coding regions ranged from 7 to 83 nucleotides at the 5′ end and from 44 to 89 at the 3′ end. The putative PRV gene products calculated from the nucleotide sequence data in this study are shown in Table 3. Only the S1 genome segment is bicistronic, encoding the Outer clamp protein and a nonstructural protein, p13, which is not a FAST protein [10]. In this sense, PRV is similar to *Mammalian orthoreovirus* (MRV), which also does not have a FAST protein and is non-fusogenic. However, MRV differs from PRV in gene

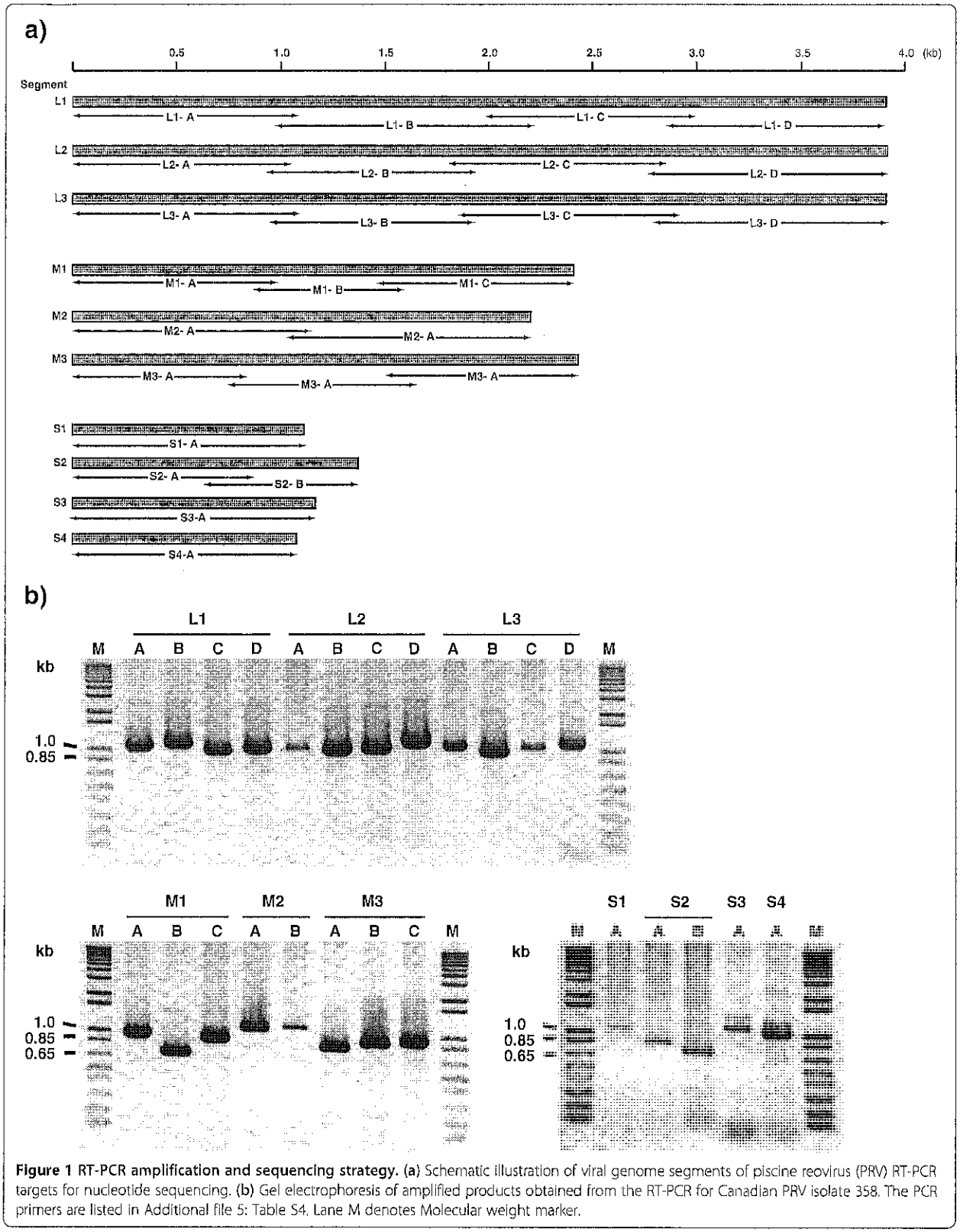


Figure 1 RT-PCR amplification and sequencing strategy. (a) Schematic illustration of viral genome segments of piscine reovirus (PRV) RT-PCR targets for nucleotide sequencing. **(b)** Gel electrophoresis of amplified products obtained from the RT-PCR for Canadian PRV isolate 358. The PCR primers are listed in Additional file 5: Table S4. Lane M denotes Molecular weight marker.

Table 2 Conserved terminal nucleotide sequences (positive strand) of PRV, *Orthoreovirus*, and *Aquareovirus* genera genome segments

Reovirus genus	Reovirus species/strain	Conserved terminal nucleotide sequences	
		5′ terminal nucleotides	3′ terminal nucleotides
PRV	Salmo/GP-2010/NOR [2]*	5′-GAUAAA/U	UCAUC-3′
Orthoreovirus genus	*Avian orthoreovirus*-138 [1]*	5′-GCUUUUU	UCAUC-3′
	Nelson Bay orthoreovirus [1]*	5′-GCUUUA	UCAUC-3′
	Mammalian orthoreovirus -1La [1]*	5′-GCUA	UCAUC-3′
	Baboon orthoreovirus [1]*	5′-GUAAAUUU	UCAUC-3′
	Reptilian orthoreovirus [1]*	5′-GUUAUUUU	UCAUC-3′
Aquareovirus genus	*Aquareovirus* A [1]*	5′-GUUUUA	UCAUC-3′
	Aquareovirus C [1]*	5′-GUUAUU	UCAUC-3′
	Aquareovirus G [1]*	5′-GUUUUA	UCAUC-3′

*Source of genome sequence information is given in square brackets.

coding assignments: in MRV, Core RdRp (λ3) is encoded on segment L1; Core shell (λ1) on segment L3; Outer clamp (σ3) is encoded on S4; Outer fiber (σ1) and NS, other (σ1s) are encoded on S1 (Table 3). Probably the biggest difference is the switch in coding assignments of segments S1 and S4 [2,10]. In most other orthoreoviruses, the Outer fiber protein is encoded on the same bi- or tricistronic S genome segment as the FAST protein and/or a poorly conserved nonstructural protein of unclear function [30].

Whole-genome sequence comparison to other members of family *Reoviridae*

The complete sequencing of Canadian PRV isolates 358, 371, and the Chilean PRV isolate CGA280-5 in the present study enabled us to elaborate the taxonomic grouping of the PRV isolates, and the phylogenetic relationships between *Orthoreovirus*, *Aquareovirus*, and PRV at the genome level. Nucleotide sequences of 13 selected members of family *Reoviridae*, belonging to *Orthoreovirus*, *Aquareovirus*, PRV, and the Bluetongue

Table 3 Piscine reovirus (PRV) genome coding assignments and protein characteristics

Genome segment*	Molecular size (bp)**	5′UTR (bp)**	3′UTR (bp)**	Protein name***	Protein size (aa) & mass (kDa)[1]	pI value	Predicted function
L1	3911	18	44	Core shell (T = 1) [λ1]	1282, 141.41 kDa	5.47	major inner capsid protein, Helicase, RNA triphosphatase
L2	3935	18	44	Core turret [λ2]	1290, 143.75 kDa	4.81	core spike, guanylyl transferase
L3	3916	7	48	Core RdRp [λ3]	1286, 144.24 kDa	8.68	minor inner capsid protein, RNA polymerase
M1	2383	21	79	Core NTPase [μ2]	760, 86.09 kDa	8.23	minor inner capsid protein, nucleoside triphosphate phosphohydrolase
M2	2179	26	89	Outer shell (T = 13) [μ1]	687, 74.26 kDa	6.27	outer capsid protein, membrane penetration, apoptosis
M3	2403	83	61	NS factory [μNS]	752, 83.53 kDa	5.00	NS, genome packaging?
S1	1081	28	60	Outer clamp [σ3]	330, 37.08 kDa	7.43	major outer capsid protein, dsRNA binding protein, translation control, modulation of cellular interferon, zinc-binding
				NS, p13 [σ1s]	124, 12.99 kDa	4.88	NS, block cell-cycle progression, cytolytic in PRV
S2	1329	21	45	Core clamp [σ2]	420, 45.93 kDa	9.02	major inner capsid protein, morphogenesis?
S3	1143	28	50	NS RNA [σNS]	354, 39.07 kDa	7.76	NS, genome packaging?
S4	1040	38	54	Outer fiber [σ1]	315, 34.60 kDa	6.04	outer capsid protein (virus attachment), cell tropism, pathways of viral spread *in-vivo*, virulence

*Genome segment nomenclature used by Palacio *et al.* [2] for PRV.
**Values obtained from cDNA sequenced [2; this paper PRV strain 358]. The 3′UTR does not include the stop codon.
***Protein nomenclature used by Key *et al.* [10] for PRV. Homolog of *Mammalian reovirus* protein is given in square brackets.
[1]PRV gene products are calculated from sequence data [2; this paper PRV strain 358].

virus as the outgroup sequence used in the analyses are shown in (Additional file 3: Table S3). Because the equivalent PRV segment S4 gene (Outer fiber protein) is not present in *Aquareovirus* genus, we restricted our analysis to segments homologous to PRV L1, L2, L3, M1, M2, M3, S1, S2, and S3, using a segment to segment comparison approach as done by Palacios *et al.* [2]. For the 13 isolates (Additional file 3: Table S3), we generated a phylogenetic tree for each of the 9 segments L1, L2, L3, M1, M2, M3, S1, S2, and S3. These trees are shown in Figures 2, 3, 4, 5, 6, 7, 8, 9 and 10. All the 9 trees show that PRV isolates cluster in a separate group. In 3 of the 9 trees (i.e., segments homologous to PRV L3, M1, and M2), isolates belonging to *Orthoreovirus*, *Aquareovirus*, and PRV grouped in clearly separate clusters, and would therefore clearly delineate PRV as a new genus separate from both *Orthoreovirus* and *Aquareovirus*. In 3 out of the 9 trees (i.e., segments homologous to PRV L1, M3, and S2), all the isolates inside the *Orthoreovirus* genus are in a separate group. In one tree (i.e., segment homologous to PRV L2), only the isolates inside the *Aquareovirus* genus are in a separate group. In 2 out of the 9 trees (i.e., segments homologous to PRV S1 and S3), none of the three groups of isolates (*Orthoreovirus*, *Aquareovirus*, and PRV) clearly clustered in a separate group although the PRV isolates formed a tight cluster. Thus while the distinction between *Orthoreovirus* genus and *Aquareovirus* genus is not consistent,

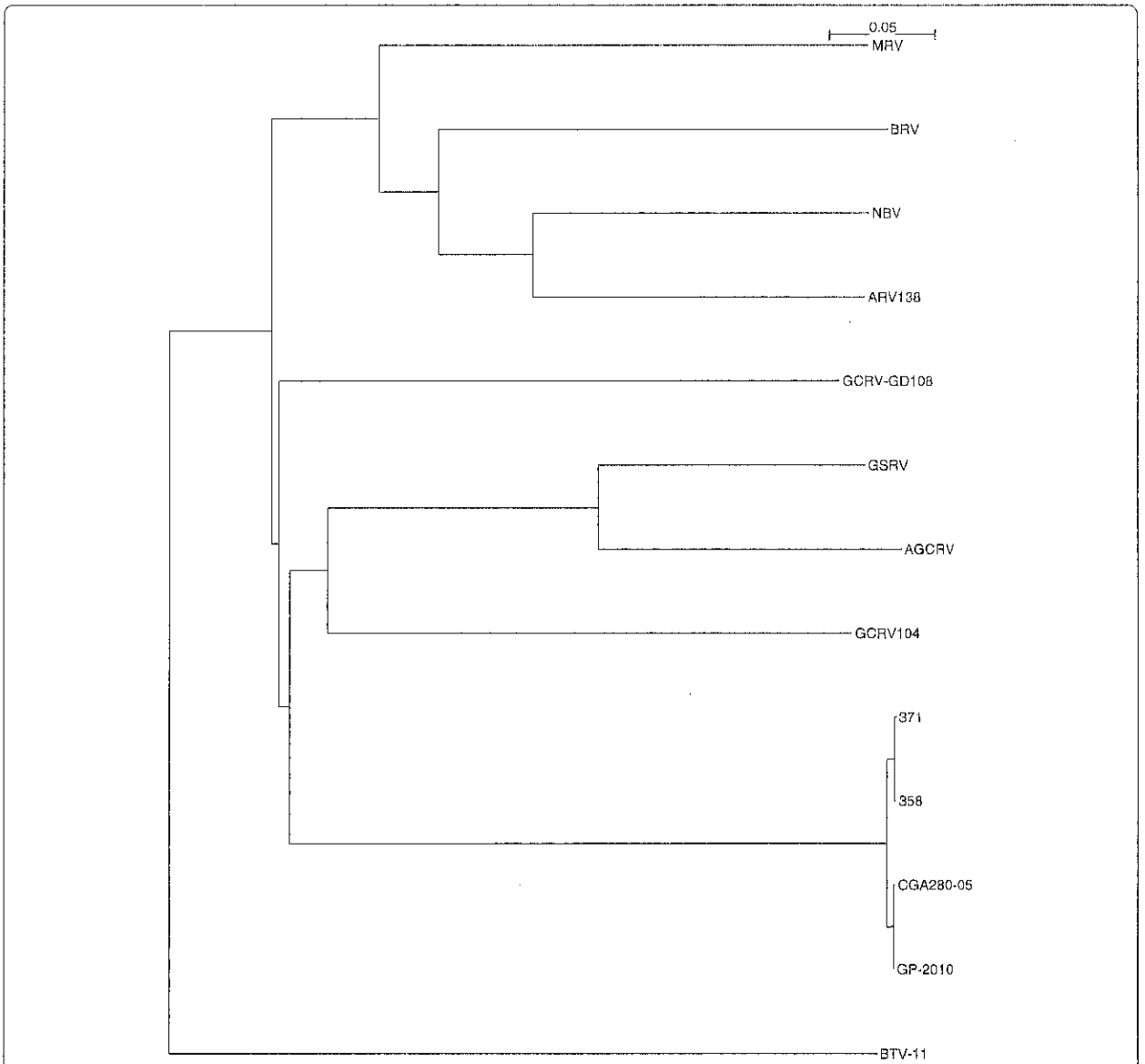


Figure 2 Phylogeny of homologous segment L1 shared by piscine reovirus (PRV) and selected members of family *Reoviridae*.

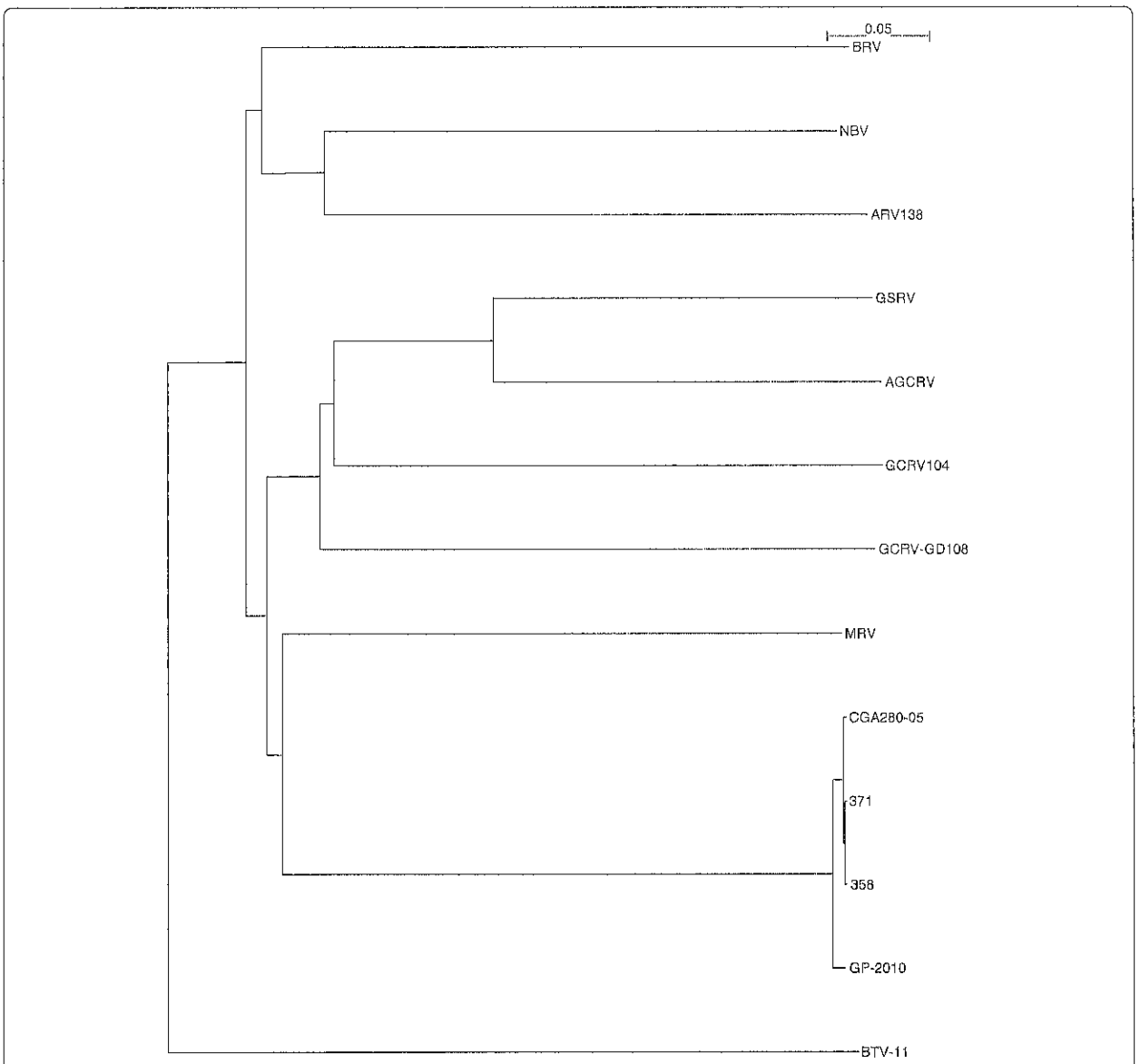


Figure 3 Phylogeny of homologous segment L2 shared by piscine reovirus (PRV) and selected members of family *Reoviridae*.

the distinction between PRV isolates and these two genera is very consistent. These observations further argue for assigning PRV to a new genus within the family *Reoviridae*.

While use of concatenated sequences for phylogenetic analyses [10] for a segmented dsRNA virus may be of limited value because of issues of reassortment and how these may influence phylogenetic groupings, it was also attempted in this study as such a phylogenetic tree is more objective and comprehensively reflects the relationships among the different isolates in *Reoviridae*. Because the lengths of these concatemers were in the range of 18kbp to 23kbp, it was difficult to make sure they aligned well across the whole length. To improve the alignment quality, we first created an alignment for every homologous segment of the 13 isolates (Additional file 3: Table S3) separately, and then merged all the aligned nine segments together for each of the isolates. In this way, we were able to ensure that all alignments involved sequences of the homologous segments. The alignments were visually checked and a phylogenetic tree generated based on this concatemer alignment is shown in (Additional file 4: Figure S1a). The concatemer alignment was then examined for highly conserved regions, which would strongly support the assumption that the 13 isolates had a common ancestor and justify the current phylogenetic analysis. These highly conserved regions were found in segments homologous to

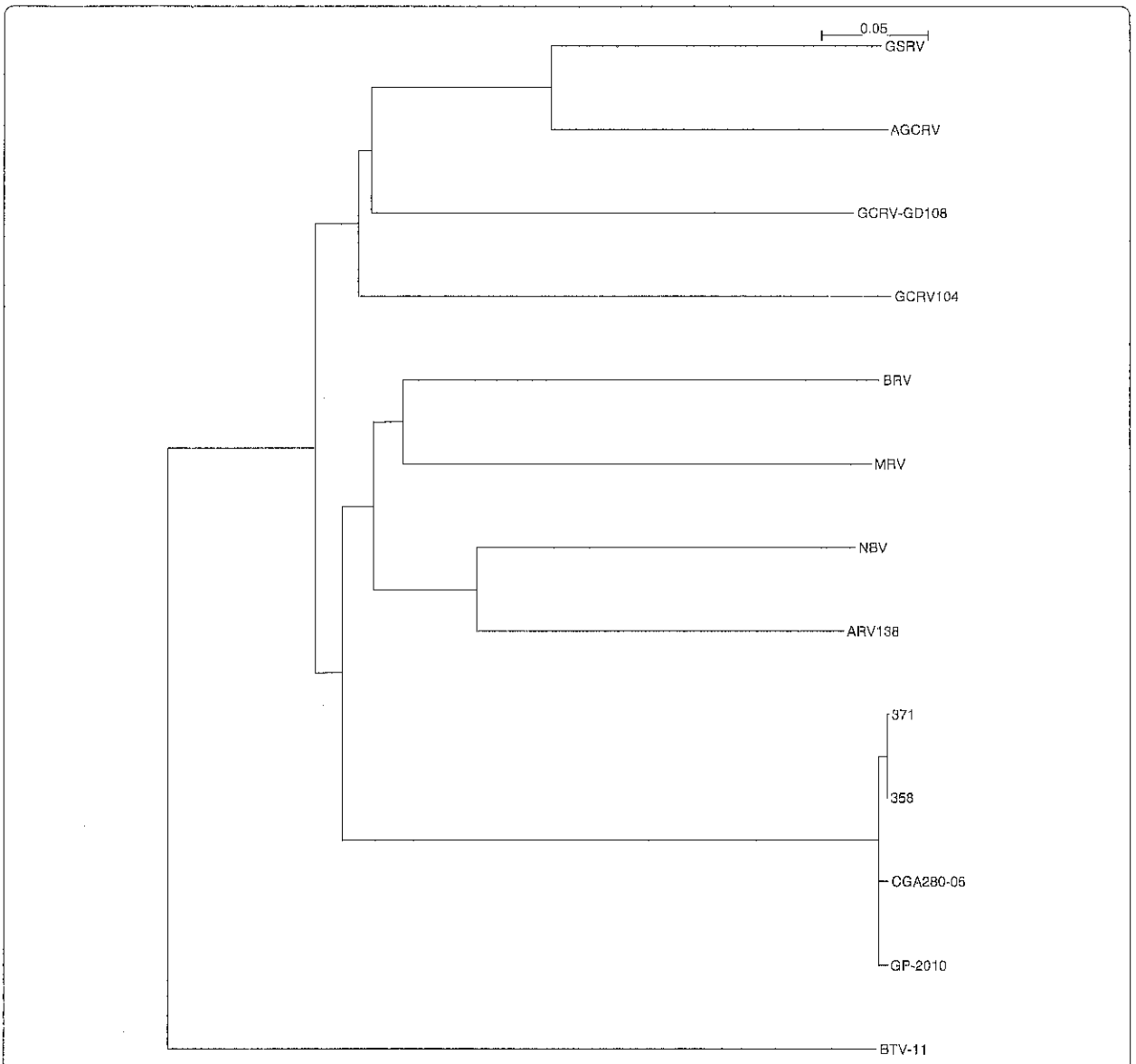


Figure 4 Phylogeny of homologous segment L3 shared by piscine reovirus (PRV) and selected members of family *Reoviridae*.

PRV segments L1, L2, and L3. The computer software JALVIEW [31] was then used to extract these regions, which were then used to generate another phylogenetic tree (Additional file 4: Figure S1b). A comparison of Figures S1a and S1b revealed that while slight differences exist, both trees individually and in combination support three major groups: *Aquareovirus* genus, *Orthoreovirus* genus, and PRV isolates, i.e., they also support the classification of PRV as a member of a new genus within the family *Reoviridae*.

The distances inside the tree in Additional file 4: Figure S1a provide more insight about this proposal. The average distance between the isolates (MRV, BRV, NBV, ARV138) in the genus *Orthoreovirus* is 0.526. The average distance between an isolate of genus *Orthoreovirus* and an isolate of genus *Aquareovirus* is 0.619. The average distance between a PRV isolate and an isolate of *genus* Orthoreovirus is 0.588, which is much closer to 0.619 than to 0.526, allowing us to unambiguously conclude that PRV represents a new genus within the family *Reoviridae*.

Phylogenetic analysis and sequence diversity of PRV genomic segment S1

To determine the genetic relationship between the PRV strains from western Canada, Chile, and Norway, we compared the segment S1 sequences using phylogenetic analyses and percent nucleotide similarities. The sequences of

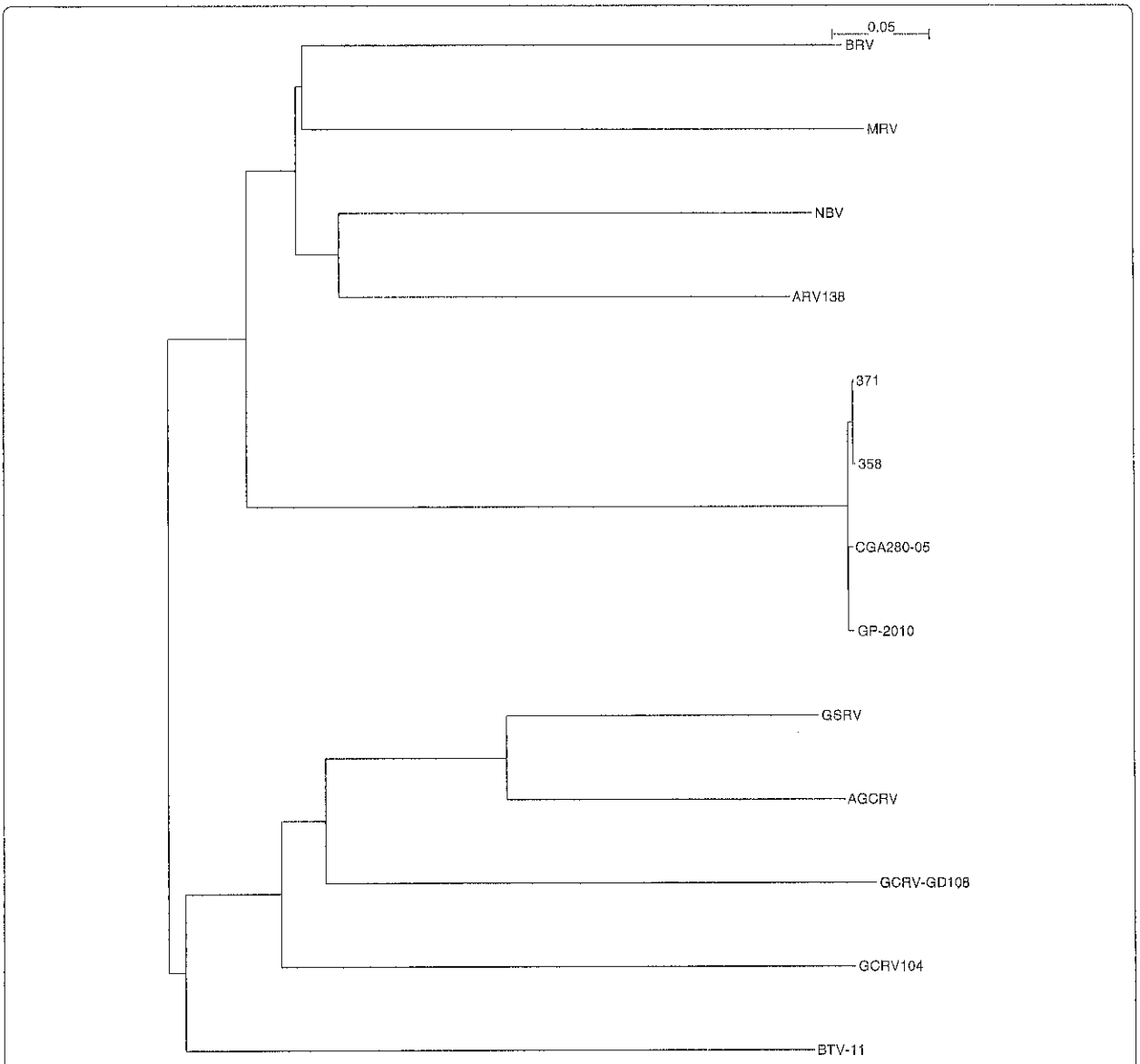


Figure 5 Phylogeny of homologous segment M1 shared by piscine reovirus (PRV) and selected members of family *Reoviridae*.

seven of the Norwegian isolates were deposited in the GenBank database as S4 sequences [28] but correspond to S1 sequences of the PRV type strain, Norwegian isolate Reovirus sp. Salmo/GP-2011/NOR [2], and the PRV isolates in the present study. Figure 11 shows the phylogenetic tree generated with these sequences. It shows 4 Norwegian isolates 5433, 3817, 1921, 9326, are very close to the Canadian strains and another 4 Norwegian isolates 7243, 7030, GP-2010, 8286 are very close to Chilean strains. This indicates one PRV genotype in Norway, Genotype I, with two major sub-genotypes, which we designate Ia and Ib, with Canadian PRV strains in sub-genotype Ia and Chilean PRV strains in sub-genotype Ib, both with strong bootstrap support. The Canadian PRV strains form two subgroups, (167, 196, 358, 209, bootstrapping support 90.5%, and 163, 371, bootstrapping support 61.2%). The two PRV sub-genotypes are separated by a relatively long branch (Figure 11), suggesting that they have been evolving independently in Norway. Interestingly, the phylogenetic trees of the individual genome segment nucleotide sequences of *Reoviridae* (Figures 2, 4, 5, 6, 7 and 8, and 10) except for segments homologous to PRV L2 and S2 (Figures 3 and 9, respectively) also seem to support the existence of the two sub-genotypes of PRV.

Piscine reovirus segment S1 is bicistronic (Table 3), encoding the Outer clamp protein and a 124-aa protein,

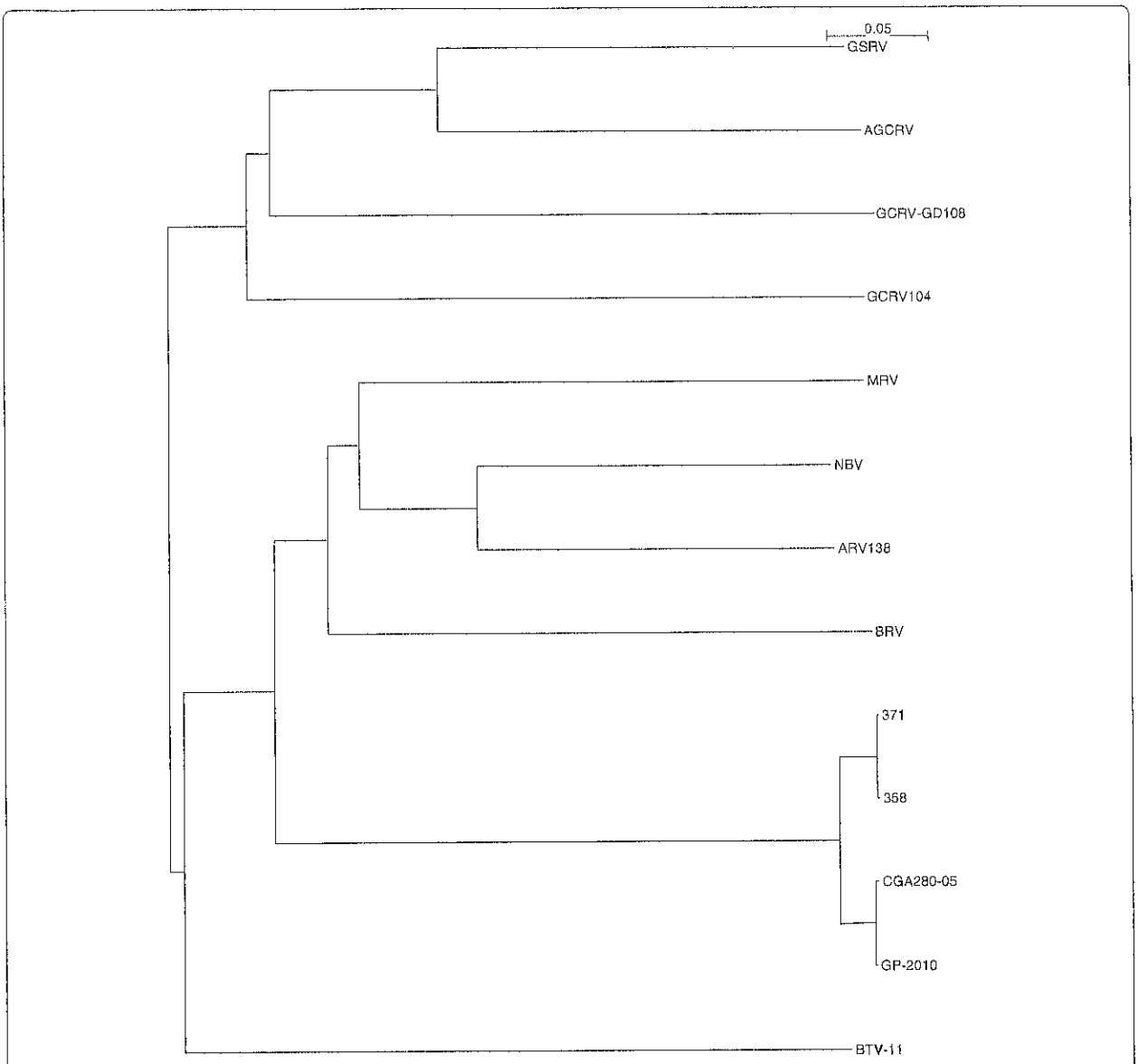


Figure 6 Phylogeny of homologous segment M2 shared by piscine reovirus (PRV) and selected members of family *Reoviridae*.

designated p13, that induces cytotoxicity [10]. Thus, S1 may be relevant for virulence of PRV. Our sequence analysis of p13 protein showed the Chilean PRV strains had 100% amino acid sequence identity with the Norwegian strain Reovirus sp. Salmo/GP-2010/NOR, whereas the Canadian strains had ≤92.7% amino acid sequence identity with this PRV strain (Additional file 2: Table S2). In the S1 sequence phylogenetic trees (Figures 11 and 12), the Canadian PRV strains are most similar to the Norwegian PRV strains found in Atlantic salmon with HSMI outbreaks from the Lofoten Archipelago of Norway [28]; in contrast, the Chilean PRV strains are most similar to the strains found in Atlantic salmon farms without HSMI outbreaks near Trondheim, Norway [28] (Dr. Torstein Tengs, personal communication). These findings suggest the existence of PRV provides the potential for a HSMI outbreak, but other factors (including environment, stress, PRV/host contact types, PRV infection titre) determine whether a HSMI outbreak actually occurs. This requires further investigation.

Table 4 shows the percent sequence identities on segment S1 between the new Canadian and Chilean PRV strains and the Norwegian PRV isolates reported in the GenBank database. This analysis confirms the phylogenetic analysis (Figures 11 and 12) showing that all Canadian

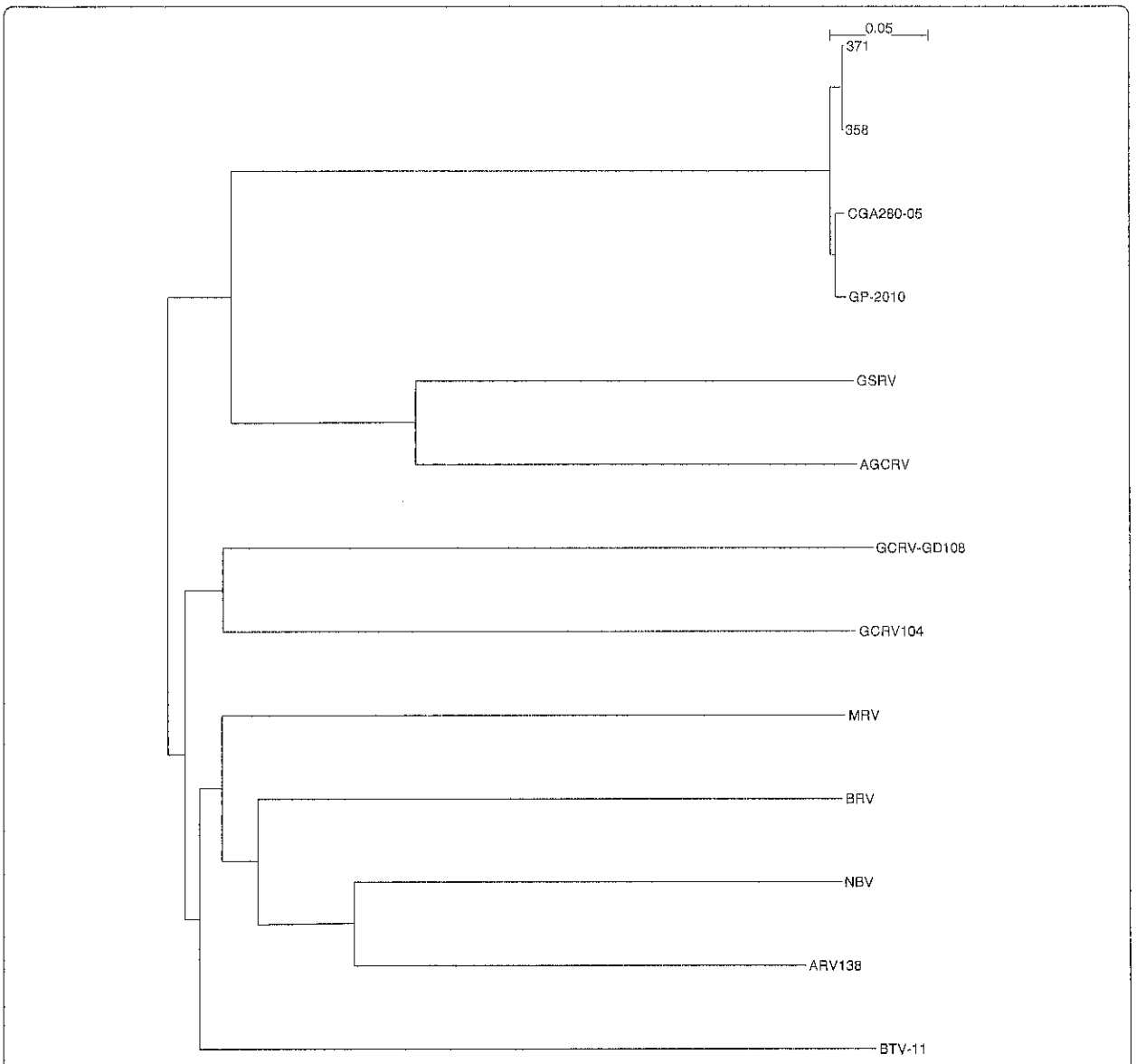


Figure 7 Phylogeny of homologous segment M3 shared by piscine reovirus (PRV) and selected members of family *Reoviridae*.

isolates belong to Norwegian sub-genotype Ia and Chilean isolates belong to Norwegian sub-genotype Ib. The Canadian and Norwegian PRV isolates of sub-genotype Ia showed nucleotide sequence identities ≥ 98.1% and amino acid sequence identities ≥ 98.2%. As noted in Table 4, the Chilean PRV S1 sequences 8857 and 337 have inserts relative to the other strains, which contributes to lower sequence identities with other strains. If these two Chilean isolates are excluded, then the Norwegian and Chilean PRV strains of sub-genotype Ib showed nucleotide sequence identities ≥ 98.1% and amino acid sequence identities ≥ 99.4%. The nucleotide and amino acid sequence identities between sub-genotypes Ia and I b strains were ≤ 96.9%. and ≤ 97.0%, respectively, (Table 4).

Divergence time estimation between Canadian and Chilean PRV and the Norwegian strains

Our analysis using BEAST simulation [32] shows the time when Canadian PRV isolates diverged from Norwegian PRV isolates was between 2006 and 2011; the time when Chilean PRV isolates diverged from Norwegian PRV isolates was between 2003 and 2010. These estimations were based on isolates, collection times (Additional file 1: Tables S1a and S1b) and all the information inside the phylogenetic tree (Figure 11). We also used the program BACKTRACK [33], which reads a phylogenetic tree with evolutionary distances and years of isolation for all the sequences and then generates a time interval for each inner node, to estimate the divergence

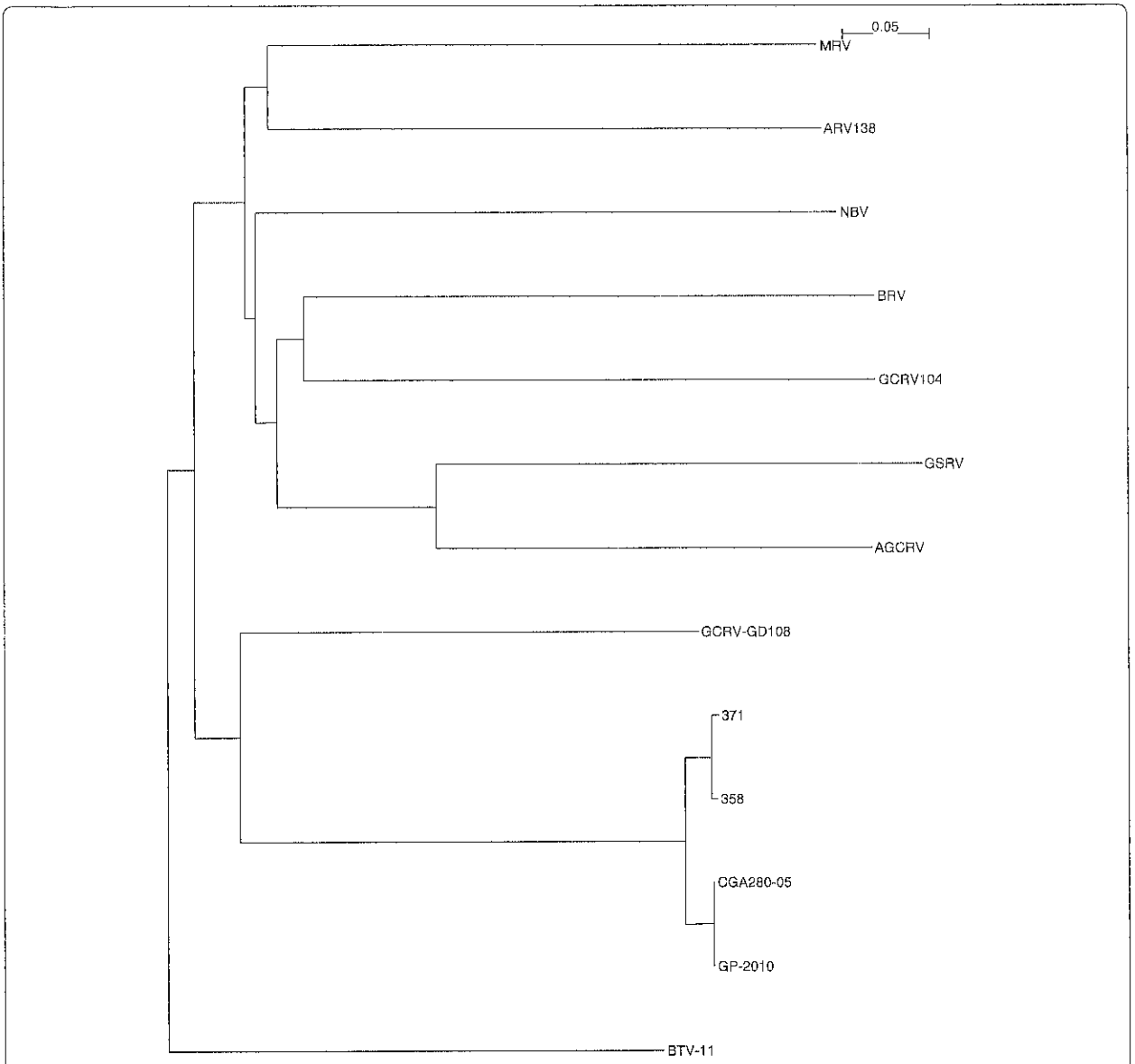


Figure 8 Phylogeny of homologous segment S1 shared by piscine reovirus (PRV) and selected members of family *Reoviridae*.

times. With BACKTRACK, the Canadian isolates diverged from Norwegian isolates between 2007 and 2011; the Chilean isolates diverged from Norwegian isolates between 2004 and 2011. Both algorithms produced a wide range in the estimations. We tried to make the estimations more specific by using the knowledge we have about these sequences. For example, we believe the multiple insertion events of CGA8857 and CGA337 could be caused by some kind of environmental changes and the mutation rates during that period could be significantly higher than normal. Thus, we believe the most likely time when Canadian isolates diverged from Norwegian isolates was between 2006 and 2008, i.e., around 2007 ± 1; the most likely time when Chilean isolates diverged from Norwegian isolates was between 2007 and 2009, around 2008 ± 1. This evolutionary direction was confirmed with several outgroup sequences. The timeline for Canadian PRV is supported by observations that: 1) Heart lesions and HSMI type lesions were reported in British Columbia farmed Atlantic salmon beginning in 2008, in fish that had entered seawater in 2007. The pattern of inflammation in the heart was consistent with systemic immune stimulation; differentials include a bacterial or viral infection [34], and 2) a survey of juvenile Pink salmon "*Oncorhynchus gorbuscha*" in the Broughton Archipelago region of western Canada in April and May 2008 (200 samples in 44 pools) found no PRV when tested with a RT-qPCR assay targeting PRV L1 gene in 2010 [35]. It is not known how

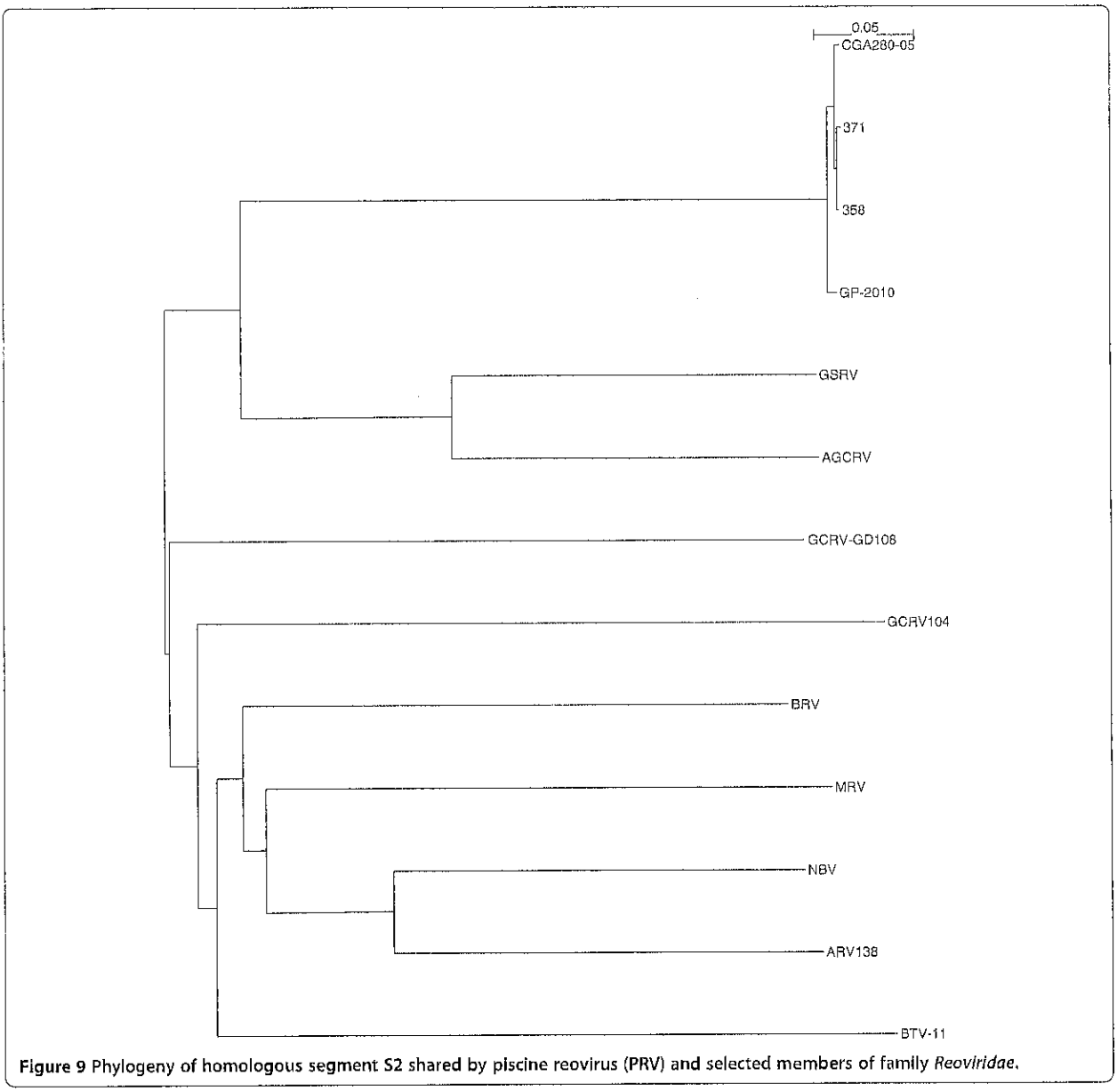


Figure 9 Phylogeny of homologous segment S2 shared by piscine reovirus (PRV) and selected members of family *Reoviridae*.

the virus could have been transmitted from Norway to Canada since there have never been any authorized direct imports of Atlantic salmon eggs from Norway since 1985; recent imports have been from Washington State-USA (2001) and Iceland (2004–2009) [36]. There is no information about the PRV situation in Washington State or Iceland. Horizontal spread and/or introduction of virus through wild fish migration are not reasonable routes of transmission. The distribution of PRV in Canada is uncertain since there is no national surveillance for it. In Chile, the presence of PRV in farmed Atlantic salmon reared in Chilean seawater was first detected in 2010 and published in a laboratory report in 2011 [26], which cited a high prevalence among the sites located in different areas of the Los Lagos region growing-up macro-zone. PRV could have been introduced to Chile through importation of Atlantic salmon eggs similarly to ISAV [37-39] albeit more recently than ISAV: most Atlantic salmon egg imports to Chile in 2008 were from Norway, and from 2009–2013 have been from Iceland [40]. In Chile, HSMI will be recommended to be included on the List 3 of high-risk diseases [25], thus ensuring active surveillance for it in Chilean aquaculture. To better understand the molecular epidemiology of PRV, it will be necessary to know the situation of PRV in other salmon producing countries and in countries with wild salmonids. Not all countries have surveillance for HSMI; therefore, it may be advisable to consider

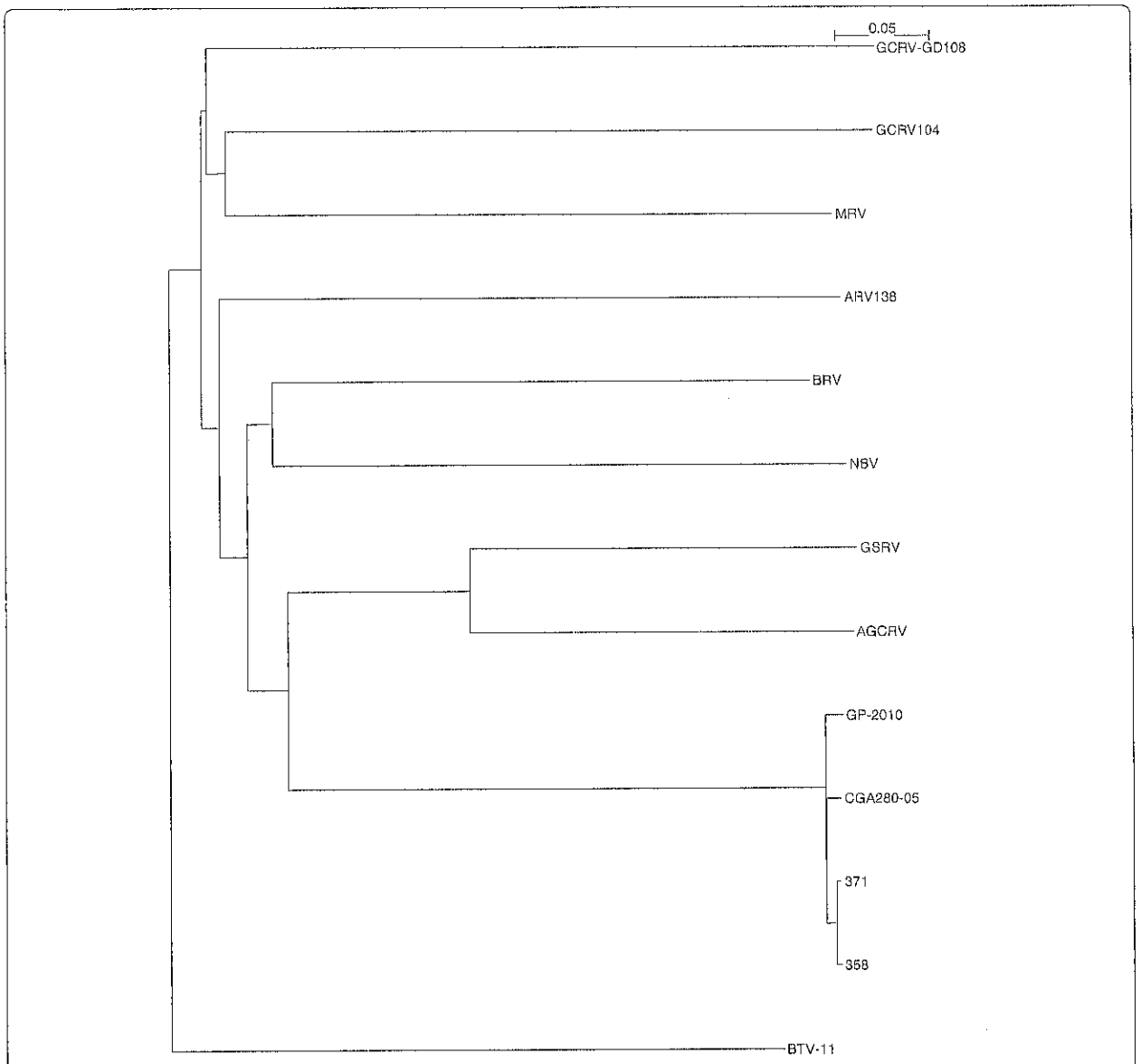


Figure 10 Phylogeny of homologous segment S3 shared by piscine reovirus (PRV) and selected members of family *Reoviridae*.

PRV-HSMI as an emerging disease and initiate its surveillance.

Conclusions

The present work constitutes the first report of genomic analysis of PRV strains detected in tissue samples obtained from fish in western Canada, and in Chile, extending the geographical range of the characterized virus to Pacific shorelines of both North and South America. Our work suggests PRV entered both Chile and western Canada recently. We provide strong support for classification of PRV as a member of a new genus within the family *Reoviridae*. Our work groups PRV into one genotype, Genotype I, with two major sub-genotypes designated Ia and Ib, with Canadian PRV strains in sub-genotype Ia and Chilean PRV strains in sub-genotype Ib. Taken together, these findings raise awareness on PRV existence outside of Norway so that the aquaculture industry and wild fisheries managers worldwide can become proactive and curtail its international spread, as well as implement mitigation measures regionally and locally.

Methods

Fish samples and processing

All samples used in this study were submitted to the laboratory for testing for PRV and other aquatic animal viruses. Samples were either taken from fresh fish and

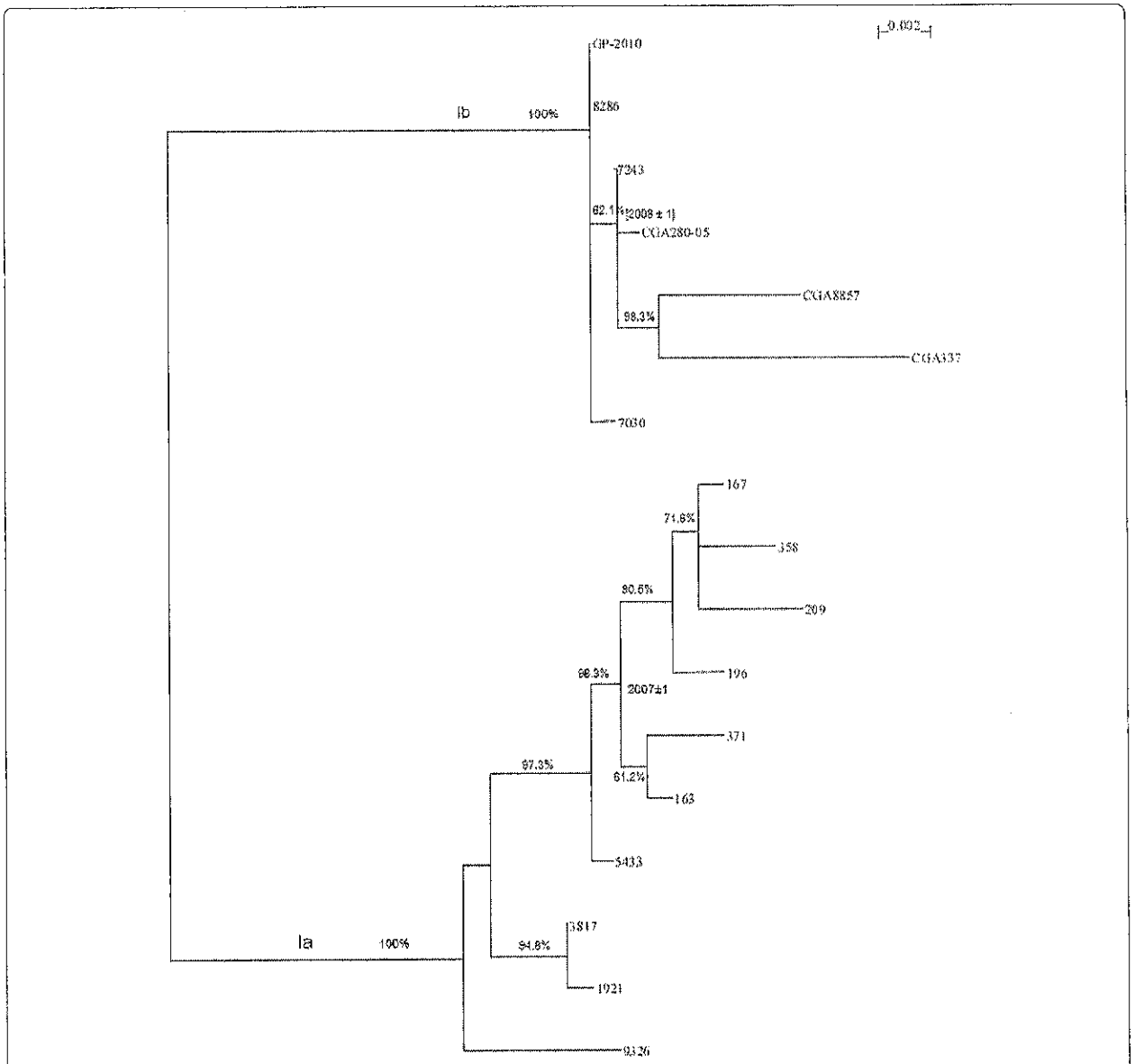


Figure 11 Phylogenetic trees showing the relationships between the different piscine reovirus (PRV) isolates; RNA segment S1 showing the relationships between all PRV isolates.

put into microcentrifuge tubes containing RNAlater® (Ambion Inc., Foster City CA) preservative or were immediately placed in sterile whirlpak bags and shipped overnight by courier cold on ice to the testing laboratory; samples, which consisted of individual gill, heart, kidney or pooled gill and heart or kidney, heart and liver tissues, were either bagged individually or pooled (2–3 tissues per pool) for each fish. The fish tissue sample source is detailed in Additional file 1: Table S1. The samples from western Canada were either harvest samples of marine-farmed Atlantic salmon or wild fish samples from fish caught live under sport, scientific or First Nation licenses in regions where Atlantic salmon aquaculture sites were present (Additional file 1: Table S1a).

Each tissue (or pool of tissues) was weighed and macerated to a 10% suspension w/v in phosphate buffered saline (PBS) with 10x antibiotics. The specimen supernatant was used for RNA extraction. The samples from Chile were from marine-farmed Atlantic salmon after seawater transfer (Additional file 1: Table S1b) and were collected in RNAlater® preservative. Samples preserved in RNAlater® (Ambion Inc) were first washed three times with PBS and then homogenized as described above prior to total RNA extraction.

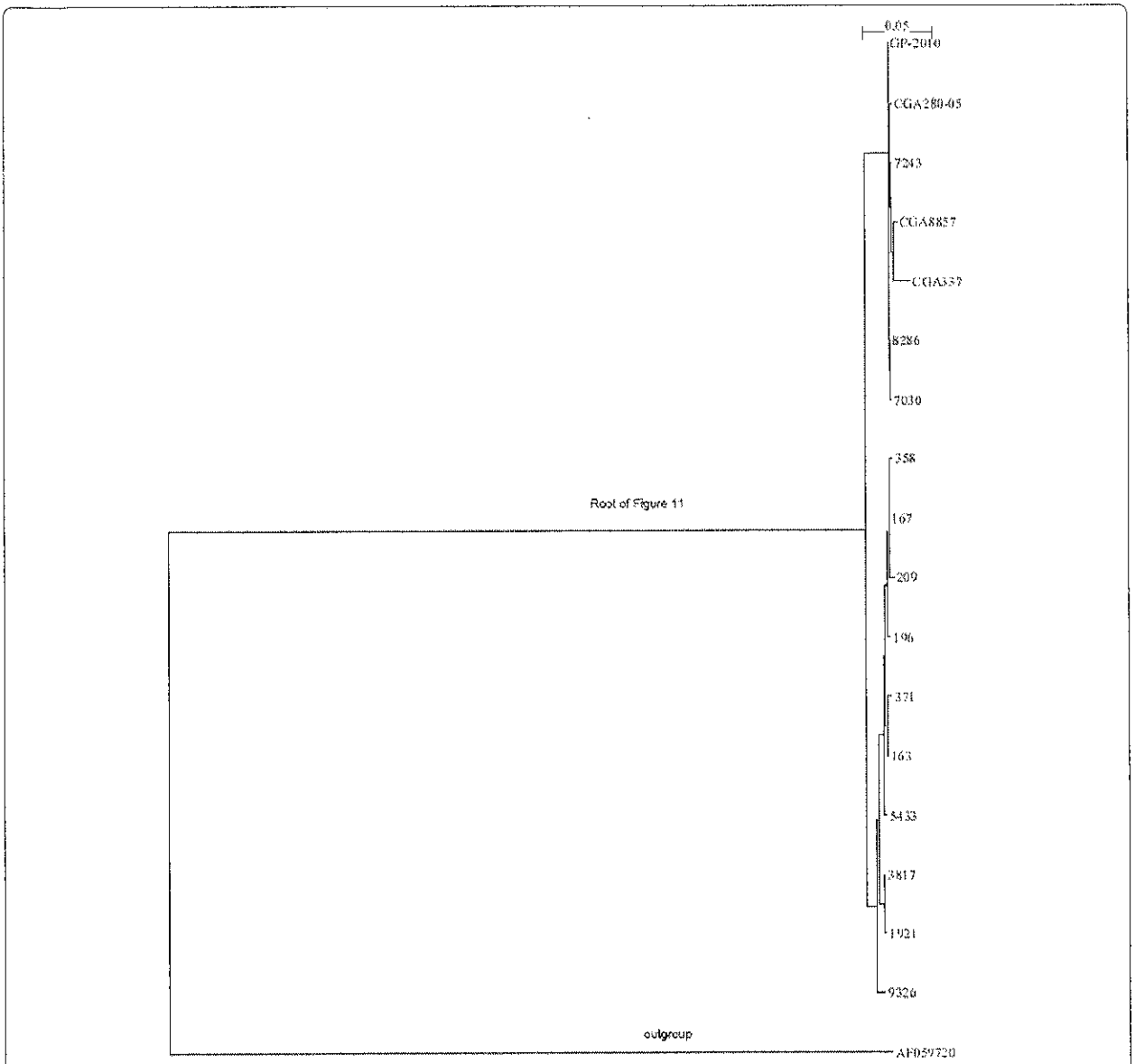


Figure 12 Phylogenetic trees showing the relationships between the different piscine reovirus (PRV) isolates; RNA segment S1 showing the relationships between all PRV isolates with outgroup sequence S3 of Avian reovirus strain 176 (AF059720).

RT-PCR and nucleic acid sequencing

Total RNA was isolated using a modified total RNA extraction protocol with the RNeasy® mini Kit (QIAGEN). Briefly, total RNA was isolated from samples using 1.25 ml of TRIZOL Reagent (Invitrogen) and 375 μl of sample volume as previously described [41]. The Viral RNA mini Kit (QIAGEN) was also utilized on selected samples following the manufacturer's recommended protocol. In all cases, the extracted RNA was eluted in 20–50 μl of nuclease-free water, and RNA yields were quantified and purity analysed using the OD260/280 ratio and a NanoDrop ND-1000 spectrophotometer (Thermo Scientific). The eluted RNA was tested immediately following quantitation, or was stored frozen at −80°C until use.

RT-qPCR was run on the LightCycler 480 (Roche Applied Science), version 4.0. The crossing point (Cp) or threshold cycle (Ct) was determined by use of the maximum-second-derivative function on the LightCycler software release 1.5.0. The OneStep RT-PCR kit (QIAGEN) was employed for all RT-qPCR reactions according to the manufacturer's specifications.

Sample RNA quality was based on RT-qPCR for elongation factor 1 alpha (ELF-1α) as internal control targeting either Atlantic salmon ELF-1α (GenBank accession number BT072490) or Chinook salmon ELF-1α (GenBank

Table 4 Pairwise sequence comparison of Segment S1 of Canadian, Norwegian and Chilean PRV strains showing two sub-genoypes[1]

PRV isolate	163	167	196	209	358	371	5433*	3817*	1921*	9326*	GP-2010	8286*	7030*	7243*	280-5	8857	337
163	-	**99.4**	**99.4**	**99.2**	**99.3**	**99.6**	**99.6**	**99.0**	**98.9**	**98.6**	96.8	96.6	96.5	96.5	96.6	94.9	94.8
167	**99.4**	-	**99.6**	**99.5**	**99.6**	**99.3**	**99.4**	**98.8**	**98.7**	**98.4**	96.6	96.4	96.3	96.3	96.4	94.7	94.6
196	**99.4**	**99.4**	-	**99.4**	**99.4**	**99.3**	**99.4**	**98.8**	**98.7**	**98.4**	96.6	96.4	96.3	96.3	96.4	94.7	94.6
209	**98.8**	**98.8**	**98.8**	-	**99.4**	**99.0**	**99.1**	**98.5**	**98.4**	**98.1**	96.3	96.1	96.0	96.0	96.1	94.4	94.3
358	**99.4**	**99.4**	**99.4**	**98.8**	-	**99.1**	**99.2**	**98.6**	**98.5**	**98.2**	96.4	96.2	96.1	96.1	96.2	94.4	94.8
371	**98.8**	**98.8**	**98.8**	**98.2**	**98.8**	-	**99.4**	**98.8**	**98.7**	**98.4**	96.6	96.4	96.3	96.3	96.4	94.7	94.6
5433*	**99.7**	**99.7**	**99.7**	**99.1**	**99.7**	**99.1**	-	**99.2**	**99.1**	**98.8**	96.9	96.9	96.8	96.8	96.7	95.2	95.1
3817*	**99.7**	**99.7**	**99.7**	**99.1**	**99.7**	**99.1**	**100.0**	-	**99.9**	**99.0**	96.9	96.9	96.9	96.9	96.8	95.3	95.2
1921*	**99.4**	**99.4**	**99.4**	**98.8**	**99.4**	**98.8**	**99.7**	**99.7**	-	**98.9**	96.9	96.9	96.8	96.8	96.7	95.2	95.1
9326*	**99.7**	**99.7**	**99.7**	**99.1**	**99.7**	**99.1**	**100.0**	**100.0**	**99.7**	-	96.8	96.8	96.7	96.7	96.6	95.1	95.0
GP-2010	96.7	96.7	96.7	96.1	96.7	96.1	97.0	97.0	96.7	97.0	-	100.0	99.9	99.9	99.8	98.2	98.3
8286*	96.7	96.7	96.7	96.1	96.7	96.1	97.0	97.0	96.7	97.0	100.0	-	99.9	99.9	99.8	98.2	98.3
7030*	96.4	96.4	96.4	95.8	96.4	95.8	96.7	96.7	96.4	96.7	99.7	99.7	-	99.8	99.7	98.1	98.2
7243*	96.7	96.7	96.7	96.1	96.7	96.1	97.0	97.0	96.7	97.0	100.0	100.0	99.7	-	99.9	98.3	98.4
280-5	96.4	96.4	96.4	95.8	96.4	95.8	96.7	96.7	96.4	96.7	99.7	99.7	99.4	99.7	-	98.2	98.3
8857	82.5	82.2	82.2	93.9	82.5	82.2	82.5	82.5	82.2	82.5	86.2	86.2	85.9	86.2	86.2	-	97.4
337	93.0	93.0	93.0	92.3	93.0	92.6	93.3	93.3	93.0	93.3	96.7	96.7	96.3	96.7	96.7	86.6	-

[1]Values above the diagonal are nucleotide sequence identities (%); values below the diagonal are deduced amino acid sequence identities of Outer clamp (σ3) protein (%). Bold text denotes sequence identities among sub-genotype Ia PRV strains.
*Denotes Norwegian PRV "isolates" from Atlantic salmon farms at different points in the life cycle from pre-smolts to fish ready for slaughter [29], available in GenBank Accession Numbers JN991006 (isolate 5433), JN991012 (isolate 3817), JN991007 (isolate 1921), JN991008 (isolate 9326), JN991011 (isolate 8286), JN991010 (isolate 7030), and JN991009 (isolate 7243). PRV isolate Salmo/GP-2010/NOR is the Norwegian PRV sequenced on all 10 genomic segments; its segment S1 sequence is GenBank Accession Number GU994022.
The Chilean PRV sequences 8857 and 337 have inserts relative to the other strains, contributing to the lower sequence identities with other strains.

accession number FJ890356) carried out using Roche LightCycler® 480 RNA master Hydrolysis Probe kit (Roche Diagnostics). The following primers and probes were used.

For Atlantic salmon EF1α:

ASELF1α Forward – 5'- CGT GAC ATG AGG CAG ACA GT-3';
ASELF1α Reverse – 5'- CGG CCT TAA CAG CAG ACT TTG-3';
ASELF1α Probe – 5'-TGC TGT CGG TGT CAT CAA GGC T-3'; and

For Chinook salmon ELF1α:

CSELF1α Forward – 5'- GGT CAC CAC CTA CAT CAA GAA GA-3';
CSELF1α Reverse – 5'- CCA ACC AGA GAT GGG CAC AAA G-3';
CSELF1α Probe – 5'-TGG CTA CAA CCC TGC CAC TGT C-3'.

The probes were labelled at the 5' end with 6-FAM and at the 3' end with BHQ-1 quencher (Biosearch Technologies Inc.). The final concentrations of primers and probe in each case were 900 nM for each primer and 250 nM for the probe in a final volume of 25 μl. The following thermal cycling parameters were used: 1 cycle of RT for 3 min at 63°C followed by denaturation at 95°C for 3 s, and 45 cycles of denaturation at 95°C for 15 s, annealing and detection at 60°C for 1 min and extension at 72°C for 1 s. Ct values above 40 and no Ct values were defined as negative and these samples would be considered unfit for further testing if after re-extraction and repeated RT-qPCR yielded the same results.

The RT-qPCR assay for PRV used the primer-probe set sequences developed by Haugland *et al.* [42] targeting the PRV L1 gene. The primers were PRV-F– 5'-CCC CAT CCC TCA CAT ATG GAT A-3'and PRV-R– 5'-GGT GAA ATC ATC GCC AAC TCA-3'. The PRV probe, which was labelled at the 5' end with 6-FAM and at the 3' end with BHQ-1 quencher (Biosearch Technologies Inc.) was 5'-ATG TCC AGG TAT TTA CC-3'. The reaction conditions were the same as used by Palacios *et al.* [2], but with 8 μl of template RNA. The following concentrations were used: 400 nM primer, 300 nM probe and 1.25 mM $MgCl_2$. The following thermal cycling

parameters were used: 1 cycle of RT for 30 min at 50°C followed by denaturation at 94°C for 15 min, and 45 cycles of denaturation at 94°C for 15 s, annealing at 54°C for 30 s and amplification and detection at 72°C for 15 s. Samples to be considered positive had Ct values up to 40 and with an exponential curve; Ct values between 40.1 and 45 were considered suspicious, and a sample was negative if there was no Ct value.

Because the laboratory did not have a PRV isolate from cell culture to use as positive control, samples with positive Ct values were further tested in classic RT-PCR targeting the 3′ portion of genome segment L1 with the following PCR primer pairs: PRV-L1 For1 – 5′-CAC TCA CCA ATG ACC CAA ATG C-3′; PRV-L1 Rev1 – 5′-TTG ACA GTC TGG CTA CTT CGG-3′ and/or PRV-L1 For2 – 5′-CTG AAC TGC TAG TTG AGG ATG G-3′; PRV-L1 Rev2 – 5′-GCC AAT CCA AAC AGA TTA GG-3′. These PCR primers and those used to amplify the 10 genomic segments of PRV, listed in (Additional file 5: Table S4) were designed based on the published PRV sequences [2]. RT-PCR for the amplification of each viral genome segment was carried out by using the OneStep RT-PCR kit (QIAGEN). Briefly, the reaction mixture contained 1 μl of total RNA, 4 μl of 5X QIAGEN OneStep RT-PCR buffer, 0.8 μl of dNTPs, 0.5 μM (final concentration) of each primer pair, and 0.8 μl of QIAGEN OneStep RT-PCR enzyme mix in a final volume of 20 μl. Thermal cycling conditions were as follows: an initial cycle of 50°C for 40 min and 95°C for 10 min; 40 cycles of 95°C for 30 s, 54°C for 30 sec, 72°C for 70 s; and a final extension cycle of 72°C for 10 min. Amplified products were analyzed by electrophoresis on 1% agarose gel and purified using High Pure PCR Product Purification Kit (Roche). The PCR products were then either directly sequenced or they were cloned into the pCRII vector using a TOPO TA cloning kit (Invitrogen) in preparation for nucleotide sequencing. Plasmid DNA for sequencing was prepared as described before [43]. DNA sequencing was performed as previously described [44] by ACGT Corporation (Toronto, Ontario, Canada). DNA Sequencing was done either directly on RT-PCR products or on plasmid DNA containing the cloned RT-PCR products obtained from reactions using total RNA from tissue samples.

Sequencing analysis

Similarity analysis was performed using BLAST programs available via the National Center for Biotechnology Information [45] and the FASTA program package for personal computers [46]. Analysis to identify putative ORFs and their predicted amino acid sequences and other protein characteristics was conducted using the Sequence Manipulation suite, version 2 [47].

Phylogenetic analyses

The Canadian and Chilean PRV sequences used in the phylogenetic analyses are described in (Additional file 2: Table S2). All the Norwegian PRV sequences were obtained from GenBank [29]. Sequences were processed using ClustalX 2.1 [48]. The multiple sequence alignment was manually verified and adjusted to reach high quality alignment. The phylogenetic trees were generated when positions with gaps were excluded and corrections for multiple substitutions were used. Bootstrapping was performed for 1,000 times. In most cases, only the bootstrapping supports higher than 70% were noted. For some important branches, those bootstrapping values a little lower than 70% were also noted. To verify the evolution direction, outgroup sequences were used to determine the root of the phylogenetic trees.

Divergence time estimation in a rooted phylogenetic tree

BEAST v1.7.5 [32] was used to estimate divergence time. To find the most suitable substitution model, we ran jModelTest 0.1.1 [49] against the aligned sequences. The result shows K80 model [50] is the most suitable model. Based on this result, a similar model, HKY85 model [51], was chosen in the BEAST simulation. We believe the mutation rates among lineages could be different, and the uncorrelated relaxed molecular clock was chosen. Five million simulation steps were performed and enough effective sample sizes (ESSs) were generated. We also used program BACKTRACK [33], which reads a phylogenetic tree with evolutionary distances and years of isolation for all the sequences and then generates a time interval for each inner node, to estimate the divergence times.

Additional files

Additional file 1: Title: Additional results on the piscine reovirus (PRV) positive samples from Canada and Chile. Description: Two tables showing RT-qPCR and conventional RT-PCR results of fish tissue samples from Canada and Chile tested for PRV.

Additional file 2: List of new piscine reovirus (PRV) nucleotide sequences and their percent identity to Norwegian isolate Salmo/GP-2010/NOR.

Additional file 3: GenBank Accession numbers of genome segments of selected members of family *Reoviridae* used in phylogenetic comparison of nucleotide sequences of individual genome segments [52].

Additional file 4: Title: Phylogenetic trees showing the relationships between isolates in family *Reoviridae* at the genome-level. Description: (Figure S1a) Concatenated sequences of nine homologous segments (segment L1, L2, L3, M1, M2, M3, S1, S2, S3) shared by piscine reovirus (PRV) and selected members of family *Reoviridae*, were used to generate a phylogenetic tree. (Figure S1b) Phylogeny of highly-conserved regions of concatemers in Figure S1a.

Additional file 5: Title: List of oligonucleotide primers used in amplification of piscine reovirus (PRV) genome segments. Description: Table listing oligonucleotide primers.

Competing interests
The authors declare that they have no competing interests in this scientific work.

Authors' contributions
MJTK isolated total RNA from tissue samples, performed the RT-qPCR for ELF-1α and PRV and developed and performed the classic RT-PCR for 3' portion of segment L1 of PRV, and helped to write the manuscript. TI designed the PRV PCR primers used to amplify transcripts of all the 10 genome segments, performed the classic RT-PCR and cloned all PCR products for sequencing and helped to write the manuscript. YW performed all the phylogenetic analyses and helped to write the manuscript. AM provided the Canadian samples for diagnostic testing and edited the manuscript. MGG coordinated the laboratory testing in Chile and edited the manuscript. FSBK coordinated all viral testing and DNA sequence analysis and helped to write the manuscript. All authors read and approved the final manuscript.

Acknowledgements
This work was supported by the Virology Research Laboratory at the Atlantic Veterinary College, University of Prince Edward Island, Charlottetown, PE, Canada. Van City supported the work by Alexandra Morton. We thank Dr. Richard Routledge for submitting the Cutthroat trout samples for diagnostic testing.

Author details
[1]Department of Pathology and Microbiology, Atlantic Veterinary College, University of Prince Edward Island, 550 University Ave., Charlottetown, PEI C1A 4P3, Canada. [2]Department of Computer Science and Information Technology, University of Prince Edward Island, 550 University Ave., Charlottetown, PEI C1A 4P3, Canada. [3]Raincoast Research Society, Box 399, 390 1st Street, Sointula, BC V0N 3E0, Canada. [4]Centro de Investigaciones Biológicas Aplicadas (CIBA), Diego de Almagro Norte 1013, No. 10, Puerto Montt, Chile. [5]Universidad San Sebastián. Facultad de Ciencias, Lago Panguipulli 1390, Puerto Montt, Chile. [6]ETECMA, Diego de Almagro Norte 1013 No. 10, Sector Cardonal, Puerto Montt, X Región, Chile.

Received: 9 April 2013 Accepted: 5 July 2013
Published: 11 July 2013

References
1. Attoui H, Mertens PPC, Becnel J, Belaganahalli S, Bergoin M, Brussaard CP, Chappell JD, Clarke M, del Vas M, *et al*: **Family Reoviridae.** In *Virus Taxonomy: Ninth Report of the International Committee on Taxonomy of Viruses*. Edited by King AMQ, Adams MJ, Carstens EB, Lefkowitz EJ. San Diego, CA: Academic Press; 2011:541–637.
2. Palacios G, Lovoll M, Tengs T, Hornig M, Hutchison S, *et al*: **Heart and skeletal muscle inflammation of farmed salmon is associated with infection with a novel reovirus.** *PLoS One* 2010, **5**:e11487.
3. Duncan R: **Extensive sequence divergence and phylogenetic relationships between the fusogenic and nonfusogenic orthoreoviruses: a species proposal.** *Virology* 1999, **260**:316.
4. Shmulevitz M, Duncan R: **A new class of fusion-associated small transmembrane (FAST) proteins encoded by the non-enveloped fusogenic reoviruses.** *EMBO J* 2000, **19**:902–912.
5. Sabin A: **Reoviruses: a new group of respiratory and enteric viruses formerly classified as ECHO type 10 is described.** *Science* 1959, **130**:1387–1389.
6. Chua K, Crameri G, Hyatt A, Yu M, Tompang M, *et al*: **A previously unknown reovirus of bat origin is associated with an acute respiratory disease in humans.** *Proc Nat Acad Sci USA* 2007, **104**:11424–11429.
7. Leland MM, Hubbard GB, Sentmore HT, Soike KF, Hilliard JK: **Outbreak of orthoreovirus-induced meningoencephalomyelitis in baboons.** *Comp Med* 2000, **50**:199–205.
8. van den Brand JM, Manvell R, Paul G, Kik MJ, Dorrestein GM: **Reovirus infections associated with high mortality in psittaciformes in The Netherlands.** *Avian Pathol* 2007, **36**:293–299.
9. Lamirande EW, Nichols DK, Owens JW, Gaskin JM, Jacobson ER: **Isolation and experimental transmission of a reovirus pathogenic in ratsnakes (*Elaphe* species).** *Virus Res* 1999, **63**:135–141.
10. Key T, Read J, Nibert ML, Duncan R: **Piscine reovirus encodes a cytotoxic, non-fusogenic, integral membrane protein and previously unrecognized virion outer-capsid proteins.** *J Gen Virol* 2013, **94**:1039–1050.
11. Kibenge FSB, Godoy MG, Fast M, Workenhe S, Kibenge MJT: **Countermeasures against viral diseases of farmed fish.** *Antiviral Res* 2012, **95**:257–281.
12. Kongtorp RT, Kjerstad A, Taksdal T, Guttvik A, Falk K: **Heart and skeletal muscle inflammation in Atlantic salmon Salmo salar L: a new infectious disease.** *J Fish Dis* 2004, **27**:351–358.
13. Ferguson HW, Kongtorp RT, Taksdal T, Graham D, Falk K: **An outbreak of disease resembling heart and skeletal muscle inflammation (HSMI) in Scottish farmed salmon (*Salmo salar* L) with observations on myocardial regeneration.** *J Fish Dis* 2005, **28**:119–123.
14. Wiik-Nielsen CR, Løvoll M, Sandlund N, Faller R, Wiik-Nielsen J, Jensen BB: **First detection of piscine reovirus (PRV) in marine fish species.** *Dis Aquat Org* 2012, **97**:255–258.
15. Garseth ÅH, Fritsvold C, Opheim M, Skjerve E, Biering E: **Piscine reovirus (PRV) in wild Atlantic salmon, *Salmo salar* L., and sea-trout, *Salmo trutta* L., in Norway.** *J Fish Dis* 2012. doi:10.1111/j.1365-2761.2012.01450.x.
16. National Veterinary Institute: In *Farmed Fish Health Report 2007*. Edited by Skjelstad H, Bornø G, Flesjå K, Hansen H, Nilsen H, Wasmuth MA, Hjeltnes B. Oslo: National Veterinary Institute; 2007:19.
17. Bornø G, Sviland C: **The health situation in farmed salmonids 2010.** In *Farmed Fish Health Report 2010*. Edited by Bornø G, Sviland C, Hellberg H. Oslo: National Veterinary Institute; 2010:36.
18. Løvoll M, Alarcón M, Jensen BB, Taksdal T, Kristoffersen AB, Tengs T: **Quantification of piscine reovirus (PRV) at different stages of Atlantic salmon *Salmo salar* production.** *Dis Aquat Org* 2012, **99**:7–12.
19. Mikalsen AB, Haugland O, Rode M, Solbakk IT, Evensen O: **Atlantic salmon reovirus infection causes a CD8 T Cell myocarditis in Atlantic salmon (Salmo salar L.).** *PLoS One* 2012, **7**:e37269.
20. Chi SC, Hu WW, Lo BJ: **Establishment and characterization of a continuous cell line (GF-1) derived from grouper, Epinephelus coioides (Hamilton): a cell line susceptible to grouper nervous necrosis virus (GNNV).** *J Fish Dis* 1999, **22**:173–182.
21. Kemp M, Donovan J, Higham H, Hooper J: **Biochemical markers of myocardial injury.** *Br J Anaesth* 2004, **93**:63–73.
22. Yousaf MN, Powell MD: **The effects of heart and skeletal muscle inflammation and cardiomyopathy syndrome on creatine kinase and lactate dehydrogenase levels in Atlantic salmon (*Salmo salar* L.).** *Sci World J* 2012, **741302**:9.
23. Løvoll M, Wiik-Nielsen J, Grove S, Wiik-Nielsen CR, Kristoffersen AB, Faller F, *et al*: **A novel totivirus and piscine reovirus (PRV) in Atlantic salmon (*Salmo salar*) with cardiomyopathy syndrome (CMS).** *Virol J* 2010, **7**:309.
24. Wiik-Nielsen J, Løvoll M, Fritsvold C, Kristoffersen AB, Haugland Ø, Hordvik I, Aamelfot M, Jirillo E, Koppang EO, Grove S: **Characterization of myocardial lesions associated with cardiomyopathy syndrome in Atlantic salmon, *Salmo salar* L., using laser capture microdissection.** *J Fish Dis* 2012, **35**:907–916.
25. *Anonymous 2012: Salmon mortality levels rise in H1*. http://fis.com/fis/worldnews/worldnews.asp?l=e&country=0&special=aquaculture&monthyear=&day=&id=54692&ndb=1&df=0 (Published August 17, 2012; Consulted August 20, 2012).
26. Bustos P, Rozas M, Bohle H, Iidefonso R, Sandoval A, Gaete A, Araya C, Grothusen H, Tapia E, Gallardo A, Rojas M, Lara M, Labra A, Gálvez C: **Primer reporte de piscine reovirus en Salmon del Atlántico, Salmo salar, cultivado en Chile.** *ADL Diagnostic Chile Ltda* 2011, **7**:1–4.
27. Feinberg J: *Science divided on fish virus found in Cultus Lake trout*. http://www.theprogress.com/news/163480656.html.
28. Løvoll M, Alarcón M, Jensen BB, Taksdal T, Kristoffersen AB, Tengs T: **Quantification of piscine reovirus (PRV) at different stages of Atlantic salmon *Salmo salar* production.** *Dis Aquat Org* 2012, **99**:7–12. supplementary material http://www.int-res.com/articles/suppl/d099p007_supp.pdf).
29. Benson DA, Cavanaugh M, Clark K, Karsch-Mizrachi I, Lipman DJ, Ostell J, Sayers EW: **GenBank.** *Nucleic Acids Res* 2013, **41**(D1):D36–D42.
30. Yan X, Parent KN, Goodman RP, Tang J, Shou J, Nibert ML, Duncan R, Baker TS: **Virion structure of baboon reovirus, a fusogenic orthoreovirus that lacks an adhesion fiber.** *J Virol* 2011, **85**:7483–7495.

31. Waterhouse AM, Procter JB, Martin DMA, Clamp M, Barton GJ: Jalview Version 2-a multiple sequence alignment editor and analysis workbench. *Bioinformatics* 2009, 25:1189–1191.
32. Drummond AJ, Suchard MA, Xie D, Rambaut A: Bayesian phylogenetics with BEAUti and the BEAST 1.7. *Mol Biol Evol* 2012, 29:1969–1973.
33. Kibenge FSB, Kibenge MJ, Wang Y, Qian B, Hariharan S, McGeachy S: Mapping of putative virulence motifs on infectious salmon anaemia virus surface glycoprotein genes. *J Gen Virol* 2007, 88:3100–3111.
34. The Honourable Bruce I: *Cohen, Commissioner. Commission of Inquiry into the Decline of the Sockeye Salmon in the Fraser River, Final Report, October 2012, Exhibit #1549–310.* Available at http://www.cohencommission.ca/en/Exhibits.php.
35. Saksida SM, Marty GD, Jones SRM, Manchester HA, Diamond CL, Bidulka J, St-Hilaire S: Parasites and hepatic lesions among pink salmon, *Oncorhynchus gorbuscha* (Walbaum), during early seawater residence. *J Fish Dis* 2012, 35:137–151.
36. DFO: *Public reporting on aquaculture in the Pacific Region – salmon egg imports*; 2012. http://www.pac.dfo-mpo.gc.ca/aquaculture/reporting-rapports/egg-oeuf-eng.htm (Published 2012-03-07; Consulted 2012-12-27).
37. Vike S, Nylund S, Nylund A: ISA virus in Chile: evidence of vertical transmission. *Arch Virol* 2009, 154:1–8.
38. Kibenge FSB, Godoy MG, Wang Y, Kibenge MJT, Gherardelli V, Mansilla S, Lisperger A, Jarpa M, Larroquete G, Avendaño F, Lara M, Gallardo A: Infectious salmon anaemia virus (ISAV) isolated from the ISA disease outbreaks in Chile diverged from ISAV isolates from Norway around 1996 and was disseminated around 2005, based on surface glycoprotein gene sequences. *Virol J* 2009, 6:88.
39. Plarre H, Nylund A, Karlsen M, Brevik Ø, Sæther PA: Evolution of infectious salmon anaemia virus (ISA virus). *Arch Virol* 2012, 157:2309–2326.
40. *Sernapesca: Estadística de importación de ovas por origen 2008 – 2013.* http://www.sernapesca.cl/index.php?option=com_remository&Itemid=246&func=fileinfo&id=4696.
41. Workenhe ST, Kibenge MJT, Iwamoto T, Kibenge FSB: Absolute quantitation of infectious salmon anaemia virus using different real-time reverse transcription PCR chemistries. *J Virol Methods* 2008, 154:128–134.
42. Haugland Ø, Mikalsen AB, Nilsen P, Lindmo K, Thu BJ, Eliassen TM, Roos N, Rode M, Evensen O: Cardiomyopathy syndrome of Atlantic salmon (Salmo salar L.) is caused by a double-stranded RNA virus of the *Totiviridae* family. *J Virol* 2011, 85:5275–5286.
43. Kibenge FSB, Dybing JK, McKenna PK: Rapid procedure for large-scale isolation of plasmid DNA. *Biotechniques* 1991, 11:65–67.
44. Kibenge FSB, Xu H, Kibenge MJT, Qian B, Joseph T: Characterization of gene expression on genomic segment 7 of infectious salmon anaemia virus. *Virol J* 2007, 4:34.
45. Altschul SF, Gish W, Miller W, Myers EW, Lipman DJ: Basic local alignment search tool. *J Mol Biol* 1990, 215:403–410.
46. Pearson WR, Lipman DJ: Improved tools for biological sequence comparison. *Proc Nat Acad Sci USA* 1988, 85:2444–2448.
47. *Sequence Manipulation Suite version 2.* http://www.ualberta.ca/~stothard/javascript/index.html.
48. Larkin MA, Blackshields G, Brown NP, Chenna R, McGettigan PA, McWilliam H, Valentin F, Wallace IM, Wilm A, Lopez R, Thompson JD, Gibson TJ, Higgins DG: Clustal W and Clustal X version 2.0. *Bioinformatics* 2007, 23:2947–2948.
49. Posada D: jModelTest: Phylogenetic Model Averaging. *Mol Biol Evol* 2008, 25:1253–1256.
50. Kimura M: A simple method for estimating evolutionary rates of base substitutions through comparative studies of nucleotide sequences. *J Mol Evol* 1980, 16:111–120.
51. Hasegawa M, Kishino H, Yano T: Dating of human-ape splitting by a molecular clock of mitochondrial DNA. *J Mol Evol* 1985, 22:160–174.
52. Cheng L, Fang Q, Shah S, Atanasov IC, Zhou ZH: Subnanometer-resolution structures of the grass carp reovirus core and virion. *J Mol Biol* 2008, 382:213–222.

doi:10.1186/1743-422X-10-230
Cite this article as: Kibenge *et al.*: Whole-genome analysis of piscine reovirus (PRV) shows PRV represents a new genus in family *Reoviridae* and its genome segment S1 sequences group it into two separate sub-genotypes. *Virology Journal* 2013 10:230.

Comparative Biochemistry and Physiology, Part A 173 (2014) 7–16

Contents lists available at ScienceDirect

Comparative Biochemistry and Physiology, Part A

journal homepage: www.elsevier.com/locate/cbpa

Species- and sex-specific responses and recovery of wild, mature pacific salmon to an exhaustive exercise and air exposure stressor

Michael R. Donaldson [a,*], Scott G. Hinch [a], Ken M. Jeffries [a], David A. Patterson [b], Steven J. Cooke [c], Anthony P. Farrell [d], Kristina M. Miller [e]

[a] Pacific Salmon Ecology and Conservation Laboratory, Centre for Applied Conservation Research and Department of Forest Sciences, University of British Columbia, Vancouver, British Columbia, Canada
[b] Fisheries and Oceans Canada, Freshwater Ecosystems Section, Cooperative Resource Management Institute, School of Resource and Environmental Management, Simon Fraser University, Burnaby, British Columbia, Canada
[c] Fish Ecology and Conservation Physiology Laboratory, Ottawa-Carleton Institute of Biology, Carleton University, Ottawa, Ontario, Canada
[d] Department of Zoology and Faculty of Land and Food Systems, University of British Columbia, Vancouver, British Columbia, Canada
[e] Fisheries and Oceans Canada, Molecular Genetics Section, Pacific Biological Station, Nanaimo, British Columbia, Canada

ARTICLE INFO

Article history:
Received 25 November 2013
Received in revised form 25 February 2014
Accepted 26 February 2014
Available online 4 March 2014

Keywords:
Stress
Recovery
Sockeye salmon
Pink salmon
Cortisol
Lactate
Gene expression

ABSTRACT

Despite the common mechanisms that underlie vertebrate responses to exhaustive exercise stress, the magnitude and the timecourse of recovery can be context-specific. Here, we examine how wild, adult male and female pink (*Oncorhynchus gorbuscha*) and sockeye (*Oncorhynchus nerka*) salmon respond to and recover from an exhaustive exercise and air exposure stressor, designed to simulate fisheries capture and handling. We follow gill tissue gene expression for genes active in cellular stress, cell maintenance, and apoptosis as well as plasma osmoregulatory, stress, and reproductive indices. The stressor initiated a major stress response as indicated by increased normalised expression of two stress-responsive genes, Transcription Factor JUNB and cytochrome C (pink salmon only). The stressor resulted in increased plasma ion cortisol, lactate, and depressed estradiol (sockeye salmon only). Gene expression and plasma variables showed a general recovery by 24 h post-stressor. Species- and sex-specific patterns were observed in stress response and recovery, with pink salmon mounting a higher magnitude stress response for plasma variables and sockeye salmon exhibiting a higher and more variable gene expression profile. These results highlight species- and sex-specific responses of migrating Pacific salmon to simulated fisheries encounters, which contribute new knowledge towards understanding the consequences of fisheries capture-and-release.

1. Introduction

Maintaining homeostasis when faced with a stressor involves an intersection of physiology, behaviour and life history that is fundamental to the persistence of animal populations (Ricklefs and Wikelski, 2002). Stressors can displace an organism's homeostatic state (Selye, 1936) and typically elicit an adaptive set of molecular, cellular, hormonal, metabolic, and behavioural responses (Romero, 2004). The responses of fish to exhaustive exercise stressors have been well characterized at the organismal level (Black et al., 1962; Wood, 1991; Milligan, 1996; Kieffer, 2000). Typically, a stressor that evokes strenuous activity and burst swimming, such as escape from predators or fisheries capture-and-release (Milligan, 1996), initiates an aerobic response with the rapid release of catecholamines (i.e., adrenaline and noradrenaline) into circulation, along with a corticosteroid release (i.e., plasma cortisol peaks within 1–2 h; Barton, 2002). As tissue oxygen demands are rapidly exceeded and energy stores are depleted from muscle tissue, the response to the stressor can become anaerobic (Wood, 1991). Consequently, lactate accumulation in muscle and blood can alter blood pH and osmoregulatory balance (Wood, 1991; Milligan, 1996; Kieffer, 2000). Exhaustive exercise stress combined with air exposure, a common consequence of capture-and-release fisheries, can result in additional physiological disturbances (Ferguson and Tufts, 1992).

Regaining homeostasis following exhaustive exercise stress requires oxygen in excess of basal metabolic requirements and sufficient time to recover (Wood, 1991). To meet tissue oxygen demands during recovery, cardio-respiratory activity increases and, for some species, can take hours to return to routine levels (Lee et al., 2003; Donaldson et al., 2010). Recovery of ionic, metabolic and stress variables that are typically associated with exhaustive exercise stress can likewise take hours (Wood, 1991). The magnitude of the stress response and timecourse of recovery are important, as these factors can be linked to

* Corresponding author at: Centre for Applied Conservation Research, Department of Forest and Conservation Sciences, 2424 Main Mall, University of British Columbia, Vancouver, BC V6T 1Z4, Canada. Tel.: +1 604 822 1969.
E-mail address: Michael.r.donaldson@gmail.com (M.R. Donaldson).

http://dx.doi.org/10.1016/j.cbpa.2014.02.019
1095-6433/

long-term changes in whole-organism behaviour, performance, and disease resistance (Mazeaud et al., 1977). Delayed recovery can govern the frequency of maximal performance (Milligan, 1996) and can result in mortality in extreme cases (Black, 1958; Wood et al., 1983). Thus, while responding to a stressor is aimed at protecting the animal and restoring homeostasis, it also sequesters energy away from anabolic processes and maintenance functions such as reproduction to catabolic activities that mobilize energy to respond to the stressor (Wendelaar Bonga, 1997).

Despite decades of research on the physiological responses of fish to exhaustive exercise stress at the organismal and tissue levels, cellular and molecular responses have received less attention until recently. Acting in concert with the responses that occur at higher levels of biological organization, the cellular suite of stress responses helps to temporarily tolerate a variety of stressors or remove damaged cells by apoptosis (Kültz, 2005). Thus, changes in gene expression (i.e., quantitative, qualitative, and changes in reaction coefficients) can be linked with a range of stressors (Krasnov et al., 2005). In fish, a number of genes have been investigated as potential biomarkers for various stressors. For example, following various stressors, Heat Shock Protein (e.g., HSP90) expression increases to maintain cellular homeostasis (Iwama et al., 2004). Genes linked to cell apoptosis, such as cytochrome c (herein abbreviated as cyt c) and Transcription Factor JUNB (herein abbreviated as JUNB), are upregulated in response to temperature stress in sockeye salmon (*Oncorhynchus nerka*; Jeffries et al., 2012a). JUNB was likewise upregulated following low-water and air exposure stressors in rainbow trout (*Oncorhynchus mykiss*; Momoda et al., 2007). Transcription factor NUPR1, which is involved in the regulation of cell growth and apoptosis (Mallo et al., 1997), is stress responsive in rainbow trout and can remain upregulated several hours post-stressor (Momoda et al., 2007). A complicating factor in understanding the behaviour of these genes in the stress response is the fact that studies conducted on fish to date often focus on different timecourses (Krasnov et al., 2005), species, tissues (Kassahn et al., 2009), techniques (Prunet et al., 2008), and genes of interest. The role of gene expression in the recovery process is likewise poorly understood. Thus, there is a need to understand the mechanisms of response and recovery to exhaustive exercise stress and air exposure at the molecular level in relation to the responses of standard plasma indices of stress.

Migratory behaviour includes a suite of physiological adaptations to stress-related selective pressures that operate on the individual, and have outcomes at the population level (Ramenofsky and Wingfield, 2007). Pink salmon (*Oncorhynchus gorbuscha*) and sockeye salmon both undergo semelparous and anadromous reproductive migrations, but differ in their respective life history, performance, behaviour, thermal tolerance, abundance, and conservation status. Sockeye salmon typically grow for one year in freshwater before migrating to sea, and generally return to spawn at age four. In contrast, pink salmon migrate directly to sea after emergence from redds, returning to spawn at two years of age. As a consequence, pink salmon are the smallest (in both length and weight) of the Pacific salmonids at maturity (Heard, 1991), which results in a lower absolute prolonged swimming performance relative to sockeye salmon, although length-adjusted swimming performance is not different with that of sockeye salmon (Williams and Brett, 1987; MacNutt et al., 2006) and pink salmon also behaviourally reduce transport and activity costs compared to sockeye salmon (Standen et al., 2002) by seeking out optimal microhabitats of least migratory resistance.

Throughout their spawning migrations, Pacific salmon face many stressors, including threat of predation and fisheries. Pink and sockeye salmon often migrate through the same locations during overlapping time periods. As a consequence, fisheries can catch non-target species which are subsequently released as bycatch to resume their migrations. There is a growing understanding that post-release survival of salmon is influenced by fisheries capture method (e.g. Donaldson et al., 2011) and that the duration of recovery depends on the duration of the stressor (e.g., Donaldson et al., 2010). A sex-specific trend is also emerging where female salmon tend to have lower survival than males following fisheries-related (Robinson et al., 2013) and temperature-related stressors (Jeffries et al., 2012b; Martins et al., 2012).

Despite the rich body of literature documenting exhaustive exercise stress in fish (Kieffer, 2010), only a few studies have focused on wild, adult salmonids (e.g., Farrell et al., 2001a,b) and fewer still have compared species- and sex-specific patterns following exercise (e.g., Pottinger, 2010). Likewise, although knowledge is being accumulated on the genes involved in the stress response, less is known about gene expression during the recovery process. To address these knowledge gaps, this study first sought to characterize the response and recovery of wild, maturing, adult Pacific salmon to fisheries-related exhaustive exercise stress and air exposure by examining a series of plasma stress, osmoregulatory and reproductive indices and the expression of genes active in cellular stress, cell maintenance, and apoptosis. This study then tested the hypothesis that the physiological recovery processes are species- and sex-specific by comparing the recovery patterns of male and female sockeye and pink salmon.

2. Materials and methods

2.1. Study site and animals

Experiments were conducted at Fisheries and Oceans Canada's Weaver Creek Spawning Channel, near Agassiz, British Columbia, Canada. Water temperatures throughout the course of the study were 11–12 °C, measured using a permanent temperature probe operated by Fisheries and Oceans Canada staff.

A total of 112 wild, adult sockeye salmon and 88 pink salmon were used in the experiment and were distributed across two treatment groups (control or exercise and air exposure treatment) and five sampling intervals (0, 0.5, 1, 4, 24 h). Individual fish were sampled once to collect gill tissue and a blood sample to avoid repeated handling and sampling. Equal proportions of male and female pink and sockeye salmon allowed sex-specific differences to be examined (e.g., plasma cortisol; Donaldson et al., 2010). Pink salmon experiments were conducted October 1st–7th, 2009 and sockeye salmon experiments were conducted October 8th–14th, 2009. In 2009, peak spawning was October 19–24th for pink salmon and October 15–19th for sockeye salmon.

2.2. Study design

Fish were captured by dip net from a raceway downstream of the spawning channel entrance. Individuals were rapidly transferred (1–2 s to minimize air exposure) to a holding tote on a research vehicle, and transported ~300 m (2–3 min transport time) to the experimental area. Individuals in the exercise and air exposure treatments were transferred into a donut shaped exercise tank (diameter 150 cm, inner diameter 50 cm, water depth 40 cm) supplied with fresh, flowing water pumped from the spawning channel. Fish were manually chased for 3 min, then collected by dip net and exposed to air for 1 min as previously described (Donaldson et al., 2010). Briefly, fish placed in the tank were manually coaxed to continually burst swim (Milligan, 1996) by three experimenters positioned around the exercise tank, which resulted in fish being visibly exhausted (no longer able to burst swim, unresponsive to tactile stimuli and some individuals unable to maintain equilibrium; Wood, 1991). The procedure was intended to simulate an exhaustive fisheries capture and release event (e.g., angling and release or rapid release from a net fishery). The air exposure was intended to simulate air contact while being removed from a hook or net.

Fish were randomly assigned a sampling interval of 0, 0.5, 1, 4, and 24 h. Control fish were neither exercised nor air-exposed and were transferred directly into holding boxes. Control fish were sampled 24 h

later to allow for full recovery from minor handling. Exercised and air exposed fish were immediately placed into individual, dark plastic holding boxes with secure lids (L × W × D = 93.7 × 54.0 × 47.3 cm). Each box received freshwater pumped at 0.63 $L \cdot s^{-1}$ using an electric submersible pump placed in the spawning channel. The outflow was positioned at the back of the box. The inflow was centred in the lower third of the box to direct water at the fish's mouth. The boxes were large enough to enable fish to orient into the water flow with periodic tail beats to change or maintain position, however when collected for sampling, fish were often not observed to be oriented directly into the flow. We speculate that the sampling boxes provided an environment similar to fish in the wild holding in low flow riverine areas behind large rocks with lower direct velocity than methods designed to facilitate fish recovery using high velocity ram ventilation (e.g., Milligan et al., 2000; Farrell et al., 2001b). Our results indicate that the sampling boxes did not impose additional holding stress since plasma stress indices for the control group were similar to studies where pink and sockeye salmon were rapidly dip netted and blood sampled from the same location (see Discussion; Hruska et al., 2010; McConnachie et al., 2012).

For tissue sampling, individuals were rapidly removed from their box and placed supine in a water-filled V-shaped foam-padded sampling trough (Cooke et al., 2005) for immediate biopsy and length measurements. The biopsy, which lasted <2 min, collected a 2.5 mL blood sample by caudal puncture using a sterile 3.8 cm, 21-gauge needle and a heparinised vacutainer (lithium heparin, 3 mL, Becton-Dickson, NJ, USA), which was then stored in ice-chilled water for <1 h until subsequent processing. Also, ~3 mm gill filament tips from the first gill arch were collected using sharpened end-cutter pliers, sterilized with 95% ethanol and rinsed with distilled water (Cooke et al., 2005). Gill samples were transferred using sterile forceps to cryovials, flash frozen in liquid nitrogen, and subsequently transferred to −80 °C freezers for subsequent analyses. The rapid caudal puncture technique has been found in adult Pacific salmon to yield statistically similar plasma values compared to cannulation techniques (Clark et al., 2011a).

2.3. Plasma assays

The chilled ~2.5 mL blood sample was centrifuged at 7000 *g* for 3 min and plasma was stored in liquid nitrogen prior to being frozen at −80 °C until analysis. Plasma was subsequently analysed for the following: cortisol, testosterone, and 17 B-estradiol using commercial ELISA kits (ELISA nos. 402710, 402110, 402510, with Molecular Devices Spectramax 240pc plate reader; Neogen Inc., Lansing, MI, USA); lactate and glucose (YSI 2300 stat plus analyser, YSI Inc., Yellow Springs, OH, USA); osmolality (Advanced Instruments 3320 freezing point osmometer, Advanced Instruments Inc., Norwood, MA, USA); chloride (digital chloridometer; Haake Buchler Instruments, Inc., Saddle Brook, NJ, USA); and sodium and potassium (Cole-Parmer model 410 single channel flame photometer; Cole-Parmer Inc., Montreal, Canada; Farrell et al., 2001b).

2.4. Quantitative real-time PCR (qRT-PCR) methods

Gill tissue was collected from non-lethal biopsies to quantify gene expression via qRT-PCR. We examined four genes of interest and two reference genes (Table 1). Primers for Heat Shock Protein 90 (HSP90AB1), cytochrome c (cyt c), and two reference genes, Si:dkey-78d16.1 protein (78d16.1) and Bone Morphogenetic Protein 4 (BMP4), were designed in-house, with primers developed to equally match contigs of rainbow trout and Atlantic salmon (Jeffries et al., 2012a). Transcription Factor Jun B (JUNB) and Nuclear Protein 1 (NUPR1) primers were published in Momoda et al. (2007). RNA was extracted following the protocols described in Miller et al. (2009). To prepare samples for qRT-PCR, an iScript™ cDNA Synthesis Kit (Bio-Rad Laboratories, Inc., Hercules, CA, USA) was used to synthesize cDNA from 1 μg of total RNA. An ABI 7900HT Fast Real-Time PCR system (Applied Biosystems, Carlsbad, CA, USA) was used to perform Relative Quantification (RQ) assays. The cDNA template was diluted 1:2.5 and assays were conducted in 384-well plates using 20 μL reaction volumes [10 μL Kapa SYBR fast qPCR Master Mix (2×) (Kapa Biosystems, Inc., Woburn, MA, USA); 0.4 μL of a mixture of 0.2 μM forward and reverse primers; 2 μL of diluted cDNA; 7.6 μL of RNase/DNase-free water]. The cycling conditions were 95 °C for 3 min followed by 40 cycles of 95 °C for 3 s and 60 °C for 30 s, and a dissociation stage (95 °C for 15 s, 60 °C for 15 s, and 95 °C for 15 s) was added at each RQ run to ensure that only one gene product was amplified for each primer set. All samples were run in duplicate and with non-template controls included. Target gene expression was normalised to two reference genes that were not responsive to the experimental factors, as determined by the reference gene association function of the DataAssist v 3.0 software suite (Applied Biosystems Inc., Foster City, CA, USA).

2.5. Statistical methods

Normalised expression of target genes was determined using the comparative C_T method (Livak & Schmittgen, 2001) using DataAssist v 3.0 (Applied Biosystems Inc., Foster City, CA, USA). Statistical analyses were conducted on the expression of the genes of interest relative to two reference genes. A Principal Component Analysis (PCA) with a Varimax factor rotation was used, which conducts an orthogonal transformation of factors with eigenvalues ≥1.0, a technique that partitions correlated variables into factors for subsequent analyses (Wagner and Congleton, 2004). This approach is used to identify general trends among similarly responding variables in the data set. Variables with loading factors ≥±0.5 were considered to contribute to the factor. All response variables were $\log_{10}$-transformed prior to PCA. Plasma

Table 1
Primer sequences for reference genes and genes of interest used in qRT-PCR.

Gene type	Gene name	Gene symbol	EST number	Primer sequence (5′–3′)
Reference genes	Bone Morphogenetic Protein 4	BMP4	CA056395	F-TTGCCCATAGTCAGTGTTAGCG
				R-GTGCCATCTCCATGCTCTACC
	Si:dkey–78d16.1 protein	78d16.1	CA056739	F-AAAGGTCCCACGCTCCAAAC
				R-ACACACCCATCTGTCTCATCACC
Genes of interest	Cytochrome C	cyt c	CB494539	F-CGAGCGTGCAGATCTTATAGC
				R-CTTCTCCGCTGAACAGTTGATG
	Heat Shock Protein 90	HSP90AB1	CB493960	F-TGGGCTACATGGCTGCCAAG
				R-TCCAAGGTGAACCCAGAGGAC
	Transcription Factor JUNB	JUNB	N/A[a]	F-CTACACGCACAGCGATATTCG
				R-TCGTCGCTGCTCTGCATGT
	Nuclear Protein 1	NUPR1	N/A[a]	F-GACAAATCGGACGGCTAATCCT
				R-CTGCCTGCCCATTTGGTTTT

[a] From rainbow trout (*Oncorhynchus mykiss*; Momoda et al., 2007).

estradiol was excluded from the PCA since it was only measured in females.

MANOVAs and ANOVAs were conducted on the rotated factors to test for the effects of time, sex, species, and their factorial interactions. Where noted, ANOVAs with Tukey's post-hoc tests were conducted and dissimilar letters represent statistical differences in figures. All statistical analyses were conducted using JMP 9.0 (SAS Institute Inc., Cary, NC, USA). For MANOVAs, significance was tested at $\alpha = 0.013$ (Bonferroni correction based on 4 rotated factors). Fork length was variable with species and sex (61.70 ± 0.43 cm and 66.40 ± 0.88 cm for female and male sockeye salmon, respectively, and 49.89 ±0.36 cm and 51.37 ± 0.42 cm for female and male pink salmon, respectively), but MANOVA did not reveal any significant effects of fork length on physiological response variables for pink (Wilk's lambda = 2.902; $F_{18} = 0.806$; $P = 0.669$) or sockeye salmon (Wilk's lambda = 0.614; $F_{18} = 0.614$; $P = 0.845$). Thus, fork length was not included as a covariate in analyses.

3. Results

No mortality was observed during the study. The PCA resulted in four rotated factors (abbreviated RF; Table 2; Fig. 1). The four gill gene variables loaded on RF1. Osmoregulatory variables (i.e., plasma chloride, sodium, and osmolality) loaded on RF2. Stress variables (i.e., plasma cortisol and lactate) loaded on RF3. Hormones (e.g., plasma cortisol and testosterone) loaded on RF4.

A MANOVA of the rotated factors (RF1, RF2, RF3, and RF4) revealed a significant whole model (Wilk's lambda = 0.006; $F_{108,13.765} = 13.765$; $P < 0.001$) with significant effects for time (Wilk's lambda = 0.057; $F_{24,500.08} = 26.517$; $P < 0.001$), sex (Wilk's lambda = 2.215; $F_{4,143} = 79.201$; $P < 0.001$) and species (Wilk's lambda = 1.222; $F_{4,143} = 43.673$; $P < 0.001$), as well as the species * time interaction (Wilk's lambda = 0.462; $F_{24,500.08} = 1.221$; $P < 0.001$) and the species * sex interaction (Wilk's lambda = 0.101; $F_{4,143} = 2.215$; $P < 0.001$), but not the time * sex (Wilk's lambda = 0.816; $F_{24,500.08} = 1.250$; $P = 0.192$) or species * time * sex interactions (Wilk's lambda = 0.849; $F_{24,500.08} = 0.996$; $P = 0.470$). Only significant terms and interactions were included in subsequent ANOVAs testing the effects of time, sex, species, species * time interaction and species * sex interaction, which found significant whole models for RF1 (SS = 59.065; $F_{15} = 6.494$, $P < 0.001$), RF2 (SS = 42.886; $F_{15} = 24.221$, $P < 0.001$), RF3 (SS = 121.348; $F_{15} = 44.949$, $P < 0.001$), and RF4 (SS = 100.874; $F_{15} = 26.127$, $P < 0.001$).

RF1 was only influenced by time and species (Table 3). RF2 was influenced by time, sex, species, and the species * time interaction. RF3 was influenced by time, sex, species, species * time and species * sex interactions. RF4 was influenced by time, sex, and their interaction.

The general pattern of physiological response was similar for both species, yet pink salmon mounted a higher magnitude response for many of the plasma variables measured, whereas sockeye tended to have higher and more variable gene expression.

3.1. RF1: cellular stress variables

Gill cyt c expression, which was significantly increased at 2 h, was highest when measured at 4 h, and recovered to control values at 24 h post-treatment for pink salmon (SS = 0.163; $F_6 = 4.179$; $P = 0.001$; Fig. 2). Gill JUNB was highest when measured at 4 h and returned to control values at 24 h for both pink (SS = 0.201; $F_6 = 5.789$; $P < 0.001$) and sockeye salmon (SS = 0.116; $F_6 = 2.521$; $P = 0.026$). Gill HSP90AB1 and NUPR1 expression remained unchanged over time for both species. Gene expression did not differ by sex for either species.

3.2. RF2: osmoregulatory variables

Indices of osmoregulatory status generally increased post-treatment (Fig. 3). Plasma sodium increased over time and recovered by 24 h in both species (pink females SS = 0.015; $F_6 = 8.208$; $P < 0.001$; pink males SS = 0.0246; $F_6 = 9.444$; $P < 0.001$; sockeye females SS = 0.213; $F_6 = 8.008$; $P < 0.001$; sockeye males SS = 0.029; $F_6 = 4.301$; $P = 0.002$). Plasma potassium was highest when measured at 2 or 4 h post-treatment for pink females (SS = 0.782; $F_6 = 3.323$; $P = 0.011$) and sockeye males (SS = 2.583; $F_6 = 12.490$; $P < 0.001$). Plasma osmolality increased over time and recovered by 24 h for pink salmon (pink females SS = 0.021; $F_6 = 32.527$; $P < 0.001$; pink males SS = 0.0167; $F_6 = 12.344$; $P < 0.001$) and was variable for sockeye salmon males (SS = 0.023; $F_6 = 3.246$; $P = 0.009$) and not significant for sockeye females. Plasma chloride decreased post-treatment for both sexes of pink salmon (pink females SS = 0.023; $F_6 = 30.948$; $P < 0.001$; pink males SS = 0.0183; $F_6 = 11.607$; $P < 0.001$) but remained variable for sockeye males (SS = 0.019; $F_6 = 2.785$; $P = 0.021$) and did not change for sockeye females.

3.3. RF3: organismal stress variables

For both species, plasma stress variables that responded to the stressor had recovered to control values by 24 h post-exercise (Fig. 4).

Table 2
Rotated factor loadings and final communalities for factor analysis of $\log_{10}$-transformed plasma and gill gene response variables for adult pink and sockeye salmon. Variables with loading factors ≥±0.5 are marked in bold.

Response variable	Rotated factor #				Final communality estimates
	1	2	3	4	
Eigenvalue	3.198	2.688	1.485	1.291	
Gill cyt c	**0.918**	−0.039	0.150	−0.032	0.869
Gill HSP90AB1	**0.881**	−0.163	−0.018	−0.094	0.811
Gill JUNB	**0.635**	0.091	0.320	−0.071	0.519
Gill NUPR1	**0.584**	−0.141	−0.123	0.118	0.391
Plasma glucose ($mmol \cdot L^{-1}$)	0.132	0.297	0.182	−0.195	0.177
Plasma lactate ($mmol \cdot L^{-1}$)	0.088	0.319	**0.812**	−0.163	0.794
Plasma chloride ($mmol \cdot L^{-1}$)	−0.182	**0.914**	−0.017	0.197	0.908
Plasma sodium ($mmol \cdot L^{-1}$)	−0.220	**0.644**	0.155	−0.170	0.516
Plasma potassium ($mmol \cdot L^{-1}$)	−0.193	−0.224	0.186	0.061	0.126
Plasma osmolality ($mOsM \cdot kg^{-1}$)	−0.060	**0.955**	0.139	0.143	0.956
Plasma cortisol ($ng \cdot mL^{-1}$)	0.147	−0.041	**0.734**	**0.662**	0.999
Plasma testosterone ($ng \cdot mL^{-1}$)	−0.033	0.052	−0.042	**0.638**	0.412
Cumulative variance explained (%)	26.647	49.045	61.417	72.174	

Note: Variables with factor loadings ≥±0.5 are shown in bold. Response variables were $\log_{10}$ transformed prior to Principal Component Analysis.

Plasma lactate was highest between 0.5 and 1 h (pink females SS = 8.233; $F_6 = 62.666$; $P < 0.001$; pink males SS = 8.781; $F_6 = 20.360$; $P < 0.001$; sockeye females SS = 6.843; $F_6 = 28.949$; $P < 0.001$; sockeye males SS = 11.041; $F_6 = 64.836$; $P < 0.001$). Plasma cortisol was highest when measured between 1 and 2 h for both species (pink females SS = 3.488; $F_6 = 22.469$; $P < 0.001$; pink males SS = 2.773; $F_6 = 9.315$; $P < 0.001$; sockeye females SS = 1.019; $F_6 = 11.958$; $P < 0.001$; sockeye males SS = 0.559; $F_6 = 5.007$; $P < 0.001$).

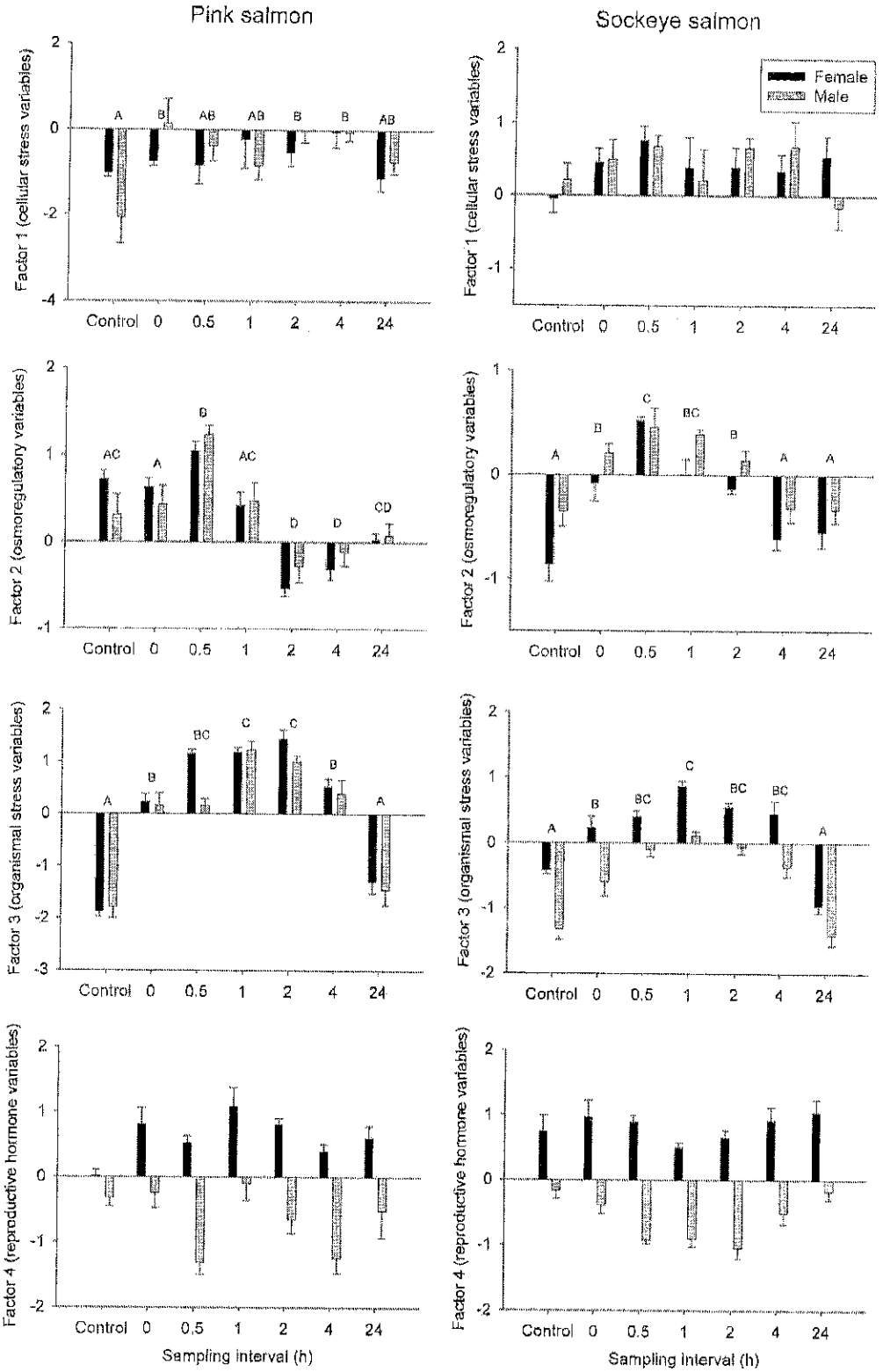


Fig. 1. Means ± SE for rotated factor loadings of log_{10}-transformed plasma and gill gene response variables for adult pink and sockeye salmon. PCAs based on plasma and gill samples. Dissimilar letters denote statistical differences from Tukey's post-hoc tests following ANOVAs.

Table 3
ANOVA effects tests that were significant for the whole model comparing rotated factor loadings of log_{10}-transformed plasma and gill gene response variables for adult pink and sockeye salmon.

Rotated factor #	Rotated factor name	Source	DF	SS	F ratio	*P*-value
1	Cellular stress variables	Time	**6**	**16.843**	**4.629**	**<0.001**
		Sex	1	0.491	0.810	0.370
		Species	**1**	**46.264**	**76.294**	**<0.001**
		Species * time	6	6.141	1.688	0.127
		Species * sex	1	0.366	0.604	0.438
2	Osmoregulatory variables	Time	**6**	**26.650**	**37.628**	**<0.001**
		Sex	**1**	**1.300**	**11.012**	**0.001**
		Species	**1**	**6.069**	**51.412**	**<0.001**
		Species * time	**6**	**6.067**	**8.567**	**<0.001**
		Species * sex	1	0.366	3.102	0.080
3	Organismal stress variables	Time	**6**	**100.026**	**92.627**	**<0.001**
		Sex	**1**	**10.340**	**57.449**	**<0.001**
		Species	**1**	**2.971**	**16.506**	**<0.001**
		Species * time	**6**	**10.160**	**9.408**	**<0.001**
		Species * sex	**1**	**1.658**	**9.215**	**0.003**
4	Reproductive hormone variables	Time	**6**	**5.885**	**3.811**	**0.001**
		Sex	**1**	**80.511**	**312.793**	**<0.001**
		Species	1	0.281	1.093	0.298
		Species * time	**6**	**7.688**	**4.978**	**<0.001**
		Species*sex	1	0.018	0.069	0.793

Note: Bold values denote significant effects of tests at $\alpha = 0.013$. Response variables were log_{10} transformed prior to Principal Component Analysis.

3.4. R4: reproductive hormone variables

Plasma testosterone was highly variable but did not change significantly over time for males or females of either species. Plasma estradiol, which was not included in PCAs since it was measured only in females, decreased immediately following stress in sockeye salmon ($SS = 0.192$; $F_6 = 3.104$; $P = 0.018$), but not pink salmon ($SS = 1.568$; $F_6 = 0.669$; $P = 0.675$; Fig. 5).

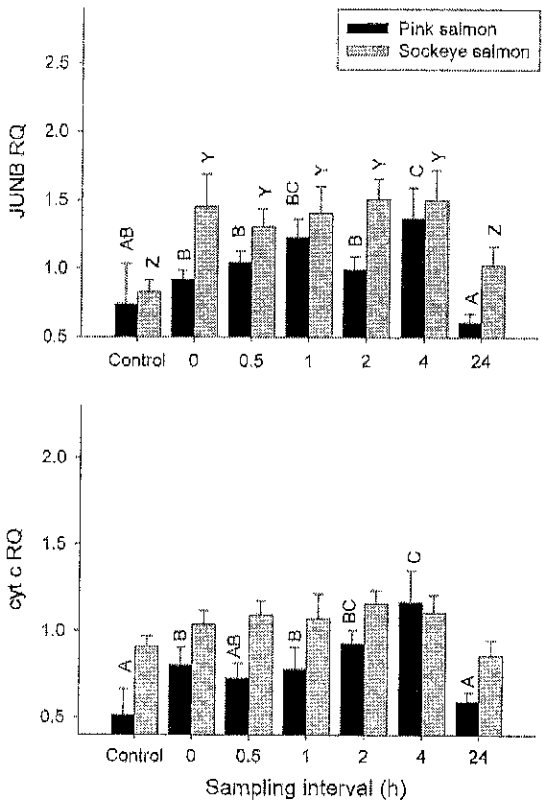


Fig. 2. Relative Quantification (RQ) of cellular stress variables gill JUNB and cyt c for adult pink and sockeye salmon. Sexes pooled. Dissimilar letters denote statistical differences from Tukey's post-hoc tests following ANOVAs.

4. Discussion

4.1. Cellular stress response and recovery

JUNB provides an important link between the endocrine stress responses and downstream transcriptional processes (Vamvakopoulos and Chrousos, 1994). JUNB forms the transcription factor activator protein 1 transcription complex, which is linked to cellular proliferation, apoptosis and stress response (Piechaczyk and Farràs, 2008). In fish, JUNB is responsive to a range of stressors, including low-water and confinement (Momoda et al., 2007), acute temperature (Lewis et al., 2010), and chronic temperature (Jeffries et al., 2012a). Here, JUNB expression was highest when measured at 2 and 4 h in pink salmon and between 0.5 and 4 h in sockeye salmon after the stressor, yet had returned to control levels by 24 h, much like the plasma stress variables. Similarly, JUNB expression in liver peaked at 3 h and recovered by 24 h when juvenile rainbow trout were stressed by a 0.5-h exposure to low water and a 30-s air exposure (Momoda et al., 2007). Likewise, red blood cell expression of this gene increased in rainbow trout at 4 h and 24 h following acute heat stress (Lewis et al., 2010). The JUNB timecourse, where peak expression can occur several hours after the stressor, points to this gene's role in the recovery process as well as other maintenance functions including arrested cell growth, apoptosis, or even cell proliferation (Piechaczyk and Farràs, 2008).

Like JUNB, cyt c expression was responsive to exercise stress, with highest values measured at 4 h for pink salmon, potentially due to the release from the mitochondria into the cytoplasm of cells undergoing apoptosis (Loeffler and Kroemer, 2000). Interestingly, Jeffries et al. (2012a) found the up-regulation of cyt c as well as JUNB in moribund sockeye salmon following chronic high temperature exposure. The finding that pink salmon showed increased expression of both cyt c and JUNB over time, but that this expression returned to control values by 24 h, suggests that while these genes may respond strongly to stress and can signal mortality, they may also recover following the stressor, indicating the role of these genes in cellular maintenance and recovery for Pacific salmon. Gene expression was not sex-specific, despite an earlier report to this effect for JUNB in immature rainbow trout (Momoda et al., 2007).

HSP90AB1 remained largely unchanged over time, perhaps suggesting that the stressor used here may not have been sufficient to induce such a response (Iwama et al., 2004). NUPR1 which is a stress-responsive transcription factor found in several tissues that responds to a range of stressors (Chowdhury and Samant, 2009; Cano and

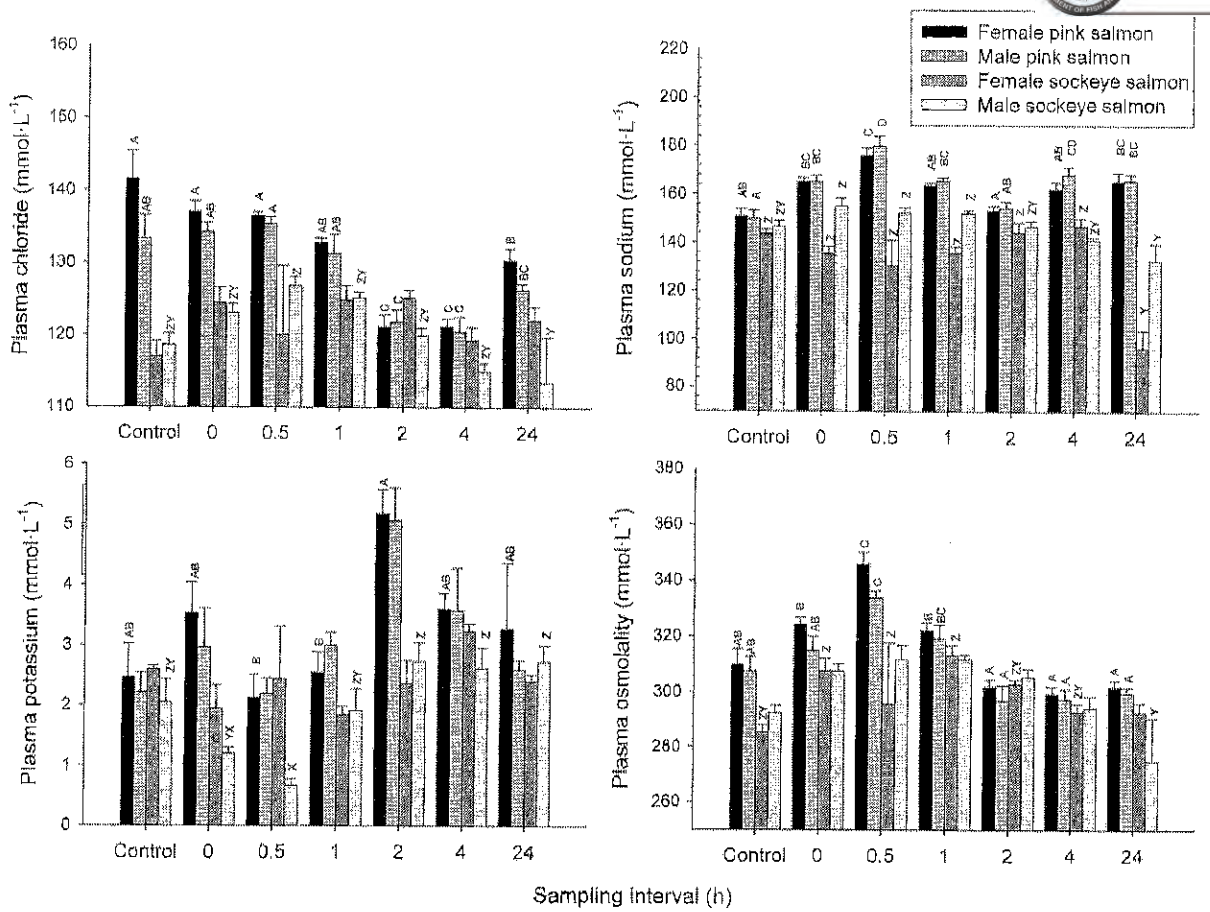


Fig. 3. Means ± SE for osmoregulatory variables plasma chloride, sodium, potassium, and osmolality for adult pink and sockeye salmon. Dissimilar letters denote statistical differences from Tukey's post-hoc tests following ANOVAs.

Hamidi, 2011), including the glucocorticoid response for rainbow trout liver (Momoda et al., 2007) and mouse pancreas (Path et al., 2004), was not reflected in PCAs. However, a lack of gene expression does not necessarily mean that there were no changes in protein expression. Likewise, there remains the possibility that these genes could be expressed differently in other tissues, since microarray studies have identified a broad suite of energy metabolism genes upregulated in rainbow trout liver following exercise/handling-related stressors (Momoda et al., 2007; Wiseman et al., 2007; Cairns et al., 2008).

4.2. Response and recovery of osmoregulatory variables

The temporary increases in plasma ions observed during the first 4 h of recovery are consistent with previous observations in freshwater fish (Wood, 1991). Plasma osmolality followed the increases in plasma solutes (lactate, sodium, and chloride), which resulted in each of these variables loading with osmolality on PCA RF2. Increased plasma ions generally paralleled the increase in plasma lactate, which is generated by glycolysis and is known to decrease muscle and blood pH (Wang et al., 1994), disrupting ion-osmoregulatory balance and shifting water from blood to muscle tissue. In both species, plasma potassium decreased at 30 min post-stress, a finding which corroborates previous work on sockeye salmon (Gale et al., 2011). Decreased plasma potassium following stress could be due to the temporary re-uptake of potassium ions from the extracellular space (Nielsen et al., 1992). The general increase in plasma potassium over the longer term likely occurred as a result of potassium ions being gradually lost from muscle and accumulating in plasma (Sejersted and Sjøgaard, 2000).

4.3. Organismal stress response and recovery

Plasma lactate values from control groups for both species (~1 mmol·L^{-1}) are comparable to values expected for resting salmonids (Wood et al., 1983; Milligan, 1996; Barton, 2002) and are nearly identical to the control values obtained for adult coho salmon (Donaldson et al., 2010). Our results indicate that the sampling boxes did not provide any additional stress, and in fact may have provided an equivalent or even less stressful environment than the spawning channel itself, since the plasma stress values obtained from both pink and sockeye salmon were either equivalent or lower relative to samples collected from fish that were dip netted directly from the channel and sampled immediately, potentially indicating that the plasma values obtained here approximate the baseline for these species at this stage of maturation. For example, Hruska et al. (2010) identified that female and male sockeye salmon that were sampled from the same spawning channel as the present study (but a different year) had mean plasma cortisol concentrations of ~350 and ~91 ng/mL respectively, whereas the control female and male sockeye salmon in our study had ~207 and ~71 ng/mL, respectively. Likewise, in the same year and location as the present study, for female pink salmon, the mean plasma cortisol was ~300 ng/mL for fish captured and sampled directly from the spawning channel compared to ~84.5 ng/mL for the control group in the present study. Plasma stress variables had recovered to control values by 24 h post-stress, as expected (Wood, 1991).

The immediate response upon capture (i.e., at time zero) of plasma lactate, but not cortisol, was similar to sockeye salmon caught by either rapid angling or beach seine (~3 min) and sampled immediately

(Donaldson et al., 2011). The timing of the highest measured plasma cortisol and lactate values is consistent with literature values which typically show a peak between 0.5 h and 2 h before recovering (Wood et al., 1983; Milligan, 1996; Barton, 2002). Plasma cortisol values here compared with those observed following a similar exhaustive exercise-related stressor in sockeye salmon (Donaldson et al., 2011) but were comparatively higher relative to plasma cortisol values from other salmonid species following a confinement stressor (Pottinger, 2010), which may reflect either a higher level of stress following the experimental treatment here or a different reproductive state (see below).

Plasma glucose typically increases in response to acute stressors in a range of salmonid species (e.g., Pottinger, 2010), but has been found to remain relatively high yet stable over time in migrating Pacific salmon (Donaldson et al., 2010). The finding that female pink salmon had elevated plasma glucose following the stressor was thus somewhat atypical from other recent Pacific salmon studies. Some species-specific variability in the response and recovery of many of the variables investigated here was anticipated since identical stressors can elicit variable responses within the same family (Black, 1955; Pottinger, 2010). However, the dramatically higher magnitude of the difference in plasma lactate and cortisol response for pink salmon was unexpected, although general increases in blood lactate have been observed previously throughout the spawning period for this species (Congleton, 1972).

4.4. Reproductive hormones and species- and sex-specific differences

Previous studies have had difficulty disentangling the influence of body size and reproductive maturity on species-specific physiological responses to stress (Pottinger, 2010). Body size can influence the physiological stress response and recovery of some species (Gingerich and Suski, 2012), but analyses did not reveal an effect of body size on response variables in the present study. Similarly, plasma indices of stress were independent of body mass for mature adult Chinook salmon (Clark and Farrell, 2011).

In Pacific salmon, reproductive hormones tend to increase progressively during maturation before rapidly decreasing immediately before spawning (Williams et al., 1986; Jeffries et al., 2011). Pink salmon did have comparatively higher plasma estradiol (females) relative to sockeye salmon, suggesting a slightly earlier state of maturation. Indeed, pink salmon were sampled 12–23 days prior to peak spawning and sockeye salmon were sampled only 1–11 days prior to peak spawning. However, since species-specific differences did not emerge as a significant factor in the reproductive hormone ANOVA, it remains unclear if maturation state alone (rather than genetic differences, for example) explains sex-specific differences in the response and recovery of the other plasma variables. Regardless, the heightened response to exhaustive exercise stress of less mature pink salmon is consistent with a pattern described for rainbow trout, where maturity and higher sex hormone concentrations moderate the stress response (Pottinger et al., 1995, 1996).

Reproductive hormones can become depressed by stress (Pickering et al., 1987; Schreck et al., 2001). This appeared to be the case for estradiol in female sockeye salmon here, which is relevant due to the essential role that reproductive hormones play in the final stages of maturation and senescence for spawning Pacific salmon (Hruska et al., 2010; Jeffries et al., 2012b). Several studies on Pacific salmon have identified that females typically experience higher mortality compared with males (Patterson et al., 2004; Crossin et al., 2008; Jeffries et al., 2012b; Martins et al., 2012; Robinson et al., 2013) and it has been suggested that female salmon have less capacity to cope with environmental stressors (Clark et al., 2011b). Previously identified sex-specific differences in maturing Pacific salmon include higher heart rates, plasma cortisol, lactate, glucose, testosterone and estradiol in female sockeye

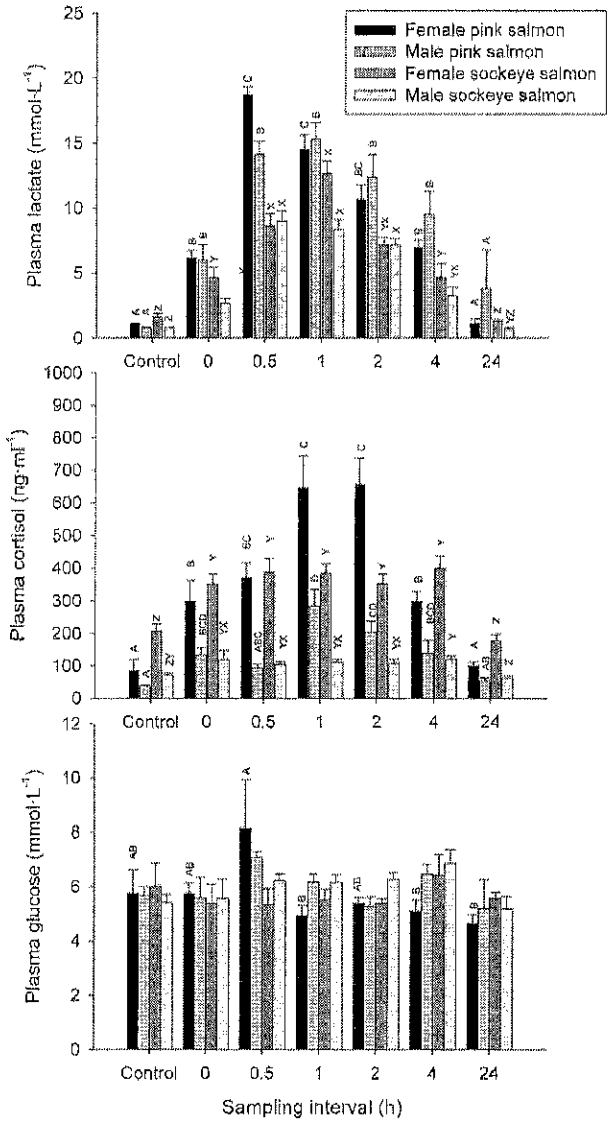


Fig. 4. Means ± SE for organismal stress variables plasma lactate, cortisol, and glucose for adult pink and sockeye salmon. Dissimilar letters denote statistical differences from Tukey's post-hoc tests following ANOVAs.

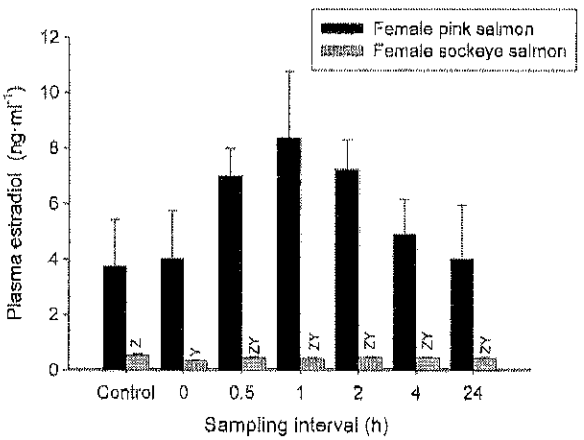


Fig. 5. Means ± SE for reproductive hormone variable plasma estradiol for adult female pink and sockeye salmon. Dissimilar letters denote statistical differences from Tukey's post-hoc tests following ANOVAs.

salmon relative to males (Sandblom et al., 2009; Jeffries et al., 2012b). Sex-specific differences for plasma cortisol are particularly well known and have been observed in acute and chronically stressed rainbow trout and Pacific salmon (Fagerlund, 1967; Pottinger et al., 1995, 1996; Sandblom et al., 2009). Sex-specific differences can even be observed under routine conditions, for example, control female and male coho salmon had ~200 and ~100 $ng \cdot mL^{-1}$ plasma cortisol, respectively (Donaldson et al., 2010), an approximate 2:1 ratio for plasma cortisol in females and males, which compares with control values for pink and sockeye salmon in the present study.

5. Conclusions

While there were some similarities in how pink and sockeye salmon responded and recovered to a controlled exhaustive exercise and air exposure stressor, the magnitude of response and patterns of recovery differed between species. The more rapid and stronger stress response of pink salmon, as indicated by the accentuated plasma cortisol and lactate, osmoregulatory disturbances, and the higher and more variable gene expression of sockeye salmon may be related to differences in reproductive state between species, although inherent species-specific differences remain a possibility. JUNB and cyt c (pink salmon only) responded to stress but recovered by 24 h, mimicking the general recovery pattern of plasma stress variables and providing new information on how these genes respond and recover following exhaustive exercise stress in wild fish. The magnitude of the plasma stress response was generally higher in females compared to males for both species. Collectively, these results provide new data on the species- and sex-specific nature of how wild, maturing Pacific salmon respond to and recover from fisheries-related exhaustive exercise stress and air exposure. Future research could aim to distinguish whether or not the sex- and species-specific patterns identified here relate to the survival of released fish, which could be important for enhancing Pacific salmon fisheries management.

Acknowledgements

All experimental procedures were approved by the University of British Columbia Animal Care Committee, in accordance with the Canadian Council of Animal Care. This study benefited greatly from the assistance and guidance of A. Lotto, G. Raby, M. Drenner, C. Whitney, S. McConnachie, K. Cook, M. Gale, J. Burt, and A. Collins. We thank the staff at the Weaver Creek spawning channel, particularly R. Stitt and W. Charlie. We thank the Fisheries and Oceans Canada Environmental Watch Program, particularly J. Hills, V. Ives, L. Thompson, M. Hague, D. McKay, T. Nettles, J. Carter, and V. Baudry for providing invaluable help with laboratory assays and logistic support. We thank the Fisheries and Oceans Canada Molecular Genetics Laboratory, particularly T. Ming, S. Li, A. Shulze, K. Kaukinen, and N. Ginther. The research was funded by a Natural Sciences and Engineering Research Council of Canada (NSERC) Strategic Grant. Additional support was provided by the University of British Columbia. M.R.D. was funded by an NSERC Alexander Graham Bell Canada Graduate Scholarship-D3, Mary and David Macaree Fellowship, and University of British Columbia Four Year Fellowship.

References

Barton, B., 2002. Stress in fishes: a diversity of responses with particular reference to changes in circulating corticosteroids. Integr. Comp. Biol. 42, 517–525.
Black, E.C., 1955. Blood levels of hemoglobin and lactic acid in some freshwater fishes following exercise. J. Fish. Res. Board Can. 12, 917–929.
Black, E.C., 1958. Hyperactivity as a lethal factor in fish. J. Fish. Res. Board Can. 5, 573–586.
Black, E.C., Connor, A.R., Lam, K.C., Chiu, W.G., 1962. Changes in glycogen, pyruvate and lactate in rainbow trout (*Salmo gairdneri*) during and following muscular activity. J. Fish. Res. Board Can. 19, 409–436.
Cairns, M.T., Johnson, M.C., Talbot, A.T., Pemmasani, J.K., McNeill, R.E., Houeix, B., Sangrador-Vegas, A., Pottinger, T.G., 2008. A cDNA microarray assessment of gene expression in the liver of rainbow trout (*Oncorhynchus mykiss*) in response to a handling and confinement stressor. Comp. Biochem. Physiol. D 3, 51–66.
Cano, C., Hamidi, T., 2011. Nupr1: the Swiss-knife of cancer. J. Cell. Physiol. 226, 1439–1443.
Chowdhury, U., Samant, R., 2009. Emerging role of nuclear protein 1 (NUPR1) in cancer biology. Cancer Metastasis Rev. 28, 225–232.
Clark, T.D., Donaldson, M.R., Drenner, S.M., Hinch, S.G., Patterson, D.A., Hills, J., Ives, V., Carter, J.J., Cooke, S.J., Farrell, A.P., 2011a. The efficacy of field techniques for obtaining and storing blood samples from fishes. Journal of Fish Biology 79, 1322–1333.
Clark, T.D., Jeffries, K.M., Hinch, S.G., Farrell, A.P., 2011b. Exceptional aerobic scope and cardiovascular performance of pink salmon (Oncorhynchus gorbuscha) may underlie resilience in a warming climate. Journal of Experimental Biology 214, 3074–3081.
Clark, T.D., Farrell, A.P., 2011. Effects of body mass on physiological and anatomical parameters of mature salmon: evidence against a universal heart rate scaling exponent. J. Exp. Biol. 214, 887–893.
Congleton, J.L., 1972. Blood lactate concentrations in pink salmon (*Oncorhynchus gorbuscha*) before and after spawning. Comp. Biochem. Physiol. B 42, 717–720.
Cooke, S.J., Crossin, G.T., Patterson, D.A., English, K.K., Hinch, S.G., Young, J.L., Alexander, J.F., Healey, M.C., Van Der Kraak, G., Farrell, A.P., 2005. Coupling non-invasive physiological assessments with telemetry to understand inter-individual variation in behaviour and survivorship of sockeye salmon: development and validation of a technique. J. Fish Biol. 67, 1342–1358.
Crossin, G.T., Hinch, S.G., Cooke, S.J., Welch, D.W., Patterson, D.A., Jones, S.R.M., Lotto, A.G., Leggatt, R.A., Mathes, M.T., Shrimpton, J.M., Van Der Kraak, G., Farrell, A.P., 2008. Exposure to high temperature influences the behaviour, physiology, and survival of sockeye salmon during spawning migration. Can. J. Zool. 140, 127–140.
Donaldson, M.R., Clark, T.D., Hinch, S.G., Cooke, S.J., Patterson, D.A., Gale, M.K., Frappell, P.B., Farrell, A.P., 2010. Physiological responses of free-swimming adult coho salmon to simulated predator and fisheries encounters. Physiol. Biochem. Zool. 83, 973–983.
Donaldson, M.R., Hinch, S.G., Patterson, D.A., Hills, J., Thomas, J.O., Cooke, S.J., Raby, G.D., Thompson, L.A., Robichaud, D., English, K.K., 2011. The consequences of angling, beach seining, and confinement on the physiology, post-release behaviour and survival of adult sockeye salmon during upriver migration. Fish. Res. 108, 133–141.
Fagerlund, U., 1967. Plasma cortisol concentration in relation to stress in adult sockeye salmon during the freshwater stage of their life cycle. Gen. Comp. Endocrinol. 8, 197–207.
Farrell, A.P., Gallaugher, P.E., Routledge, R., 2001a. Rapid recovery of exhausted adult coho salmon after commercial capture by troll fishing. Can. J. Fish. Aquat. Sci. 2324, 2319–2324.
Farrell, A.P., Gallaugher, P.E., Fraser, J., Pike, D., Bowering, P., Hadwin, A.K.M., Parkhouse, W., Routledge, R., 2001b. Successful recovery of the physiological status of coho salmon on board a commercial gillnet vessel by means of a newly designed revival box. Can. J. Fish. Aquat. Sci. 58, 1932–1946.
Ferguson, R.A., Tufts, B.L., 1992. Physiological effects of brief air exposure in exhaustively exercised rainbow trout (*Oncorhynchus mykiss*): implications for "catch and release" fisheries. Can. J. Fish. Aquat. Sci. 49 (1157-1), 162.
Gale, M., Hinch, S., Eliason, E., Cooke, S.J., Patterson, D.A., 2011. Physiological impairment of adult sockeye salmon in fresh water after simulated capture-and-release across a range of temperatures. Fish. Res. 112, 85–95.
Gingerich, A.J., Suski, C.D., 2012. The effect of body size on post-exercise physiology in largemouth bass. Fish Physiol. Biochem. 38, 329–340.
Heard, W.R., 1991. Life history of pink salmon (*Oncorhynchus gorbuscha*). Pacific Salmon Life Histories. University of British Columbia Press, Vancouver, Canada, pp. 119–230.
Hruska, K.A., Hinch, S.G., Healey, M.C., Patterson, D.A., Larsson, S., Farrell, A.P., 2010. Influences of sexual status and behavior on physiological changes among individual adult sockeye salmon during rapid senescence. Physiol. Biochem. Zool. 83, 663–676.
Iwama, G.K., Afonso, L.O.B., Todgham, A., Ackerman, P., Nakano, K., 2004. Are hsps suitable for indicating stressed states in fish? J. Exp. Biol. 207, 15–19.
Jeffries, K.M., Hinch, S.G., Donaldson, M.R., Gale, M.K., Burt, J.M., Thompson, L.A., Farrell, A.P., Patterson, D.A., Miller, K.M., 2011. Temporal changes in blood variables during final maturation and senescence in male sockeye salmon Oncorhynchus nerka: reduced osmoregulatory ability can predict mortality. J. Fish Biol. 79, 449–465.
Jeffries, K.M., Hinch, S.G., Sierocinski, T., Clark, T.D., Eliason, E.J., Donaldson, M.R., Li, S., Pavlidis, P., Miller, K.M., 2012a. Consequences of high temperatures and premature mortality on the transcriptome and blood physiology of wild adult sockeye salmon (*Oncorhynchus nerka*). Ecol. Evol. 2, 1747–1764.
Jeffries, K.M., Hinch, S.G., Martins, E.G., Clark, T.D., Lotto, A.G., Patterson, D.A., Cooke, S.J., Farrell, A.P., Miller, K.M., 2012b. Sex and proximity to reproductive maturity influence the survival, final maturation, and blood physiology of Pacific salmon exposed to high temperature during a simulated migration. Physiol. Biochem. Zool. 85, 62–73.
Kassahn, K.S., Crozier, R.H., Pörtner, H.O., Caley, M.J., 2009. Animal performance and stress: responses and tolerance limits at different levels of biological organisation. Biol. Rev. 84, 277–292.
Kieffer, J.D., 2000. Limits to exhaustive exercise in fish. Comp. Biochem. Physiol. A 126, 161–179.
Kieffer, J.D., 2010. Perspective — exercise in fish: 50+ years and going strong. Comp. Biochem. Physiol. A 156, 163–168.
Krasnov, A., Koskinen, H., Pehkonen, P., Rexroad, C.E., Afanasyev, S., Mölsä, H., 2005. Gene expression in the brain and kidney of rainbow trout in response to handling stress. BMC Genomics 6, 3.
Kültz, D., 2005. Molecular and evolutionary basis of the cellular stress response. Annu. Rev. Physiol. 67, 225–257.
Lee, C.G., Farrell, A.P., Lotto, A., Hinch, S.G., Healey, M.C., 2003. Excess postexercise oxygen consumption in adult sockeye (*Oncorhynchus nerka*) and coho (*O. kisutch*) salmon following critical speed swimming. J. Exp. Biol. 206, 3253–3260.

Lewis, J.M., Hori, T.S., Rise, M.L., Walsh, P.J., Currie, S., 2010. Transcriptome responses to heat stress in the nucleated red blood cells of the rainbow trout (*Oncorhynchus mykiss*). Physiol. Genomics 42, 361–373.

Livak, K.J., Schmittgen, T.D., 2001. Analysis of relative gene expression data using real-time quantitative PCR and the 2(-Delta Delta C(T)) Method. Methods 25, 402–408.

Loeffler, M., Kroemer, G., 2000. The mitochondrion in cell death control: certainties and incognita. Exp. Cell Res. 256, 19–26.

MacNutt, M.J., Hinch, S.G., Lee, C.G., Phibbs, J.R., Lotto, A.G., Healey, M.C., Farrell, A.P., 2006. Temperature effects on swimming performance, energetics, and aerobic capacities of mature adult pink salmon (*Oncorhynchus gorbuscha*) compared with those of sockeye salmon (*Oncorhynchus nerka*). Can. J. Zool. 84, 88–97.

Mallo, G.V., Fiedler, F., Calvo, E.L., Ortiz, E.M., Vasseur, S., Keim, V., Morisset, J., Iovanna, J.L., 1997. Cloning and expression of the rat p8 cDNA, a new gene activated in pancreas during the acute phase of pancreatitis, pancreatic development, and regeneration, and which promotes cellular growth. J. Biol. Chem. 272, 32360–32369.

Martins, E.G., Hinch, S.G., Patterson, D.A., Hague, M.J., Cooke, S.J., Miller, K.M., Robichaud, D., English, K.K., Farrell, A.P., 2012. High river temperature reduces survival of sockeye salmon approaching spawning grounds and exacerbates female mortality. Can. J. Fish. Aquat. Sci. 69, 330–342.

Mazeaud, M.M., Mazeaud, F., Donaldson, E.M., 1977. Primary and secondary effects of stress in fish: some new data with a general review. Trans. Am. Fish. Soc. 106, 201–212.

McConnachie, S.H., Cook, K.V., Patterson, D.A., Gilmour, K.M., Hinch, S.G., Farrell, A.P., Cooke, S.J., 2012. Consequences of acute stress and cortisol manipulation on the physiology, behavior, and reproductive outcome of female Pacific salmon on spawning grounds. Horm. Behav. 62, 67–76.

Miller, K.M., Schulze, A.D., Ginther, N., Li, S., Patterson, D.A., Farrell, A.P., Hinch, S.G., 2009. Salmon spawning migration: metabolic shifts and environmental triggers. Comp. Biochem. Physiol. D 4, 75–89.

Milligan, C.L., 1996. Metabolic recovery from exhaustive exercise in rainbow trout. Comp. Biochem. Physiol. A 113, 51–60.

Milligan, C.L., Hooke, G.B., Johnson, C., 2000. Sustained swimming at low velocity following a bout of exhaustive exercise enhances metabolic recovery in rainbow trout. J. Exp. Biol. 926, 921–926.

Momoda, T.S., Schwindt, A.R., Feist, G.W., Gerwick, L., Bayne, C.J., Schreck, C., 2007. Gene expression in the liver of rainbow trout, *Oncorhynchus mykiss*, during the stress response. Comp. Biochem. Physiol. D 2, 303–315.

Nielsen, O., Lykkeboe, G., Cossins, A.R., 1992. Oxygenation-activated K fluxes in trout red blood cells. Am. J. Physiol. Cell Physiol. 263, 1057–1064.

Path, G., Opel, A., Knoll, A., Seufert, J., 2004. Nuclear protein p8 is associated with glucose-induced pancreatic beta-cell growth. Diabetes 53, S82–S85.

Patterson, D.A., Macdonald, J.S., Hinch, S.G., Healey, M.C., Farrell, A.P., 2004. The effect of exercise and captivity on energy partitioning, reproductive maturation, and fertilization success in adult sockeye salmon. Journal of Fish Biology 64, 1–21.

Pickering, A., Pottinger, T., Carragher, J., Sumpter, J., 1987. The effects of acute and chronic stress on the levels of reproductive hormones in the plasma of mature male brown trout, *Salmo trutta* L. Gen. Comp. Endocrinol. 68, 249–259.

Piechaczyk, M., Farràs, R., 2008. Regulation and function of JunB in cell proliferation. Biochem. Soc. Trans. 36, 864–867.

Pottinger, T.G., 2010. A multivariate comparison of the stress response in three salmonid and three cyprinid species: evidence for inter-family differences. J. Fish Biol. 44, 601–621.

Pottinger, T.G., Balm, P., Pickering, A., 1995. Sexual maturity modifies the responsiveness of the pituitary–interrenal axis to stress in male rainbow trout. Gen. Comp. Endocrinol. 98, 311–320.

Pottinger, T.G., Carrick, T., Hughes, S., Balm, P., 1996. Testosterone, 11-ketotestosterone, and estradiol-17 [beta] modify baseline and stress-induced interrenal and corticotropic activity in trout. Gen. Comp. Endocrinol. 104, 284–295.

Prunet, P., Cairns, M.T., Winberg, S., 2008. Functional genomics of stress responses in fish. Rev. Fish. Sci. 16, 157–166.

Ramenofsky, M., Wingfield, J.C., 2007. Regulation of migration. Bioscience 57, 135–143.

Ricklefs, R.E., Wikelski, M., 2002. The physiology/life-history nexus. Trends Ecol. Evol. 17, 462–468.

Robinson, K.A., Hinch, S.G., Gale, M.K., Clark, T.D., Wilson, S.M., Donaldson, M.R., Farrell, A. P., Cooke, S.J., Patterson, D.A., 2013. Effects of post-capture ventilation assistance and elevated water temperature on sockeye salmon in a simulated capture-and-release experiment. Conserv. Physiol. http://dx.doi.org/10.1093/conphys/cot015.

Romero, L.M., 2004. Physiological stress in ecology: lessons from biomedical research. Trends Ecol. Evol. 19, 249–255.

Sandblom, E., Clark, T.D., Hinch, S.G., Farrell, A.P., 2009. Sex-specific differences in cardiac control and hematology of sockeye salmon (*Oncorhynchus nerka*) approaching their spawning grounds. Am. J. Physiol. 297, R1136–R1143.

Schreck, C.B., Contreras-Sanchez, W., Fitzpatrick, M., 2001. Effects of stress on fish reproduction, gamete quality, and progeny. Aquaculture 197, 3–24.

Sejersted, O.M., Sjøgaard, G., 2000. Dynamics and consequences of potassium shifts in skeletal muscle and heart during exercise. Physiol. Rev. 80, 1411–1481.

Selye, H., 1936. A syndrome produced by diverse nocuous agents. J. Neuropsychiatry Clin. Neurosci. 10, 230a–231a.

Standen, E.M., Hinch, S.G., Healey, M.C., Farrell, A.P., 2002. Energetic costs of migration through the Fraser River Canyon, British Columbia, in adult pink (*Oncorhynchus gorbuscha*) and sockeye (*O. nerka*) salmon as assessed by EMG telemetry. Can. J. Fish. Aquat. Sci. 59, 1809–1818.

Vamvakopoulos, N.C., Chrousos, G.P., 1994. Hormonal regulation of human corticotropin-releasing hormone gene expression: implications for the stress response and immune/inflammatory reaction. Endocr. Rev. 15, 409–420.

Wagner, T., Congleton, J.L., 2004. Blood chemistry correlates of nutritional condition, tissue damage, and stress in migrating juvenile Chinook salmon (*Oncorhynchus tshawytscha*). Can. J. Fish. Aquat. Sci. 61, 1066–1074.

Wang, Y., Heigenhauser, G.J.F., Wood, C.M., 1994. Integrated responses to exhaustive exercise and recovery in rainbow trout white muscle: acid–base, phosphogen, carbohydrate, lipid, ammonia, fluid volume, and electrolyte metabolism. J. Exp. Biol. 258, 227–258.

Wendelaar Bonga, E., 1997. The stress response in fish. Physiol. Rev. 77, 591–625.

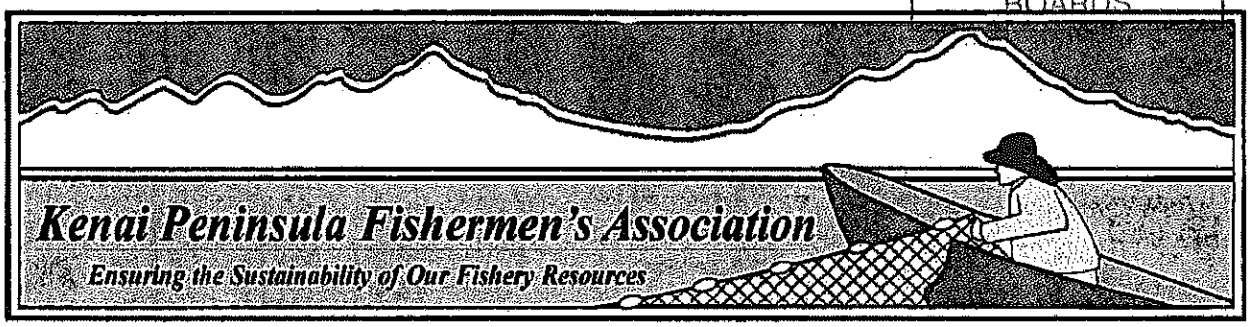
Williams, I.V., Brett, J.R., Bell, G.R., Traxler, G.S., Bagshaw, J., McBride, J.R., Fagerlund, U.H. M., Dye, H.M., Sumpter, J.P., Donaldson, E.M., Bilinski, E., Tsuyuki, H., Peters, M.D., Choromanski, E.M., Cheng, J.H.Y., Coleridge, W.L., 1986. The 1983 early run Fraser and Thompson River pink salmon; morphology, energetics and fish health. International Pacific Salmon Fisheries Commission Bulletin 23, 1–55.

Williams, I.V., Brett, J.R., 1987. Critical swimming speed of Fraser and Thompson River pink salmon (*Oncorhynchus gorbuscha*). Can. J. Fish. Aquat. Sci. 44, 348–356.

Wiseman, H.S., Osachoff, E.B., Malhotra, J., Bruno, J., VanAggelen, G., Mommsen, T.P., Vijayan, M.M., 2007. Gene expression pattern in the liver during recovery from an acute stressor in rainbow trout. Comp. Biochem. Physiol. D 2, 234–244.

Wood, C.M., 1991. Acid–base and ion balance, metabolism, and their interactions, after exhaustive exercise in fish. J. Exp. Biol. 308, 285–308.

Wood, C., Turner, J., Graham, M., 1983. Why do fish die after severe exercise? J. Fish Biol. 22, 189–201.



September 3, 2014

Glenn Haight, Executive Director
Alaska Department of Fish and Game
Boards Support Section
P.O. Box 115526
Juneau, AK 99811-5526

Dear Glenn,

The Kenai Peninsula Fishermen's Association requests and strongly encourages the Alaska Board of Fisheries to hold its 2017 Upper Cook Inlet Finfish meetings on the Kenai Peninsula. The Kenai Peninsula is home to the streams and rivers that nurture the great salmon runs of upper Cook Inlet and to the majority of the people who make their livings harvesting, processing, and otherwise capitalizing on these vital fish. Finfish meetings have not been hosted on the Kenai Peninsula for more than 15 years. The men and women represented by KPFA feel that a Kenai Peninsula meeting will give local fishing groups, businesses as well as commercial and private fishers the opportunity to take part in this important public process.

As the organization that represents more than 746 limited entry permit holders and over 500 individual family businesses that operate on the Kenai Peninsula, we feel that a meeting on the Kenai Peninsula is long overdue. These meetings affect all of our members as well as the thousands of people who are directly and indirectly touched by the Peninsula's salmon-driven economy. It's only right that the meeting be held where the majority of these fisheries take place and within reach of the Alaskans who are impacted the most by the decisions made by the Board of Fish.

Five full board cycles—15 years—have passed since the Kenai Peninsula has hosted the Upper Cook Inlet Finfish Meeting. Here are a few of the reasons that we feel it is imperative that they be held here for the 2017 board cycle:

- Citizens of the City of Kenai and the community of Kasilof, who are directly impacted by the tens of thousands of personal use fishers who descend on their communities each summer to harvest salmon, have had few opportunities to give input on management of those fisheries because the meetings are now held exclusively in Anchorage.

43961 Kalifornsky Beach Road • Suite F • Soldotna, Alaska 99669-8276
(907) 262-2492 • Fax: (907) 262-2898 • E Mail: kpfa@alaska.net

- The majority of the sportfishing activities in Upper Cook Inlet occur on the Kenai Peninsula, yet Peninsula residents have repeatedly had limited access to the Board of Fisheries process which grows more and more anchored to Anchorage.
- By holding the meetings far from those who best know the fisheries, and because attending a two-week meeting in Anchorage is cost-prohibitive, the tremendous resource of local and traditional knowledge regarding the 130-year-old commercial salmon fisheries has all but disappeared from the Board of Fish process.
- For those same reasons, the local and traditional knowledge regarding centuries-old subsistence fisheries has all but disappeared from the Board of Fish process.
- Peninsula businesses that prosper from, and support the commercial, sport and subsistence lifestyles throughout the year would benefit from taking part the deliberations made at these meetings.
- If the meeting is held on the Kenai Peninsula, local businesses including hotels, restaurants, B & B's, retail stores, and gas stations among others, will benefit from the winter boost in revenue during an otherwise slow time of year.
- The Kenai Peninsula is home to many of Upper Cook Inlet's Fish and Game Advisory Committees, Aquaculture, Conservation and Fishing associations and their participation will be enhanced.
- The Kenai and Kasilof rivers run through the Kenai Peninsula Borough and thus all of the sport, personal use and subsistence fisheries supported by those rivers occur within the borough.
- The entire East Side Setnet fishery is conducted within the Kenai Peninsula Borough.
- The entire Drift Fishery is conducted in the Kenai Peninsula Borough.
- All Personal Use Fisheries on the Kenai Peninsula occur within the Kenai Peninsula Borough.
- Virtually all Upper Cook Inlet Saltwater Sport Fisheries are conducted within the Kenai Peninsula Borough.

For these reason and many more, the Board of Directors of the Kenai Peninsula Fisherman's Association submits this letter to the Alaska Board of Fisheries and strongly urges them to hold its 2017 Upper Cook Inlet Finfish meetings on the Kenai Peninsula.

For over a decade and a half the people of the Kenai Peninsula have been marginalized, excluded from the Board of Fish process by distance, cost, and inconvenience, please don't let that continue.

Respectfully

Andy Hall

Andy Hall, President
Kenai Peninsula Fishermen's Association

43961 Kalifornsky Beach Road • Suite F • Soldotna, Alaska 99669-8276
(907) 262-2492 • Fax: (907) 262-2898 • E Mail: kpfa@alaska.net

Kenai
Area
Fisherman's
Coalition
PROTECTING YOUR FISHING RIGHTS & RESOURCES P. O. Box 375 Kenai, Ak. 99611 (907) 283-1054 dwimar@gci.net

Board of Fisheries
ADF&G/ Board Support
P.O. Box 115526
Juneau, Ak. 99811-5526

August 28, 2014

Dear Board Members,

During your upcoming October work session one of the items on the agenda is the site selection for the future 2017 Upper Cook Inlet (UCI) meeting. We are once again requesting that you consider the Kenai / Soldotna area as the location for this meeting. Historically, 80 – 85 percent of the proposals under consideration during an UCI meeting are relative to the Kenai or Kasilof Rivers and adjacent offshore Cook Inlet waters, however, this meeting has not been held in our area since 1999. That includes the normal cycle meetings of 2002, 2005, 2008, 2011, 2014 and a special meeting in 2003. After the 2005 meeting the Board considered and supported a mandate to hold its meetings in locations most appropriate for the matters under consideration, but that has not occurred to date during the UCI cycle. In the past we have asked the Board to consider a method of fairness whereby the meetings would be alternated between the Anchorage / MATSU area and the Kenai / Soldotna area. This would provide fairness to users in both geographic locations that wish to participate.

In 2008 the Board denied a similar request and once again opted for Anchorage as the location for that meeting. The reason given for this decision was that the Board felt Anchorage was a central location. We would ask, central to whom? It is certainly convenient for Anchorage / MATSU folks that can easily commute from their homes on a daily basis, but not so central for folks from the Kenai Peninsula that must drive over a mountain pass in winter conditions and bare the expenses of travel, lodging and meals for the opportunity to participate in the process. This can easily cost $500 - $1,000 for an individual just to participate through the testimony and committee stages.

Despite the expenses incurred by Kenai Peninsula residents to participate we still find that roughly 75 – 80% of the participants are from the Kenai Peninsula area. Right about now you're probably saying, "so what's the problem"? The problem is that nearly all of these participants are from the well-financed special interest groups that can afford to support many participants with funding to cover their expenses. The ones left out of the process are individual private anglers, personal use and subsistence users from the Kenai Peninsula area. This is not a fair process for these folks and should not continue. Alternating meeting locations would bring fairness to the process for everyone interested in UCI fishery issues.

The biggest reason this continues is because of the lobbying power some influential special interest groups maintain over the process. These groups know that as long as they can continue to have the meetings in the Anchorage area they can control the process because other Peninsula users cannot afford to attend at the same level. Private anglers, commercial fishermen and other user groups have repeatedly asked for a fair resolution of this issue by alternating the meeting locations every other Board cycle, thus providing the value of fairness this idea provides. Additionally, prior to the 2005 meeting, our local legislators requested a price

comparison for holding a meeting in the Kenai / Soldotna area versus Anchorage. Because of lower lodging and meeting room costs in the Kenai / Soldotna area the price was comparable. Since then additional hotels, stores and restaurants have been built and provide plenty of comfort and accessibility for Board members, participants and agency folks.

During the 2014 UCI meeting our KAFC representatives repeatedly asked board members to evaluate the participating audience at various junctures in the meeting process to gauge what percentage of the participants in the room were from the Kenai Peninsula area. It was very obvious that after the "public testimony" portion of the meeting the vast majority of remaining participants were from the Kenai Peninsula area.

We still hear the occasional reference to safety issues regarding a Kenai area meeting. It should be mentioned that those concerns are in reference to a isolated incident that occurred during the 1999 UCI meeting held in Soldotna. In 2013 Kenai hosted the "BOF King Salmon Task Force" meetings without incident. The panel, participants and audience were very cordial in their demeanor during difficult discussions from very diverse groups. This should be testament that our area can host a safe and productive UCI BOF meeting process.

We would encourage you to support an alternating UCI meeting schedule starting with the 2017 meeting being held in the Kenai / Soldotna area.

On behalf of private resource users from the Kenai Peninsula we would like to thank you for consideration in this matter.

Respectfully Submitted,

Ed Schmitt – Chairman
Kenai Area Fisherman's Coalition

cc: Gov. Sean Parnell
Sen. Peter Micciche
Rep. Mike Chenault
Rep. Kurt Olson
Rep. Paul Seaton
Cora Campbell, Commissioner ADF&G
Mayor Mike Navarre, Kenai Pen. Borough
Mayor Pat Porter, City of Kenai
Mayor Nels Anderson, City of Soldotna

PO Box 22073
Juneau, AK 99802-2073

halibutcoalition@gmail.com
www.halibutcoalition.org

September 24, 2014

Mr. Karl Johnstone
Chair
Board of Fisheries
PO Box 115526
Juneau, AK 99811-5526

Dear Chair Johnstone and Members of the Board,

Re: ACR 27 Continuation of sport fishing business and guide registration and reporting and vessel registration requirements

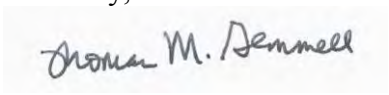
The Halibut Coalition supports the adoption and passage of ACR 27 submitted by ADF&G either for consideration at the first available meeting or by delegating the Board's authority to the Department to modify sport fishing guide regulations within 5AAC 75.075 – 75.085. We believe ACR 27 meets the criteria for consideration out of cycle because it corrects regulations to reflect changes in statute. Until the Legislature adjourned on April 20th after the proposal deadline it was not known that the statutes AS 16.40.260 – 16.40.299 authorizing the guide services licensing the recordkeeping would not be repealed or extended.

Timely reporting of charter harvest is important in the sustainable management of Alaska's fishery resources and is particularly important in regards to the federal management of pacific halibut. The Federal Halibut Charter program is based upon the premise of having a business license/registration in place and more importantly the requirement for a logbook in which the charter client must sign the logbook by regulation to acknowledge that his or her name, license number and number of halibut retained are recorded correctly.

The Halibut Coalition is an association of fishermen (commercial, sport and subsistence), seafood processors, and coastal communities dedicated to sustainable management and harvest of the Alaska halibut resource. The Coalition includes 13 organizations and over 400 individual members.

Thank you for considering our comments.

Sincerely,



Tom Gemmell
Executive Director

KENAI RIVER

Special Management Area

"Working together...for the river"

ADVISORY BOARD

KENAI RIVER SPECIAL MANAGEMENT AREA ADVISORY BOARD

RESOLUTION NO. 2014 - 01

A RESOLUTION OF THE KENAI RIVER SPECIAL MANAGEMENT AREA ADVISORY BOARD, REQUESTING THE ALASKA BOARD OF FISHERIES HOLD ITS 2017 UPPER COOK INLET FINFISH MEETING ON THE KENAI PENINSULA.

WHEREAS, Upper Cook Inlet Finfish issues are vitally important to the Kenai River and the Kenai Peninsula; and

WHEREAS, many local residents and businesses of the Kenai Peninsula depend on, participate in, and are otherwise affected by decisions made by the Board of Fisheries with regard to subsistence fisheries, sport fisheries, commercial fisheries, personal use fisheries and conservation measures in the Kenai River; and

WHEREAS, when making informed decisions regarding finfish issues for the Kenai River, the Board of Fisheries should consider the comments and interests from residents of the Kenai Peninsula; and

WHEREAS, the costs and travel time to attend meetings outside the Kenai Peninsula pose a significant burden to local residents, limiting participation and the Board of Fisheries' ability to benefit from local knowledge; and

WHEREAS, the Alaska Board of Fisheries has not held its full Upper Cook Inlet Finfish meeting on the Peninsula since 1999 despite numerous requests that it do so; and

WHEREAS, holding the meeting on the Kenai Peninsula would show local residents, businesses and communities that the Board of Fisheries listens, cares about and understands the local impacts of its decisions; and

WHEREAS, there are local quality venues of sufficient size with advanced technologic capabilities to host public meetings, as well as exceptional lodging and dining opportunities on the Kenai Peninsula;

NOW, THEREFORE, BE IT RESOLVED BY THE KENAI RIVER SPECIAL MANAGEMENT AREA ADVISORY BOARD:

Section 1. That the Alaska Board of Fisheries is respectfully and strongly urged by the Kenai River Special Management Area Advisory Board to hold the full 2017 Upper Cook Inlet Finfish meeting on the Kenai Peninsula.

Section 2. That this Resolution be forwarded to Governor Sean Parnell, Senator Peter Micciche, Senator Gary Stevens, Speaker Mike Chenault, Representative Kurt Olson, Representative Paul Seaton, Governor's Chief of Staff Mike Nizich, Department of Fish & Game Commissioner Cora Campbell, Alaska Board of Fisheries Members – Karl Johnstone, Orville Huntington, Susan Jeffrey, John Jensen, Fritz Johnson, Thomas Kluberton, Reed Moriskey, Alaska Board of Fisheries Executive Director Glenn Haight

APPROVED BY THE KENAI RIVER SPECIAL MANAGEMENT AREA ADVISORY BOARD THIS 11TH DAY OF SEPTEMBER, 2014.

JOE CONNORS,
KENAI RIVER SPECIAL MANAGEMENT

AREA ADVISORY BOARD PRESIDENT

"Village with a Past, City w

210 Fidalgo Avenue, Kenai, Alaska 99611-7794
Telephone: (907) 283-7535 / FAX: (907) 283-3014
www.ci.kenai.ak.us

the city of
KENAI, ALASKA

September 23, 2014

Glenn Haight
Alaska Department of Fish & Game
PO Box 115526
Juneau, AK 99811-5526

Dear Mr. Haight:

The purpose of this correspondence is to transmit a joint resolution requesting that the Alaska Board of Fisheries (BOF) hold their 2017 Upper Cook Inlet (UCI) Finfish meeting on the Kenai Peninsula. This resolution was unanimously adopted by political subdivisions of the State of Alaska located on the Kenai Peninsula. These are the Kenai Peninsula Borough, and the Cities of Seward, Homer, Seldovia, Soldotna, and Kenai.

The BOF last held its UCI Finfish meeting on the Kenai Peninsula in 1999, even though approximately 80 percent of the issues and proposals considered are based on Kenai Peninsula Fisheries.

There are several venues on the Kenai Peninsula capable of hosting the 2017 BOF meeting. These include, but are not limited to the Kenai Central High School Auditorium/Challenger Learning Center, and the Soldotna Regional Sports Center. The Kenai Peninsula Borough School District is keenly interested in providing support and utilizing the BOF meeting as a learning opportunity for its students.

There are more than sufficient lodging and other support facilities available to support the BOF meeting.

Upon my return on September 29, 2014, I will provide additional information for the BOF work session packet of October 15 &16. It is also my intent to attend the work session along with Brian Gabriel, a Kenai City Council Member. In the event that public participation is allowed at the work session, both Councilor Gabriel and I would request to address the Board of Fish.

Thank you for your attention in this matter.

Sincerely,
CITY OF KENAI
Mm Schahl for

Rick R. Koch
City Manager

Enclosure

cc: Governor Sean Parnell
Mike Nizich, Chief of Staff
Cora Campbell, Commissioner ADF&G
Senator Peter Micciche
Speaker Mike Chenault
Representative Kurt Olson
Mayor Mike Navarre

KENAI PENINSULA BOROUGH
CITY OF HOMER
CITY OF KENAI
CITY OF SELDOVIA
CITY OF SEWARD
CITY OF SOLDOTNA

JOINT RESOLUTION NO. 2014 - 01

A JOINT RESOLUTION OF THE ASSEMBLY OF THE KENAI PENINSULA BOROUGH, COUNCILS OF THE CITY OF HOMER, CITY OF KENAI, CITY OF SELDOVIA, CITY OF SEWARD AND CITY OF SOLDOTNA, REQUESTING THE ALASKA BOARD OF FISHERIES HOLD ITS 2017 UPPER COOK INLET FINFISH MEETING ON THE KENAI PENINSULA.

WHEREAS, Upper Cook Inlet Finfish issues are vitally important to, and directly impact residents, municipal governments and communities on the Kenai Peninsula; and

WHEREAS, many local residents and businesses of the Kenai Peninsula depend on, participate in, and are otherwise affected by decisions made by the Board of Fisheries with regard to subsistence fisheries, sport fisheries, commercial fisheries, personal use fisheries and conservation measures in Upper Cook Inlet; and

WHEREAS, when making informed decisions regarding finfish issues in Upper Cook Inlet, the Board of Fisheries should consider the comments and interests from residents of the Kenai Peninsula; and

WHEREAS, the costs and travel time to attend meetings outside the Kenai Peninsula pose a significant burden to local residents, limiting participation and the Board of Fisheries' ability to benefit from local knowledge; and

WHEREAS, the Alaska Board of Fisheries has not held its Upper Cook Inlet Finfish meeting on the Peninsula since 1999 despite numerous requests that it do so; and

WHEREAS, holding the meeting on the Kenai Peninsula would show local residents, businesses and communities that the Board of Fisheries listens, cares about and understands the local impacts of its decisions; and

WHEREAS, there are local quality venues of sufficient size with advanced technologic capabilities to host public meetings, as well as exceptional lodging and dining opportunities on the Kenai Peninsula;

NOW, THEREFORE, BE IT RESOLVED BY THE KENAI PENINSULA BOROUGH ASSEMBLY, AND THE COUNCILS FOR THE CITY OF HOMER, CITY OF KENAI, CITY OF SELDOVIA, CITY OF SEWARD AND CITY OF SOLDOTNA:

Section 1. That the Alaska Board of Fisheries is respectfully and strongly urged by the Kenai Peninsula municipal governments representing their constituents to hold the 2017 Upper Cook Inlet Finfish meeting on the Kenai Peninsula.

Section 2. That this Joint Resolution be forwarded to Governor Sean Parnell, Senator Peter Micciche, Senator Gary Stevens, Speaker Mike Chenault, Representative Kurt Olson, Representative Paul Seaton, Governor's Chief of Staff Mike Nizich, Department of Fish & Game Commissioner Cora Campbell, Alaska Board of Fisheries Members – Karl Johnstone, Orville Huntington, Susan Jeffrey, John Jensen, Fritz Johnson, Thomas Kluberton, Reed Moriskey, Alaska Board of Fisheries Executive Director Glenn Haight

Section 3. That this resolution takes effect immediately upon approval by the participating city councils.

APPROVED BY THE ASSEMBLY OF THE KENAI PENINSULA BOROUGH THIS 2nd DAY OF September 2014.

KENAI PENINSULA BOROUGH 1964

HAL SMALLEY,
ASSEMBLY PRESIDENT

MIKE NAVARRE,
KENAI PENINSULA BOROUGH MAYOR

ATTEST:

Johni Blankenship, Borough Clerk

APPROVED BY THE COUNCIL OF THE CITY OF HOMER this 8th day of September, 2014.

MARY E. WYTHE, HOMER MAYOR

ATTEST:

Jo Johnson, City Clerk

APPROVED BY THE COUNCIL OF THE CITY OF KENAI this 8th day of September, 2014.

PAT PORTER, KENAI MAYOR

ATTEST:

for Sandra Modigh, City Clerk

APPROVED BY THE COUNCIL OF THE CITY OF SELDOVIA THIS 10 DAY OF September, 2014.

KEITH GAIN, SELDOVIA MAYOR

ATTEST:

For Mary Klinger, City Clerk Deputy Clerk

APPROVED BY THE COUNCIL OF THE CITY OF SEWARD, THIS 11th DAY OF September, 2014.

JEAN BARDARSON, SEWARD MAYOR

CITY OF SEWARD INCORPORATED SEAL JUNE 1, 1912 STATE OF ALASKA

ATTEST:

Johanna Kinney, City Clerk

APPROVED BY THE COUNCIL OF THE CITY OF SOLDOTNA, this 10th day of September, 2014.

NELS ANDERSON, SOLDOTNA MAYOR

ATTEST:

Michelle M. Sarger, City Clerk

MATANUSKA-SUSITNA BOROUGH
FISH AND WILDLIFE COMMISSION
350 East Dahlia Avenue
Palmer, Alaska 99645

September 16, 2014

Alaska Department of Fish and Game
Board Support Section
PO Box 115526
Juneau, Alaska 99811-5526

And
Alaska Board of Fisheries Chairman and members

Good Day to you all,

Welcome back for another cycle of reviewing and implementing fisheries regulations for the various fisheries resources of the State of Alaska. We on the Matanuska-Susitna Borough Fish and Wildlife Commission (MSBFWC) wish you well and safe travels for this upcoming cycle of meetings.

The MSBFWC would like to comment on two items we understand will be coming before you at your workshop in Juneau in October.

The first item, ACR 20, asks you to either redo or undo the methodology you passed at the last Upper Cook Inlet meeting which provides for an orderly closure of the Central District Commercial Drift Net Fishery. This regulation has only been in effect for one season and seemed to work well in providing an orderly transition from sockeye harvest into the potential harvest of pink and chum salmon species. The existing regulations also worked very well in providing ADF&G with a tool to manage the coho fishery primarily for the sport and guided sport fisheries, as stated in management plans for Cook Inlet.

We do not feel that ACR 20 meets the criteria mandated for the Board to accept the proposal as an agenda change and ask that you reject it in this out-of-cycle year for Cook Inlet issues. The proposers can resubmit the concept in two more years, in cycle, and the Board can then better deal with the issue having three years of information and the broadest possible public input in deliberating the concerns expressed. In fact, this approach could be applied to all the Cook Inlet commercial fisheries based ACR's in front of you – let them come up at an in-cycle meeting.

The second issue involves the location of the next Upper Cook Inlet (UCI) meeting. Our understanding is that Kenai/Soldotna would like to host this meeting. The last regulatory meeting held on the Kenai Peninsula resulted in some ugly situations and required the police to be called in to maintain order. Some of our commission

members were present at that meeting and were eye-witnesses to the problems. This is not a conducive atmosphere for developing and implementing what are often controversial fisheries regulations.

We would suggest that the meeting be held in Anchorage as the best available "neutral" location with facilities capable of hosting a potentially two-week long board meeting.

If the Board would prefer to hold a meeting of this controversial nature in an area directly impacted by board actions, then we would suggest holding the next meeting in either Palmer or Wasilla in the Matanuska-Susitna Valley. Our area has NEVER hosted a regularly scheduled Upper Cook Inlet regulatory meeting. Furthermore, our area currently has the unwelcome distinction of having eight (8) of the twelve (12) salmon Stocks of Concern statewide, with several other stocks either eligible or almost so for declaration as Stocks of Concern. If that "distinction" alone doesn't qualify us as an affected area, then what would?

In summary, the MSBFWC asks the Alaska Board of Fisheries to reject ACR 20 as not meeting criteria for an out-of-cycle agenda change and that the Board holds their next UCI meeting in Anchorage.

Thank you,

T. Bruce Knowles
Chairman, MSBFWC

550 S. Alaska St., Ste 101, PO Box 45, Palmer, AK 99645

Tel: (907) 745-2880 Fax: (907) 746-4164

www.palmerchamber.org info@palmerchamber.org

September 25, 2014

Alaska Department of Fish and Game
Board Support Section
PO Box 115526
Juneau, Alaska 99811-5526
and

Alaska Board of Fisheries Chairman and Members

During the last Board of Fisheries meeting in Anchorage, The Greater Palmer Chamber of Commerce worked diligently to inform, and encourage our membership of issues related to Upper Cook Inlet fishery management that effect commerce in our area.

Our Board of Directors would like to voice our support of the 2017 Upper Cook Inlet Board of Fisheries meeting being held once again in Anchorage.

Anchorage provides several convenient transportation and lodging options. It is in geographically the most neutral place when compared with other possible locations. Most importantly, the location should invite and welcome public input and participation. Anchorage fits these needs.

Secondly, we also ask you to take no action on ACR 20 which requests changes be made to the Central District Commercial Drift Net Fishery. We do not think ACR 20 meets the criteria mandated for the Board to accept the proposal. We ask you to reject it in this out-of-cycle year for Cook Inlet issues. We recognize the positive effect the management changes made at the last Board Meeting have had on Northern District Salmon runs and support the continued gathering of information in the years prior to the 2017 UCI BOF Meeting.

We thank you for the opportunity to voice our concerns and weigh in with our recommendations. We appreciate your tireless efforts and work for the fisheries of Alaska.

Respectfully submitted,

David Combs,
President
Greater Palmer Chamber of Commerce

ALASKA STATE LEGISLATURE

Senator Cathy Giessel
Senator Peter Micciche

Representative Mike Chenault
Representative Kurt Olson
Representative Paul Seaton

Kenai Peninsula Delegation

September 24, 2014

Alaska Department of Fish and Game
Glenn Haight, Executive Director; Alaska Board of Fisheries
PO Box 115526
Juneau, Alaska 99811-5526

Dear Director Haight:

The Kenai Peninsula Delegation is writing this to you as a unified voice, requesting that you schedule and hold the 2017 Upper Cook Inlet Finfish Board of Fish (BOF) meetings in the Kenai/Soldotna area.

The time has come to offer these important meetings in locations that are fair and reasonable to all the stakeholders, not just those located near the metropolitan area of Anchorage. A large number of stakeholders are from the Kenai Peninsula who attend at their own considerable time, expense and effort, year after year. It seems appropriate and equitable that, from time to time, the Board of Fish would meet in our vicinity. The last full BOF meeting held here was back in 1999. This request is not unreasonable, given that a vibrant fishing community exists on the waters of Cook Inlet and the Peninsula.

One rationale for the extended period of time since any Kenai Peninsula meetings is the alleged "unruly behavior" by a handful of fishermen at the 1999 meeting that has had a lasting negative effect on some members of the Board. This is unfortunate, but avoiding the Central Peninsula area for BOF meetings for almost 15 years seems a bit over-reactive for a group comprised of professionals and knowledgeable fishermen who know and understand the passions of those who make their living from Alaska waters. There is no denying that the Board of Fisheries process can be contentious, but this is not unique to the Upper Cook Inlet alone. It is time to stop looking back and move forward, for the benefit of all.

Given the fact that over 25% of the proposals considered by the Board of Fish during the past 10 years have been relevant to Upper Cook Inlet fisheries, a meeting here is long overdue. Many of these Upper Cook Inlet specific proposals address the Kenai and Kasilof Rivers' salmon stocks and management goals. Recognizing that impressive 10-year statistic (1075 out of 4196 proposals), a 2017 BOF meeting held in the Kenai/Soldotna area would go a long way in promoting good will and participation from all user groups, commercial, sport, subsistence and personal use fishers alike.

Along with the Kenai Area Fishermen's Coalition, the Kenai Peninsula Borough, the City of Kenai, the City of Soldotna, the City of Homer, the City of Seldovia, the Kenai River Special Management Area Advisory Board (Resolutions attached) and all interested Kenai area fishermen, we strongly urge you to schedule the 2017 Board of Fish meeting in the Central Peninsula area. We would welcome the Board and look forward to an informed, respectful discussion of the prevailing fish issues that come before you.

Respectfully,

Senator Cathy Giessel

Senator Peter Micciche

Rep. Mike Chenault

Rep. Kurt Olson

Rep. Paul Seaton

cc: Governor Sean Parnell
Cora Campbell, Commissioner, Alaska Department of Fish and Game
United Fisherman of Alaska
Kenai Area Fishermen's Coalition
Kenai Peninsula Borough
City of Kenai
City of Soldotna
City of Seldovia
City of Homer
Kenai River Special Management Area Advisory Board

Introduced by:	Mayor, Johnson, Bagley
Date:	09/02/14
Action:	Adopted
Vote:	9 Yes, 0 No, 0 Absent

KENAI PENINSULA BOROUGH
RESOLUTION 2014-056

A RESOLUTION REQUESTING THE UPPER COOK INLET FINFISH MEETING 2017 BE HELD ON THE KENAI PENINSULA AND APPROVING JOINT RESOLUTION 2014-01

WHEREAS, the Upper Cook Inlet finfish industry is a vital and long-standing component of the Kenai Peninsula Borough economy and communities; and

WHEREAS, all Kenai Peninsula residents are affected by Upper Cook Inlet fisheries either directly or indirectly; and

WHEREAS, the regular Upper Cook Inlet Finfish Alaska Board of Fisheries meeting has not been hosted on the Kenai Peninsula since 1999; and

WHEREAS, all Kenai Peninsula residents and businesses benefit from healthy fisheries management, strategies and practices; and

WHEREAS, sound management, strategies and practices are developed by transparent processes, accessible public meetings and user participation, knowledge and representation; and

WHEREAS, conducting the full regular Alaska Board of Fisheries meetings concerning Upper Cook Inlet finfish exclusively in Anchorage instead of rotating locations between Anchorage and on the Kenai Peninsula on a semi-regular basis greatly hampers public participation by Kenai Peninsula residents due to the substantial expense of attending those meetings in Anchorage; and

WHEREAS, all users of public resources are entitled to reasonable access to public meetings and processes concerning matters affecting their economy and lifestyle; and

WHEREAS, holding some of these meetings on the Kenai Peninsula would also improve the amount of testimony about local traditional knowledge to the board, which is a great resource to the Board of Fisheries; and

WHEREAS, it is in the best interest of the residents and visitors to both the Kenai Peninsula and the Anchorage area to maintain healthy well-managed salmon stocks and provide opportunities and access for diverse user groups; and

WHEREAS, Joint Resolution No. 2014-01; A Joint Resolution of the Assembly of the Kenai Peninsula Borough, and Councils of the City of Homer, City of Kenai, City of Seldovia, City of Seward and City of Soldotna, Requesting the Alaska Board of Fisheries Hold its 2017 Upper Cook Inlet Finfish Meeting on the Kenai Peninsula is proposed to be sent to the Alaska Fisheries Board and other interested officials for consideration;

NOW, THEREFORE, BE IT RESOLVED BY THE ASSEMBLY OF THE KENAI PENINSULA BOROUGH:

SECTION 1. That the Alaska Board of Fisheries is respectfully and strongly urged to schedule its full Upper Cook Inlet Finfish Meeting of 2017 and future such meetings on the Kenai Peninsula on a semi-regular basis.

SECTION 2. That Assembly President Hal Smalley and Mayor Mike Navarre are authorized to sign Joint Resolution 2014-01 on behalf of the Kenai Peninsula Borough.

SECTION 3. That this resolution takes effect immediately upon its adoption.

ADOPTED BY THE ASSEMBLY OF THE KENAI PENINSULA BOROUGH THIS 2ND DAY OF SEPTEMBER, 2014.

Hal Smalley

Hal Smalley, Assembly President

ATTEST:

John Blankenship

Johni Blankenship, MMC, Borough Clerk

KENAI PENINSULA BOROUGH 1964

Yes:	Bagley, Haggerty, Johnson, McClure, Ogle, Pierce, Smith, Wolf, Smalley
No:	None
Absent:	None

KENAI PENINSULA BOROUGH
CITY OF HOMER
CITY OF KENAI
CITY OF SELDOVIA
CITY OF SEWARD
CITY OF SOLDOTNA

JOINT RESOLUTION NO. 2014 - 01

A JOINT RESOLUTION OF THE ASSEMBLY OF THE KENAI PENINSULA BOROUGH, COUNCILS OF THE CITY OF HOMER, CITY OF KENAI, CITY OF SELDOVIA, CITY OF SEWARD AND CITY OF SOLDOTNA, REQUESTING THE ALASKA BOARD OF FISHERIES HOLD ITS 2017 UPPER COOK INLET FINFISH MEETING ON THE KENAI PENINSULA.

WHEREAS, Upper Cook Inlet Finfish issues are vitally important to, and directly impact residents, municipal governments and communities on the Kenai Peninsula; and

WHEREAS, many local residents and businesses of the Kenai Peninsula depend on, participate in, and are otherwise affected by decisions made by the Board of Fisheries with regard to subsistence fisheries, sport fisheries, commercial fisheries, personal use fisheries and conservation measures in Upper Cook Inlet; and

WHEREAS, when making informed decisions regarding finfish issues in Upper Cook Inlet, the Board of Fisheries should consider the comments and interests from residents of the Kenai Peninsula; and

WHEREAS, the costs and travel time to attend meetings outside the Kenai Peninsula pose a significant burden to local residents, limiting participation and the Board of Fisheries' ability to benefit from local knowledge; and

WHEREAS, the Alaska Board of Fisheries has not held its Upper Cook Inlet Finfish meeting on the Peninsula since 1999 despite numerous requests that it do so; and

WHEREAS, holding the meeting on the Kenai Peninsula would show local residents, businesses and communities that the Board of Fisheries listens, cares about and understands the local impacts of its decisions; and

WHEREAS, there are local quality venues of sufficient size with advanced technologic capabilities to host public meetings, as well as exceptional lodging and dining opportunities on the Kenai Peninsula;

NOW, THEREFORE, BE IT RESOLVED BY THE KENAI PENINSULA BOROUGH ASSEMBLY, AND THE COUNCILS FOR THE CITY OF HOMER, CITY OF KENAI, CITY OF SELDOVIA, CITY OF SEWARD AND CITY OF SOLDOTNA:

Section 1. That the Alaska Board of Fisheries is respectfully and strongly urged by the Kenai Peninsula municipal governments representing their constituents to hold the 2017 Upper Cook Inlet Finfish meeting on the Kenai Peninsula.

Section 2. That this Joint Resolution be forwarded to Governor Sean Parnell, Senator Peter Micciche, Senator Gary Stevens, Speaker Mike Chenault, Representative Kurt Olson, Representative Paul Seaton, Governor's Chief of Staff Mike Nizich, Department of Fish & Game Commissioner Cora Campbell, Alaska Board of Fisheries Members – Karl Johnstone, Orville Huntington, Susan Jeffrey, John Jensen, Fritz Johnson, Thomas Kluberton, Reed Moriskey, Alaska Board of Fisheries Executive Director Glenn Haight

Section 3. That this resolution takes effect immediately upon approval by the participating city councils.

APPROVED BY THE ASSEMBLY OF THE KENAI PENINSULA BOROUGH THIS 2nd DAY OF September 2014.

KENAI PENINSULA BOROUGH 1964

HAL SMALLEY,
ASSEMBLY PRESIDENT

MIKE NAVARRE,
KENAI PENINSULA BOROUGH MAYOR

ATTEST:

Johni Blankenship, Borough Clerk

APPROVED BY THE COUNCIL OF THE CITY OF HOMER this 8th day of September, 2014.

MARY E. WYTHE, HOMER MAYOR

ATTEST:

Jo Johnson, City Clerk

APPROVED BY THE COUNCIL OF THE CITY OF KENAI this 8th day of September, 2014.

Pat Porter
PAT PORTER, KENAI MAYOR

ATTEST:

for Sandra Modigh, City Clerk

APPROVED BY THE COUNCIL OF THE CITY OF SELDOVIA THIS ___ DAY OF _____, 2014.

KEITH GAIN, SELDOVIA MAYOR

ATTEST:

Mary Klinger, City Clerk

APPROVED BY THE COUNCIL OF THE CITY OF SEWARD, THIS ___ DAY OF _____, 2014.

JEAN BARDARSON, SEWARD MAYOR

ATTEST:

Johanna Kinney, City Clerk

APPROVED BY THE COUNCIL OF THE CITY OF SOLDOTNA, this ___ day of _____, 2014.

NELS ANDERSON, SOLDOTNA MAYOR

ATTEST:

Michelle M. Saner, City Clerk

Introduced By:
Date: Sep[illegible]
Action: Adopted
Vote: 6 Yes, 0 No

CITY OF SOLDOTNA
RESOLUTION 2014-037

A RESOLUTION REQUESTING THE ALASKA BOARD OF FISHERIES HOLD ITS 2017 UPPER COOK INLET FINFISH MEETING ON THE KENAI PENINSULA AND APPROVING JOINT RESOLUTION 2014-01

WHEREAS, Upper Cook Inlet finfish are a vital and long-standing component of the City of Soldotna economy and community; and

WHEREAS, all City of Soldotna residents are impacted by Upper Cook Inlet finfish fisheries either directly or indirectly; and

WHEREAS, the Alaska Board of Fisheries Upper Cook Inlet Finfish regular meeting has not been held on the Kenai Peninsula since 1999; and

WHEREAS, City of Soldotna residents and businesses benefit from informed science based fisheries management, strategies and practices; and

WHEREAS, sound management, strategies and practices are developed by transparent processes, accessible public meetings and user participation, knowledge and representation; and

WHEREAS, conducting the Alaska Board of Fisheries regular meetings concerning Upper Cook Inlet finfish exclusively in Anchorage instead of rotating locations between Anchorage and the Kenai Peninsula greatly hampers public participation by City of Soldotna residents due to the substantial expense and burden of attending multi-day meetings in Anchorage; and

WHEREAS, all users of public resources are entitled to reasonable access to public meetings and processes concerning matters affecting their economy, livelihood and lifestyle; and

WHEREAS, holding the 2017 Alaska Board of Fisheries Upper Cook Inlet Finfish meeting on the Kenai Peninsula would improve the amount of testimony about local traditional knowledge to the board, which is a great resource for the Board of Fisheries; and

WHEREAS, it is in the best interest of the residents and visitors to both the Kenai Peninsula and the Anchorage area to maintain healthy well-managed salmon stocks and provide opportunities and access for diverse user groups; and

WHEREAS, Joint Resolution No. 2014-01; A Joint Resolution of the Assembly of the Kenai Peninsula Borough, and Councils of the City of Homer, City of Kenai, City of Seldovia, City of Seward and City of Soldotna, Requesting the Alaska Board of Fisheries Hold its 2017 Upper Cook Inlet Finfish Meeting on the Kenai Peninsula is proposed to be sent to the Alaska Fisheries Board and other interested officials for consideration;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SOLDOTNA, ALASKA:

Section 1. That the Alaska Board of Fisheries is respectfully and strongly urged to schedule its full Upper Cook Inlet Finfish Meeting of 2017 and future such meetings on the Kenai Peninsula on a semi-regular basis.

Section 2. That Mayor Nels Anderson is authorized to sign Joint Resolution 2014-01 on behalf of the City of Soldotna.

Section 3. This resolution shall become effective immediately upon its adoption.

ADOPTED BY THE CITY COUNCIL THIS 10TH DAY OF SEPTEMBER, 2014.

_____
Nels Anderson, Mayor

ATTEST:

_____
Michelle M. Saner, CMC, City Clerk

Ayes: Bos, Sprague, Murphy, Baxter, Whitney, Daniels
Noes: None

Sponsored by: Mayor Pat Porter
Vice Mayor Ryan Marquis
Council Member Robert Molloy
Council Member Brian Gabriel
Council Member Tim Navarre
Council Member Terry Bookey
Council Member Mike Boyle

CITY OF KENAI

RESOLUTION NO. 2013-06

A RESOLUTION OF THE COUNCIL OF THE CITY OF KENAI, ALASKA, RESPECTFULLY REQUESTING THAT THE ALASKA BOARD OF FISHERIES MEETING, SCHEDULED FOR JANUARY 29, 2014 THROUGH FEBRUARY 11, 2014 TO CONSIDER UPPER COOK INLET FINFISH ISSUES BE HELD ON THE CENTRAL KENAI PENINSULA.

WHEREAS, the consideration of Upper Cook Inlet Finfish issues are important to, and directly affect many residents of the Central Kenai Peninsula; and,

WHEREAS, Central Peninsula residents are comprised of many individuals involved in commercial fisheries, sport fisheries, subsistence fisheries, and personal use fisheries; and,

WHEREAS, many Central Kenai Peninsula residents derive their livelihood from Upper Cook Inlet Fisheries; and,

WHEREAS, it is a significant burden to travel to Anchorage and stay for an extended period to ensure an individual is able to testify before and have their concerns heard by the Alaska Board of Fisheries; and,

WHEREAS, it is consistent with the mission of the Alaska Board of Fisheries to provide an opportunity for affected Alaskans' voices to be heard; and,

WHEREAS, venues of sufficient size having necessary support technology are available in the Central Kenai Peninsula to successfully hold the Alaska Board of Fisheries meeting; and,

WHEREAS, the Municipal Governments and residents of the Central Kenai Peninsula would be gracious hosts, and appreciative of the opportunity to host the Alaska Board of Fisheries.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF KENAI, ALASKA, that the Council respectfully requests that the Alaska Board of Fisheries Meeting scheduled for January 29, 2014 through February 11, 2014 to consider Upper Cook Inlet Finfish Issues be held on the Central Kenai Peninsula.

PASSED BY THE COUNCIL OF THE CITY OF KENAI, ALASKA, this 20th day of February, 2013.

PAT PORTER, MAYOR

RYAN MARQUIS, VICE MAYOR

MIKE BOYLE, COUNCIL MEMBER

TIM NAVARRE, COUNCIL MEMBER

ROBERT MOLLOY, COUNCIL MEMBER

BRIAN GABRIEL, COUNCIL MEMBER

TERRY BOOKEY, COUNCIL MEMBER

ATTEST:

Sandra Modigh, City Clerk

CITY OF HOMER
HOMER, ALASKA

Mayor / Council

RESOLUTION 14-095

A RESOLUTION OF THE CITY COUNCIL OF HOMER, ALASKA REQUESTING THE ALASKA BOARD OF FISHERIES HOLD ITS 2017 UPPER COOK INLET FINFISH MEETING ON THE KENAI PENINSULA AND APPROVING JOINT RESOLUTION 2014-01.

WHEREAS, Upper Cook Inlet finfish are a vital and very important component of the Homer economy and the social and cultural fabric of the community; and

WHEREAS, Homer residents are all impacted by Upper Cook Inlet finfish fisheries either directly or indirectly and many participate in commercial, sport, subsistence, and personal use fisheries there; and

WHEREAS, The Alaska Board of Fisheries Upper Cook Inlet Finfish regular meeting has not been held on the Kenai Peninsula since 1999; and

WHEREAS, City of Homer residents and businesses benefit from informed science based fisheries management, strategies, and practices; and

WHEREAS, Sound management strategies and practices are developed by transparent processes, accessible public meetings, and user participation, knowledge, and representation; and

WHEREAS, Conducting the Alaska Board of Fisheries regular meetings concerning Upper Cook Inlet finfish exclusively in Anchorage instead of rotating between Anchorage and the Kenai Peninsula greatly limits participation by Homer residents because of the substantial expense association with travel and lodging for multi-day meetings in Anchorage; and

WHEREAS, All users of public resources are entitled to reasonable access to public meetings and processes concerning matters affecting their economy, livelihood and lifestyle; and

WHEREAS, Holding the 2017 Alaska Board of Fisheries Upper Cook Inlet Finfish meeting on the Kenai Peninsula would improve the amount of testimony about local traditional knowledge, which is a great resource for the Board of Fisheries; and

WHEREAS, It is in the best interest of the residents and visitors to both the Kenai Peninsula and the Anchorage area to maintain healthy, well managed salmon stocks and provide opportunities and access for diverse user groups; and

WHEREAS, Joint Resolution No. 2014-01; A JOINT RESOLUTION OF THE ASSEMBLY OF THE KENAI PENINSULA BOROUGH, COUNCILS OF THE CITY OF HOMER, CITY OF KENAI, CITY OF SELDOVIA, CITY OF SEWARD, AND CITY OF SOLDOTNA, REQUESTING THE ALASKA BOARD OF FISHERIES HOLD ITS

2017 UPPER COOK INLET FINFISH MEETING ON THE KENAI PENINSULA, is proposed to be sent to the Alaska Board of Fisheries and other interested parties for consideration.

NOW, THEREFORE, BE IT RESOLVED that the Alaska Board of Fisheries is respectfully and strongly urged to schedule its full Upper Cook Inlet Finfish Meeting of 2017 and future such meetings on the Kenai Peninsula on a semi-regular basis.

BE IT FURTHER RESOLVED that the Homer City Council hereby expresses its support for Joint Resolution 2014-01 and authorizes Mayor Wythe to sign it on behalf of the City of Homer.

PASSED AND ADOPTED by the Homer City Council this 8th day of September, 2014.

CITY OF HOMER

MARY E. WYTHE, MAYOR

ATTEST:

JO JOHNSON, MMC, CITY CLERK

Fiscal Note: N/A

CITY OF SELDOVIA
RESOLUTION 15-04

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SELDOVIA, ALASKA REQUESTING THE ALASKA BOARD OF FISHERIES HOLD ITS 2017 UPPER COOK INLET FINFISH MEETING ON THE KENAI PENINSULA AND APPROVING JOINT RESOLUTION 2014-01

WHEREAS, City of Seldovia is located on the southern portion of the Kenai Peninsula and waters of Cook Inlet; and

WHEREAS, many local residents are impacted by Upper Cook Inlet Finfish fisheries either directly or indirectly; and

WHEREAS, conducting the Alaska Board of Fisheries Upper Cook Inlet Finfish meeting exclusively in Anchorage hinders local attendance, participation and knowledge due to the expenses and time required to travel such distances; and

WHEREAS, all users of public resources are entitled to reasonable access to public meetings and processes concerning matters affecting their economy, livelihood and lifestyle; and

WHEREAS, holding the 2017 Alaska Board of Fisheries Upper Cook Inlet Finfish meeting on the Kenai Peninsula would improve that access for locals; and

WHEREAS, Joint Resolution No. 2014-01; A Joint Resolution of the Assembly of the Kenai Peninsula Borough, and Councils of the City of Homer, City of Kenai, City of Seldovia, City of Seward and City of Soldotna, Requesting the Alaska Board of Fisheries hold its 2017 Upper Cook Inlet Finfish Meeting on the Kenai Peninsula is proposed to be sent to the Alaska Fisheries Board and other interested officials for consideration.

NOW THEREFORE BE IT RESOLVED THAT: The City Council by this resolution respectfully request the Alaska Board of Fisheries hold its Upper Cook Inlet Finfish Meeting on the Kenai Peninsula in 2017 as well as in the future on a semi-regular basis.

BE IT FURTHER RESOLVED THAT: The City Council by this resolution authorizes Mayor Keith Gain to sign Joint Resolution 2014-01 on behalf of the City of Seldovia.

PASSED and APPROVED by a duly constituted quorum of the City Council of Seldovia, Alaska, this 10th day of September 2014

SIGNED: _____
Mayor, Keith Gain

ATTEST: _____
City Clerk, Mary Klinger

Kenai
Area
Fisherman's
Coalition
PROTECTING YOUR FISHING RIGHTS & RESOURCES P. O. Box 375 Kenai, Ak. 99611 (907) 283-1054 dwimar@gci.net

Board of Fisheries
ADF&G/ Board Support
P.O. Box 115526
Juneau, Ak. 99811-5526

August 28, 2014

Dear Board Members,

During your upcoming October work session one of the items on the agenda is the site selection for the future 2017 Upper Cook Inlet (UCI) meeting. We are once again requesting that you consider the Kenai / Soldotna area as the location for this meeting. Historically, 80 – 85 percent of the proposals under consideration during an UCI meeting are relative to the Kenai or Kasilof Rivers and adjacent offshore Cook Inlet waters, however, this meeting has not been held in our area since 1999. That includes the normal cycle meetings of 2002, 2005, 2008, 2011, 2014 and a special meeting in 2003. After the 2005 meeting the Board considered and supported a mandate to hold its meetings in locations most appropriate for the matters under consideration, but that has not occurred to date during the UCI cycle. In the past we have asked the Board to consider a method of fairness whereby the meetings would be alternated between the Anchorage / MATSU area and the Kenai / Soldotna area. This would provide fairness to users in both geographic locations that wish to participate.

In 2008 the Board denied a similar request and once again opted for Anchorage as the location for that meeting. The reason given for this decision was that the Board felt Anchorage was a central location. We would ask, central to whom? It is certainly convenient for Anchorage / MATSU folks that can easily commute from their homes on a daily basis, but not so central for folks from the Kenai Peninsula that must drive over a mountain pass in winter conditions and bare the expenses of travel, lodging and meals for the opportunity to participate in the process. This can easily cost $500 - $1,000 for an individual just to participate through the testimony and committee stages.

Despite the expenses incurred by Kenai Peninsula residents to participate we still find that roughly 75 – 80% of the participants are from the Kenai Peninsula area. Right about now you're probably saying, "so what's the problem"? The problem is that nearly all of these participants are from the well-financed special interest groups that can afford to support many participants with funding to cover their expenses. The ones left out of the process are individual private anglers, personal use and subsistence users from the Kenai Peninsula area. This is not a fair process for these folks and should not continue. Alternating meeting locations would bring fairness to the process for everyone interested in UCI fishery issues.

The biggest reason this continues is because of the lobbying power some influential special interest groups maintain over the process. These groups know that as long as they can continue to have the meetings in the Anchorage area they can control the process because other Peninsula users cannot afford to attend at the same level. Private anglers, commercial fishermen and other user groups have repeatedly asked for a fair resolution of this issue by alternating the meeting locations every other Board cycle, thus providing the value of fairness this idea provides. Additionally, prior to the 2005 meeting, our local legislators requested a price comparison for holding a meeting in the Kenai / Soldotna area versus Anchorage. Because of lower lodging and meeting room costs in the Kenai / Soldotna area the price was comparable. Since then additional hotels, stores

and restaurants have been built and provide plenty of comfort and accessibility for Board n and agency folks.

During the 2014 UCI meeting our KAFC representatives repeatedly asked board members to evaluate the participating audience at various junctures in the meeting process to gauge what percentage of the participants in the room were from the Kenai Peninsula area. It was very obvious that after the "public testimony" portion of the meeting the vast majority of remaining participants were from the Kenai Peninsula area.

We still hear the occasional reference to safety issues regarding a Kenai area meeting. It should be mentioned that those concerns are in reference to a isolated incident that occurred during the 1999 UCI meeting held in Soldotna. In 2013 Kenai hosted the "BOF King Salmon Task Force" meetings without incident. The panel, participants and audience were very cordial in their demeanor during difficult discussions from very diverse groups. This should be testament that our area can host a safe and productive UCI BOF meeting process.

We would encourage you to support an alternating UCI meeting schedule starting with the 2017 meeting being held in the Kenai / Soldotna area.

On behalf of private resource users from the Kenai Peninsula we would like to thank you for consideration in this matter.

Respectfully Submitted,

Ed Schmitt – Chairman
Kenai Area Fisherman's Coalition

cc: Gov. Sean Parnell
Sen. Peter Micciche
Rep. Mike Chenault
Rep. Kurt Olson
Rep. Paul Seaton
Cora Campbell, Commissioner ADF&G
Mayor Mike Navarre, Kenai Pen. Borough
Mayor Pat Porter, City of Kenai
Mayor Nels Anderson, City of Soldotna

KENAI RIVER

Special Management Area

"Working together...for the river"

ADVISORY BOARD

KENAI RIVER SPECIAL MANAGEMENT AREA ADVISORY BOARD

RESOLUTION NO. 2014 - 01

A RESOLUTION OF THE KENAI RIVER SPECIAL MANAGEMENT AREA ADVISORY BOARD, REQUESTING THE ALASKA BOARD OF FISHERIES HOLD ITS 2017 UPPER COOK INLET FINFISH MEETING ON THE KENAI PENINSULA.

WHEREAS, Upper Cook Inlet Finfish issues are vitally important to the Kenai River and the Kenai Peninsula; and

WHEREAS, many local residents and businesses of the Kenai Peninsula depend on, participate in, and are otherwise affected by decisions made by the Board of Fisheries with regard to subsistence fisheries, sport fisheries, commercial fisheries, personal use fisheries and conservation measures in the Kenai River; and

WHEREAS, when making informed decisions regarding finfish issues for the Kenai River, the Board of Fisheries should consider the comments and interests from residents of the Kenai Peninsula; and

WHEREAS, the costs and travel time to attend meetings outside the Kenai Peninsula pose a significant burden to local residents, limiting participation and the Board of Fisheries' ability to benefit from local knowledge; and

WHEREAS, the Alaska Board of Fisheries has not held its full Upper Cook Inlet Finfish meeting on the Peninsula since 1999 despite numerous requests that it do so; and

WHEREAS, holding the meeting on the Kenai Peninsula would show local residents, businesses and communities that the Board of Fisheries listens, cares about and understands the local impacts of its decisions; and

WHEREAS, there are local quality venues of sufficient size with advanced technologic capabilities to host public meetings, as well as exceptional lodging and dining opportunities on the Kenai Peninsula;

NOW, THEREFORE, BE IT RESOLVED BY THE KENAI RIVER SPECIAL MANAGEMENT AREA ADVISORY BOARD:

Section 1. That the Alaska Board of Fisheries is respectfully and strongly urged by the Kenai River Special Management Area Advisory Board to hold the full 2017 Upper Cook Inlet Finfish meeting on the Kenai Peninsula.

Section 2. That this Resolution be forwarded to Governor Sean Parnell, Senator Peter Micciche, Senator Gary Stevens, Speaker Mike Chenault, Representative Kurt Olson, Representative Paul Seaton, Governor's Chief of Staff Mike Nizich, Department of Fish & Game Commissioner Cora Campbell, Alaska Board of Fisheries Members – Karl Johnstone, Orville Huntington, Susan Jeffrey, John Jensen, Fritz Johnson, Thomas Kluberton, Reed Moriskey, Alaska Board of Fisheries Executive Director Glenn Haight

APPROVED BY THE KENAI RIVER SPECIAL MANAGEMENT AREA ADVISORY BOARD THIS 11TH DAY OF SEPTEMBER, 2014.

JOE CONNORS,
KENAI RIVER SPECIAL MANAGEMENT

AREA ADVISORY BOARD PRESIDENT

KENAI RIVER SPORTFISHING
ASSOCIATION

September 29, 2014
Alaska Department of Fish and Game
Glenn Haight, Executive Director, Alaska Board of Fisheries
PO Box 115526
Juneau, AK 99811-5526

Dear Director Haight;

Kenai River Sportfishing Association (KRSA) provides the following comments on Agenda Change Requests (ACR 12 – ACR 21) addressing the Upper Cook Inlet (UCI) Area for the 2014 Alaska Board of Fisheries (BOF) work session.

General Comments:
The criteria used to judge whether an issue warrants consideration by the BOF outside of the normal three-year cycle is established in regulation and is found in 5 AAC 39.999. Only three reasons for potential acceptance are set forth in this regulation and they are:

1) For a fishery conservation purpose or reason;
2) To correct an error in regulation; or
3) To correct an effect on a fishery that was unforeseen when a regulation was adopted.

The regulation goes on to state that the BOF will not accept an agenda change request (ACR) that is predominantly allocative in nature in the absence of new information that is found by the board to be compelling.

The conservation of Cook Inlet king salmon, particularly those late-run kings bound for the Kenai River, was the major focus of the BOF 2014 UCI meeting. Historic low numbers of Kenai River late-run king salmon, changes in the sustainable escapement goal and extreme challenges in meeting the minimum goal without dramatic fishery closures obligated the BOF and the Alaska Department of Fish and Game (ADFG) to thoroughly consider and adopt significant changes to fishery management plans. Low numbers of Kenai River late-run king salmon are expected for the next few years, at least through this regulatory cycle.

The regularly scheduled UCI meeting of the BOF took place January 31 through February 13, 2014 in Anchorage. A total of 236 proposals were considered at this meeting. A total of 477 on-time public comments were received. A total of 289 record copies (RC's) are shown in the meeting log. Hundreds of individuals provided public testimony and participated in this meeting. Clearly this meeting was a significant event and the acceptance of an ACR now, opening the discussion on a major management plan, opens discussion on a very broad range of issues that could potentially affect thousands if not hundreds of thousands of fishermen. If the BOF were to accept each of the ACR requests it would be opening for deliberation the Kasilof River Salmon Management Plan, the Kenai River Late-Run King Salmon Management Plan, the Central District Drift Gillnet Fishery Management Plan, the Upper Cook Inlet Personal Use Salmon Fishery Management Plan as well as set gillnet specifications, operations and set gillnet registration procedures.

Regarding the criteria, conservation purpose or reason can be defined as broadly as any action pertaining to the "wise use" of a fishery resource; however, it has been much more narrowly considered by previous Boards when judging the appropriateness of accepting an ACR. Errors in regulation are generally easy to identify and correct. The third criteria, "correct an effect on a fishery that was unforeseen when the regulation was adopted" like the first can be broadly or more narrowly utilized. For a particularly multifaceted mixed stock, mixed species fishery complex like that found in Cook Inlet, it is likely impossible to consider each and every effect on the array of fisheries at the time a management plan is adopted. One of the stated reasons for the regular three-year cycle of the BOF is to allow management to evolve, issues to be identified and evaluated and adaptive management to respond.

Comments specific to ACR's 13 through 21 follow. However, as a general comment, KRSA's contention is that none meet a careful application of the criteria, each of these requests address an issue that was discussed in great detail by the BOF at the 2014 UCI regularly scheduled meeting, some have also been requested and denied through the Emergency Petition process and most have significant allocative implications. As such, ACR's 13 through 21 should all be denied.

ACR 13 - Add provision to the Kasilof River Salmon Management Plan to allow the commercial set gillnet fishery in the Kasilof Section to be opened within one-half mile of shore when the department is concerned with the conservation of king or sockeye salmon headed to the Kenai River (5 AAC 21.365(f)).
KRSA comment on ACR 13: KRSA recommends denial for ACR 13. Conservation of late-run king salmon during these years of historic low numbers is of paramount importance and clearly more important than striving to commercially harvest all available sockeye salmon bound for the Kasilof River. While changes to area restrictions may potentially have merit those proposed within ACR 13 do

not justify jeopardizing the conservation measures put in place during the regularly scheduled meeting to protect late-run king salmon. ACR 13 does not address an error in regulation. The author of ACR 13 makes the claim that increased use of the Kasilof River Special Harvest Area (KRSHA) was unforeseen by the BOF during the regularly scheduled meeting. A careful review of the record establishes that this is a false claim. The author of ACR 13 also makes the claim that increased use of the KRSHA necessitated by the obligation to conserve late-run king salmon results in a reallocation of commercial harvest to those commercial fishermen who choose to participate in the special harvest area fishery. This claim represents a focus on allocation and the information provided does not meet the standard of compelling new information. The use and character of the KRSHA fishery were each discussed in detail during the regularly scheduled meeting.

ACR 14 - Add provisions to the Gillnet specifications and operations section and the Kasilof River Salmon Management Plan allowing for the department to restrict mesh size to no larger than 4 1/4 inches in the Kasilof Section set gillnet commercial fishery when the Kasilof River salmon escapement goal is being met or exceeded (5 AAC 21.331 (b), 5AAC 21.365).
KRSA comments on ACR 14: KRSA recommends denial for ACR 14. Conservation of late-run king salmon during these years of historic low numbers is of paramount importance and clearly more important than striving to commercially harvest all available sockeye salmon bound for the Kasilof River. While changes to gear restrictions may potentially have merit those proposed within ACR 14 do not justify jeopardizing the conservation measures put in place during the regularly scheduled meeting to protect late-run king salmon. ACR 14 does not address an error in regulation. The author of ACR 14 makes the claim that gear restrictions were not addressed during the regularly scheduled meeting. A careful review of the record establishes that this is a false claim.

ACR 15 - Amend provisions within the Kenai River Late-Run King Salmon Management Plan that restrict set gillnetting in the Upper Subdistrict to no more than 12 or 36 hours per week by allowing the department to manage the Kasilof and Kenai/East Foreland sections separately of each other (5 AAC 21.359 (e)(3)(A) and (B)).

ACR 16 - Amend provisions within the Kenai River Late-Run King Salmon Management Plan that restrict set gillnetting in the Upper Subdistrict to no more than 36 hours per week by allowing the department to manage the Kasilof and Kenai/East Forelands sections separately of each other (5 AAC 21.359 (e)(3)(A).
KRSA comments on ACR 15 and ACR 16: KRSA recommends denial for both ACR 15 and ACR 16. ACR 15 and ACR 16 are essentially identical to an Emergency Petition submitted to the BOF by the South K-Beach Independent Fishermen (SOKI) in March 2014. The BOF rejected the Emergency Petition at that time and KRSA recommends that the BOF take this opportunity to reject these similar requests

that come to them in the form of ACR's. Conservation of late-run king salmon during these years of historic low numbers is of paramount importance and clearly more important than further jeopardizing the sustainability of late-run king salmon in an effort to commercially harvest all available sockeye salmon bound for the Kasilof and Kenai rivers. The authors of these ACR's each make only the case that acceptance of their ACR and proposed solution would correct an effect on a fishery that was unforeseen when a regulation was adopted. A careful review of the record clearly establishes this to be a false claim and further illustrates that the subject of limiting hours of fishing time for the commercial set net fishery in the Upper Subdistrict was a central issue of the regularly scheduled meeting and discussed in great detail.

ACR 17 - Modify the Kenai River Late-Run King Salmon Management Plan (5 AAC 21.359(e)) to allow up to four set gillnets per permit to be fished that do not exceed 105 fathoms in the aggregate, with no single net exceeding 35 fathoms in length, consistent with (5 AAC 21.359(f)).
KRSA comments on ACR 17: KRSA recommends denial of ACR 17. Conservation of late-run king salmon during these years of historic low numbers is of paramount importance and clearly more important than further jeopardizing the sustainability of late-run king salmon in an effort to optimize the commercial harvest all available sockeye salmon bound for the Kasilof and Kenai rivers by each and every individual set net permit holder. As the author of ACR states, the BOF was aware of the issue addressed in ACR 17 during the course of their regularly scheduled meeting but chose to take no action on it. Since ACR 17 addresses 5 AAC 21.359 acceptance of this ACR would legally open a discussion on the entirety of the Kenai River Late-Run King Salmon Management Plan out of cycle.

ACR 18 - Eliminate restrictions in August to the Upper Subdistrict set gillnet commercial fishery by deleting provision (f) in the Kenai River Late-Run King Salmon Management Plan (5 AAC 21.359 (f)).
KRSA comments on ACR 18: KRSA recommends denial of ACR 18. ACR 18 clearly falls short of meeting the established criteria for acceptance. A careful review of the record of the regularly scheduled meeting shows a long and deliberative discussion around the management of the set gill net fishery in the Upper Subdistrict during August in years when the projected escapement of Kenai River late-run king salmon is near the lower bound of the sustainable escapement goal range. The BOF clearly has the authority to set management objectives and adopt regulations designed to implement strategies to achieve those objectives and that is what occurred during the regularly scheduled meeting. ACR 18 simply requests a rehearing of an issue that received adequate consideration during the regularly scheduled meeting.

ACR 19 – Allow a person who owns two set gillnet permits to register and operate the permits in different registration areas in Cook Inlet (5 AAC 21.345).

KRSA comments on ACR 19: KRSA recommends denial of ACR 19 based on the fact that this request does not meeting any of the criteria for acceptance of an ACR. Ownership of more than one permit also referred to as permit stacking has been allowed in the UCI set net fishery since 2011. The substance of this request should only be address during a regularly scheduled meeting not through acceptance of an ACR.

ACR 20 – Modify how the one percent rule in August is calculated for the Central District drift gillnet fishery in Upper Cook Inlet (5 AAC 21.353(e)).
KRSA comments on ACR 20: KRSA recommends denial of ACR 20 based on the fact that the request does not meet the criteria for acceptance of an ACR. A careful review of the record of the regularly scheduled meeting shows a long, detailed, deliberate discussion around all aspects of the Central District Drift Gillnet Fishery Management Plan including the development of a "1%" rule. The BOF decided to prioritize moving salmon bound for the rivers and streams of the Northern District of Upper Cook Inlet north to those streams over maximizing the commercial drift gillnet harvest of all stocks and species present in the Central District during August. The adoption of a "1%" rule was the tool chosen by the BOF to effect an orderly closure of the Drift Gillnet Fishery. There was no error in regulation and the effect on the harvest of all salmon was clearly not unforeseen.

ACR 21 – Establish a tier drawing and limit harvest in the Upper Cook Inlet personal use salmon fishery (5 AAC 77.540).
KRSA comments on ACR 21: KRSA recommends denial of ACR 21 on the grounds that ACR 21 does not even minimally meet any of the criteria for acceptance of an ACR. The BOF was presented with a total of 25 proposals addressing the Upper Cook Inlet Personal Use Salmon Fishery and made these proposals the subject of committee A during the course of the meeting. The claim that this ACR seeks to correct an effect on a fishery that was unforeseen when a regulation was adopted is simply false and the author's request is clearly allocative in the absence of new information.

Thank you for the opportunity to provide comments on the agenda change requests under consideration by the BOF during its fall work session.

Respectfully,

Ricky Gease, Executive Director
Kenai River Sportfishing Association

TROUT UNLIMITED

September 22, 2014

Alaska Board of Fisheries
ADF&G/ Board Support
P.O. Box 115526
Juneau, AK 99811--5526

Dear Board Members:

As most of you are aware Trout Unlimited ("TU") is a national conservation organization dedicated to the protection and restoration of coldwater fisheries and their habitats. We have more than 140,000 members nation---wide with 1100 sportsmen and women in Alaska who are TU members. This number continues to grow each year and we have chapters in both Anchorage and on the Kenai Peninsula, along with Juneau and Fairbanks. Trout Unlimited's Alaska Program is joining with our Kenai Chapter in requesting that during your October work session you address the location of the 2017 Upper Cook Inlet (UCI) meeting. With the majority of the proposals under consideration most often pertaining to the Kenai or Kasilof Rivers, or the salt water adjacent to these rivers, we would respectfully request that you consider the Kenai/Soldotna area as the location for the 2017 meeting.

Many of our members from the Kenai Peninsula feel that continually holding the UCI meeting in Anchorage leaves them, the private angler, out of the process. We believe a more fair and balanced approach would be alternating locations between board cycles. This would allow our members who have jobs and family matters, or who are otherwise unable to travel and spend a week away from home, to still participate in the process. Therefore, we encourage you to begin alternating locations, starting with the 2017 UCI meeting.

On behalf of our members from the Kenai Peninsula we would like to thank you for dedicating your time to Alaska fisheries management and consideration in this matter.

Sincerely,

Tim Bristol
Trout Unlimited Alaska

Branden Bornemann
Kenai Peninsula Trout Unlimited Chapter President

September 27, 2014

To: Alaska Board of Fish Chairman Karl Johnston and Board Members:

RE: ACR 26

I would like to weigh in on Leroy Cabana's ACR 26 requesting the BOF put into regulation a sensible and enforceable definition for the 58 foot limit for Alaskan seine boats. At present the 58 foot limit is not being enforced because the bow roller exemption muddies up the definition of "length overall". As more and more seine vessels are being modified to increase packing capacity, the "bow roller"exemption is increasingly being used as an excuse to lengthen them beyond the 58 foot limit. An extra 2 feet or more added to a fish hold in a boat 18 to 24 feet wide represents a significant addition to the boats payload capacity. If the BOF doesn't clean up the language defining length overall, then we all might as well start gaming the system and lengthen our boats beyond what we all know is an actual 58 foot LOA. ACR 26 is long over due and I hope the BOF enacts a 58 ft definition that is enforceable. The Bristol Bay 32 foot limit is enforced, why not the 58 ft seiner limit?

Respectfully,

Beaver Nelson
F.V. Nuka Point
Homer, AK 99603

Timothy J. Moore

PO Box 1646

Homer, AK. 99603

Dear Alaska Board of Fish Chairman Johnstone and other members:

I am submitting comments in regard to ACR 26 which addresses (AAC 39.117) and attempts to clarify anchor rollers in regard to the 58 foot limit on purse seine vessels.

I am a salmon seiner in Prince William Sound and have fished there for 24 years.

I believe that the 58 foot limit helps to stabilize the fishing fleet and believe it should be continued. The law protects the present fishermen with Legal vessels that everyone will be playing by the same rules.

It became apparent this year that the method of measuring vessels was somewhat confusing. Without defining anchor rollers enforcement officers do not have definitive measuring methods to ensure compliance with the law.

I believe it would be not only in the best interest of the fishing fleet but also the State of Alaska to clarify measuring vessels so that this law can be clear to not only fishermen but the officers who are attempting to enforce it.

Anchor rollers should not be defined so unclear that fishermen can make extensions to their hull length over legal limits. I respectfully ask the Board to add definitions for anchor rollers to clarify this regulation.

Respectfully,

Timothy J Moore

Timothy J Moore

September 24 2014

Leroy L Cabana

3698 Sitka Rose Circle, Homer Alaska 99603

Alaska Board of Fish Chairman Karl Johnstone and Members

I am summiting written comment for my ARC 26,

Currently the overall length of all Alaska purse seine vessels are limited to 58 feet, there are two exceptions to this regulation, one is a " Bulbous Bow" and the other is the vessels "Anchor Roller"

The exception to the Bulbous Bow is straight forward and includes a BOF adopted definition. (b) "For the purposes of this section, <bulbous bow> means a bulbous extension of the bow. Below or predominately below the waterline of a vessel that is designed to increase stability or fuel efficiency and does not contain storage or equipment that can be accessed from within the vessel"

A definition of an anchor roller does not exist in the regulation book. There are BOF definitions for abalone iron, shovel, anchor and on and on but no definition of an anchor roller. One could conclude a definition of an anchor roller is not necessary as pretty much any person that's been around a fishing boat long enough to drop an anchor would likely know the anchor roller is a small 3-6 inch diameter roller held in place by two ears 4 inches to 12 inches in size designed to guide the cable or chain while dropping or pulling the anchor. Well it turns out some vessel owners whom want their vessels to exceed the 58 foot overall limit for salmon purse seine vessels in Alaska have confused an anchor roller for a bolt on bow section. These are two completely different items. Like I stated above an anchor rollers purpose is to guide the cable or chain for tending the anchor. The bolt on bow has a completely different purpose, it is for slipping around the 58 foot limit regulation and thus be fishing with an over length purse seiner while the rest of the salmon fleet fishes with a legal length vessel.

The 58 foot limit has been around since federal days starting in 1928, Alaska adopted the regulation at statehood. In 1962 the state of Alaska had to react to an earlier attempt by fishermen to circumvent the 58 foot limit by redefining the overall length to 58 feet " except for vessels with a history of purse seining before Jan 1 1962" In those days Alaska accepted the US Coast Guard documented length. Back then the US Coast Guard used {keel length} to determine a vessels length, so several fishermen had purse seine vessels built that were 60 to 75 feet long built but just had them built with a 58 foot keel. Thus they were documented as 58 feet. Alaska has a strong history of trying to keep the salmon fisheries tilted towards small owner/operator fleets which is reflected in the Bristol Bay drift gillnet fishery which has a 32 foot limit and all purse seine vessels fishing for salmon in Alaska which are restricted to 58 feet.

The realization there is a small number of vessel owners whom are building and or extending existing vessels to longer than 58 feet occurred to me in Homer Alaska this spring. I was walking from my vessel on the Homer floating dock to my truck when I almost hit my head on the hanging anchor on a salmon purse seine vessel that was parked in a 60 foot slip. As I was walking by the boat I looked to see if the captain was aboard as I was thinking why did he not park back in the slip farther so his anchor was not

over the walk way. This is where I got confused, the vessel I was looking at was to long to fit in the 60 foot slip, the stern extended past the end of the float by a foot and a half and the anchor was hanging over the float. Now I knew this vessel was built by Little Hoquiam as a 54 foot seiner. And I knew the slip was 60 foot. The next day I walked down and measured the slip with my 100 foot survey tape, yup the slip was 60 feet long and the boat was still hanging out a foot and a half. Standing there I was wondering if other boats were longer than 58 feet, I measured several and found five salmon purse seine vessels at least 60 foot and even longer. I called the State Troopers and filed a complaint, I wanted them to come down and measure the vessels and notify the owners they were to long to fish salmon. The trooper assured me they would but it never happened. On May 15 2014, I sent a written complaint to the Troopers and they informed me the vessels were not breaking the law until they engaged in salmon purse seining. Ok we wait until the salmon season in PWS and then again I call the Troopers and am told they will check it out. This is where the anchor roller vs a bolt on bow section caused confusion, when the troopers attempt to measure the vessels the owners tell them they have to measure from where the bow bolts on, which in several cases is a section three feet long or longer. I guess everyone simply looses the part in the regulation where it says " vessels will be measured from the centerline of the extremities stern to Bow excluding anchor roller. "

This attempt to create the definition of an anchor roller as something that is several feet long and then you find the anchor roller at the end of it is wrong. It is no different than building a 70 foot vessel with a 58 foot keel and calling it a 58 foot purse seiner. Bristol Bay went through this back door attempt to use over 32 foot long vessels about 15 years ago, quite a number of the "32" footers were in fact 33 to 37 feet long, some had bolt on bows and many just were long and hoping no one would know. Well enforcement decided to enforce the regulation and today you do not see any over 32 foot drift vessels in Bristol Bay.

I have read the public comment #6 from the Law office of Bruce B Weyhrauch dated March 6 2011 and would like to give my take on several of the points made in the comment.

On page 4 point 2 it states " the bolt on bow does not create any additional parking capacity"
This simply ignores the reason to have a bolt on bow, it is to increase the stern of the vessels length, people do not add on to the bow of a boat, they extend the stern so they have added floatation and carrying capacity of the vessel. The vessel owner has to remove several feet of bow so they can add to the stern so in fact allowing a bolt on bow does add to the floatation and carrying capacity.

On page 5 point 9 it states " proposal 380 repeats the inaccurate statements that were in ACR #3 that fishing vessels longer than the allowable length were being used to take salmon. This is inaccurate because if there were vessels operating illegally, their owners could have been cited (and still could be cited) and taken to court."
Well it turns out I measured 5 salmon purse seine vessels in the Homer harbor in April of 2014 and they were in fact over 58 feet long and they could not be cited by the troopers this summer simply because there is no definition for an anchor roller and the vessel owners are relying on the argument the several feet of bolt on bow are in fact simply an anchor roller. Just like everybody knew the 70 foot vessel with a 58 foot keel was circumventing the 58 foot regulation everybody knows bolting on a several feet section of bow and calling it an anchor roller is wrong. What is the " bolt on the bow limit" 2 feet, 5 feet heck somebody would likely have a 15 foot "bolt on bow" the pre 1962 58 foot keel vessels were commonly built to over 70 feet long.

On page 5 point 10 it states " proposal 380 indicates that vessels have been modified by removing a bow section and in one case several feet of vessel hull was added, and then the bow section was bolted back on. Nothing in the record supports such a statement.

In fact two of the vessels I measured in the Homer harbor were exactly that. One the 54 foot Hoquiam was built in aprox 1989 and measured 54 feet overall, it was modified in 2010 or 2011 and is now over sixty feet overall length, another aluminum seiner built about 1988 was aprox 52 feet over all length and was modified in the last couple of years to be more than 60 feet by my tape measure.

Public comment #6 goes on for pages about how the negative effect from adopting a simple definition for an anchor roller will disrupt the Alaska fisheries," hundreds of boats and thousands of fishermen" good grief how many bolt on bow vessels" does Mr Weyhruch believe are fishing in Alaska. No there are a few, the majority of purse seine vessels fishing for salmon in Alaska are not even 58 foot by any measure. These few knew what they were doing was, lets say playing in the very grey zone. They know 58 foot plus a bow roller equals maybe an additional foot of vessel length. This is likely why Mr Weyhruch insists "vessels that have been purse seining salmon in Alaska since January 1 2012 be "grandfathered in" if the Alaska BOF accepts argument there should be a definition for a bow roller.

It is suggested the BOF adopt the US Coast Guards method of measure for overall length, remember the 70 plus feet pre 1962 58 foot keel length US Coast Guard measured vessels.

There are adopted measurement standards for all of the limited gear and vessels except for the definition of an anchor roller. mesh measurement for seines are clearly spelled out, "hang a mesh on a nail or peg count down 10 stretched meshes and attach a 10 pound weight, measure the 10 meshes to determine the average stretched mesh size. Seines are measured by the fathom with traction on one end.

There is an old saying, "how do you eat and elephant?" one spoonful at a time. This is what is happening to the very foundation of the 58 foot limit for Alaska purse seine vessels. There is a constant effort by a few fishermen to repeal the 58 foot limit, it has failed at least 3 times it was voted on by the BOF, this back door attempt to slide by the meaning and intent of the 58 foot limit by building or modifying vessels to be grossly over length by adding several feet of "bolt on bow" endangers the regulation.

I can see the day when someone will propose to eliminate the 58 foot limit and make the argument the regulation is meaningless any way as there is no way for enforcement to measure a purse seine vessel. There are hundreds of large vessels capable of purse seining salmon in Alaska if there is no meaningful measurement of the vessels, crab vessels, squid vessels from California, sardine seiners from Washington and on and on. Most of us Alaska purse seiners fishing for salmon have invested a lifetime of effort to operate our own salmon seiner, most of us do not even have boats that are 58 feet long. What happens to us as more and more vessel owners build or modify their boats by having the "bolt on bow" oversize seiner.

Please consider ARC 26 so there is a chance to establish a definition for an anchor roller and create a meaningful method to measure Alaskan salmon purse seine vessels.

Leroy L Cabana

LAW OFFICE OF
BRUCE B. WEYHRAUCH, LLC
whyrock@gci.net
114 S. FRANKLIN ST.
SUITE 200
JUNEAU, ALASKA 99801
TELEPHONE: (907) 463-5566 FAX: (907) 463-5858

September 29, 2014

VIA FACSIMILE

Mr. Karl Johnstone, Chairman
Alaska Board of Fisheries
Alaska Department of Fish and Game
P.O. Box 115526
1255 W. 8th Street
Juneau, AK 99811-5526

RE: Agenda Change Request 25. Alaska Board of Fisheries, Work Session, October 2014, Juneau, Alaska

Dear Chairman Johnstone

We represent Bering Sea Pot Cod Cooperative in asking the Board of Fisheries to reject ACR 25.

ACR #25 does not comply with the standards in 5 AAC 39.999. 5 AAC 39.999(a)(1) sets forth the Board's policy for changing the Board's agenda. That regulation is specific on the guidelines that the Board must employ before it accepts an ACR, and provides that the Board will accept an agenda change request only for specific reasons:

(A) for a fishery conservation purpose or reason;
(B) to correct an error in a regulation … .

There is nothing to remotely suggest that ACR #25 has any fishery conservation purpose or reason. The Board violates 5 AAC 39.999(a)(1)(A) if it considers ACR #25 on that basis. There is no error in any regulation that would allow the Board to accept ACR #25 at the Board's October 2014 Work Session. The Board violates 5 AAC 39.999(a)(1)(B) if it considers ACR #25 on that basis.

ACR 25 has not been proposed to conserve fisheries, but to increase and expand Pacific cod harvests. There is nothing in the ACR that suggests that fishery

conservation reasons would allow the Board to take up this ACR outside the Board's regular cycle. Only one, short season of this recently implemented fishery has been prosecuted. Adopting ACR 25 based on extremely limited harvest data from that short season, to double the GHL, is not a sound conservation purpose or reason.

If the Board takes it up ACR 25, it will invite others in fisheries that are "so successful" (ACR 25 Problem Statement) to submit ACRS like this one on a continuing out-of-cycle basis.

5 AAC 39.999(a)(1)(C) allows the Board to accept ACR 25 if that ACR is intended to "correct an effect on a fishery that was unforeseen when a regulation was adopted." The intent behind this language is to conserve fisheries negatively affected by a Board regulation after time has passed to assess those negative impacts. Contrary to that intent, the reason given for asking the Board to take up ACR 25 is so that that Board will increase fishing impacts because the proponent of ACR 25 wants to harvest more fish.

Finally, 5 AAC 39.999(a)(2) provides that the Board "will not accept an agenda change request that is predominantly allocative in nature in the absence of new information that is found by the Board to be compelling." The purpose of ACR 25 is to expand a state water Pacific Cod fishery, to increase an allocation to a state water user group.

The effect is allocative because ACR 25 simply seeks to have the Board — out of its regular cycle — redistribute Pacific Cod from the TAC in an existing federally managed program that provides for participation by a wide range of gear types and vessels, to a significantly smaller and more restrictive pool of participants. No new, substantive, or compelling information has been offered in support of ACR 25 that indicates ACR 25 is anything more than a simple allocation request.

We appreciate the Board's consideration of these views.

Very Truly Yours,

Bruce Weyhrauch

Bruce B. Weyhrauch

Freezer Longline COALITION

Ph. 20
2303 W Commodore Way Suite 202
Seattle, WA 98199
www.freezerlonglinecoalition.com

September 30, 2014

Mr. Karl Johnstone, Chairman
Alaska Board of Fisheries
Board Support Section
PO Box 115526
Juneau, AK 99811-5526

Re: Request the BOF not accept ACR 24 and ACR 25.

Dear Mr. Chairman and Members of the Board of Fisheries,

On behalf of the Freezer Longline Coalition (FLC), we request that the Board of Fisheries deny the agenda change request for ACRs 24 and 25 on the basis that these proposals do meet the BOF ACR criteria and are predominately allocative.

The two ACRs are allocation proposals that the BOF has previously taken up less than a year ago in cycle. The two ACRs do not address any error in regulation or a fishery effect that was reasonably unforeseen. The two proposals do not provide any new information regarding any specific fisheries conservation concern. ACR 24 and ACR 25 simply do not meet the BOF ACR criteria.

In contrast, these ACRs may result in creating conservation concerns as the ACRs would increase and concentrate catch inside of three miles exacerbating concerns for localized depletion. One proposal (ACR 25) – if adopted - would likely create a conservation concern for BSAI octopus (which just came off the national "overfishing" list as of 4/29/2014) and could result in closures of pot cod fisheries. Octopus is the only groundfish stock under the NPFMC to ever make the national list for stocks classified as "overfished" or subject to "overfishing". The highest bycatch of octopus is in the pot cod fishery and specifically in the three statistical areas around Unimak Pass[1] (where the Area O fishery is concentrated). In 2011, BSAI pot cod fisheries were closed in-season due to octopus bycatch.

The FLC represents owners and operators of over 30 U.S.-flag vessels that participate in the hook-and-line CP, or freezer longline sector of the Pacific cod fishery in the Bering Sea and Aleutian Islands (BSAI). The freezer longline fleet is almost completely reliant on p-cod and have few alternative fisheries. FLC member vessels are specialized longline vessels that range in size from approximately 110 to 185 feet and have a long history of dependence on the p-cod resource.

[1] P. 1013, 2013 BSAI Octopus SAFE (Stock Assessment and Fishery Evaluation) and p. 16 of the NPFMC MRA Enforcement Period Discussion Paper, October 2014.

FLC member companies are the pioneers of the freezer longline sector in Alaska and have over 30 years of history fishing for p-cod in the North Pacific. FLC members are based across Alaska and Washington and offload their harvests in Alaska ports, predominantly Dutch Harbor. Five member companies are based in Alaska, including Alaskan Leader Fisheries of Kodiak, AK, Alaska Longline Company of Petersburg, AK, and two CDQ groups. The freezer longline fleet generates over $160 million in revenues annually and employees over 1200 full-time workers in Alaska and Washington.

Specifically, we request the BOF to not accept ACRs 24 and 25 for the following reasons:

ACR 24: Increase South Alaska Peninsula (SAP) p-cod GHL from 30% to 50%.

The BOF has previously and recently taken action on this issue: The BOF has received similar and identical proposals for a 50% GHL for SAP p-cod in the normal cycle in 2013, 2010, 2007, and 2004. The BOF did not adopt any of the allocative proposals for a 50% GHL at any of these in-cycle meetings. This is one of those allocation issues the BOF can expect to receive proposals upon in every cycle (and now as an ACR).

The BOF did take action less than a year ago at the Statewide Pacific Cod meeting in October 2013 to increase the SAP p-cod GHL from 25% to 30% (amended Proposal 18). At that same meeting in 2013, the proposer of ACR 24 submitted an identical proposal (Proposal 20) as the ACR, on which the BOF took no action (citing previous action on Proposal 18).

ACR is predominately allocative: The federal and state p-cod fisheries of the Gulf of Alaska and the Bering Sea are fully utilized and fully allocated. Any increase in an allocation in one area or sector is a re-allocation from another area or sector. An increase of the SAP p-cod GHL will negatively impact and harm all the participants in the federal fishery in the WGOA (including many Alaskan residents) which includes pot gear, longline gear, jig gear, and trawl gear. The participants in the federal WGOA p-cod fishery (including members of the FLC) have significant investments in vessels, permits**,** and gear as well as a long term historical dependence on the WGOA p-cod resource.

The proposer of ACR 24 is incorrect and disingenuous in stating that this proposal is not allocative as it is only "*moving Pacific cod*" around. The very definition of allocation is "*the action or process of distributing something*."

No specific conservation concern identified: The proposer implies this ACR is addressing a conservation concern but the concern is stated in only in the most general terms and provides no specific or new information. No information is presented that was not considered previously by the BOF in 2013, 2010, 2007 and 2004. The ACR refers to "lower bycatch rates" but provides no specific information or factual comparisons by gear type by species. The ACR seems to focus on the federal trawl sector but fails to acknowledge that the ACR will also be re-allocating from participants in federal pot, jig, and longline fisheries (in addition to trawl) while re-allocating to state participants also in the pot and jig fisheries. **Sixty percent (60%) of the WGOA federal p-cod TAC is currently allocated to jig and fixed gear (i.e. non-trawl).**

The ACR would greatly increase **(+67%)** and concentrate p-cod catch inside of three miles exacerbating concerns for localized depletion of groundfish stocks. Without a robust stock assessment and survey program of groundfish stocks inside of three miles, the BOF should move cautiously with large increases in concentration of groundfish harvest inside of three miles. Genetic studies of p-cod (Spies 2011) indicate that the p-cod of WGOA and the Unimak Pass area are one common stock (genetically).

The ACR fails to mention the increase in octopus bycatch that would result from an increase in p-cod allocation to state pot gear fisheries. Every fishery has bycatch, and the gear with most octopus bycatch is pot gear. Additionally, the ACR would shift p-cod catch from observed fisheries to unobserved fisheries. In particular, the BOF should recognize that the nature of the vessels in the less than 58' fleet is rapidly changing and the catch rate and harvesting power of the 58' fleet has increased considerably. The increased catch rate will result in shorter derby-style seasons in the GHL fisheries. In the future, the BOF may have to consider additional measures to regulate the pace of these fisheries such as pot and trip limits as well consideration of support for limited entry.

Formerly, the 58' Delta was the industry standard for a 58' combination seine/pot/longline vessel. These vessels were 19' in width and with a gross tonnage of 72 GRT. The new 58' vessels being built for <58' pot fisheries are now up to 28.6' in width with a gross tonnage of 170 GRT (almost 2.5 X as much volume). These wide-body 58' vessels can carry more gear and have more than twice the hold capacity of the older Deltas. The new wide-body 58' vessels may be the major contributing factor in making the state GHL fisheries into shortened derby style fisheries. The new wide body 58' vessels are technologically advanced fishing vessels with large capacities. [For further discussion of 58' vessel specifications, see comments on ACR 25 below and attachment].

No unforeseen effect requiring immediate action: The proposer of ACR 24 cites the NPFMC consideration of GOA rationalization as somehow new and unforeseen. However, the NPFMC has been working on rationalizing the GOA groundfish fisheries since 2000. The BOF established a Gulf Rationalization Committee in the early 2000s.

In 2008, the NPFMC has removed latent licenses in the GOA trawl sector and in the GOA fixed gear p-cod fisheries. In 2009, sector allocations were established in the federal GOA p-cod fishery. While the NPFMC is currently working on GOA trawl issues, it is in the discussion paper phase and any additional rationalization efforts in the GOA could be at least three years (and likely longer) before actual implementation occurs. This is the likely earliest timetable even if the NPFMC "fast tracked" this issue.

With that timeline, the BOF could take up any related issues in the normal BOF cycle. It is also premature to take a speculative action as it unknown what options the NPFMC might select at this juncture. If potential implementation issues arise from pending federal actions, these issues would be raised at the joint BOF/NPFMC meeting.

Constitutional Issue: The ACR proposer references the Alaska constitution but the reference is not made in the context of error in regulation, unforeseen effect, or a conservation concern. The reference to the constitution seems directly related to allocation which does not meet the ACR criteria. Again, it is premature to react to a future Council action that is still in the discussion paper phase. No error in any regulation is cited for considering this ACR.

ACR 25: Increase the Dutch Harbor p-cod GHL from 3% to 6% (Area O).

The BOF has previously and recently taken action on this issue: The BOF has previously taken up similar proposals in the course of the normal cycle in 2004 and 2013. In 2004, the BOF did not adopt the proposal to establish the Area O p-cod fishery stating "***The board discussed the current allocations, other than the jig fishery, are fully utilized in the federal and parallel fisheries."***

However, less than a year ago, at the Statewide Pacific Cod meeting in October 2013, the BOF established the new statewater Dutch Harbor p-cod GHL (Area O) in the Bering Sea at 3% of the combined BS and AI p-cod ABC (which are separate and distinct ABCs). This resulted in a 2014 GHL of approximately 8103 mt (or 17.9 million pounds). This ACR seeks to re-visit this allocation out of cycle less than one year from the date when it was adopted.

ACR is predominately allocative: As the BOF previously recognized, the federal and state p-cod fisheries of the Bering Sea are fully utilized and fully allocated. Any increase in an allocation in one area or sector is a re-allocation from another area or sector. An increase of p-cod GHL for Area O will negatively impact and harm all the participants in the federal fishery in the Bering Sea (including many Alaskan residents) which includes pot gear, longline gear, jig gear, and trawl gear. Sixty-two percent (62.2%) of the federal BSAI p-cod TAC is currently allocated to jig and fixed gear (non-trawl). The participants in the federal Bering Sea p-cod fishery (including members of the FLC) have significant investments in vessels, permits**,** and gear as well as a long term historical dependence on the p-cod resource.

The primary effect of proposal is allocative. The proposer of the ACR even acknowledges that is an allocative proposal. The proposer seems to suggest that a predominately allocative ACR should be accepted if there are allusions to generalized and unsubstantiated reasons for the allocation.

Increasing the GHL (for whatever purpose) is an exercise in allocation. As a rationale, the proposer of ACR 25 makes statements that are flawed regarding bycatch (see section below regarding conservation concerns regarding octopus) as well as an unsubstantiated reference to "stabilizing local communities".

Prior to the establishment of the Area O fishery, the vast majority of the p-cod catch from the federal fishery was landed in Dutch Harbor – and with the creation of the Area O fishery, these cod are also predominately landed in Dutch Harbor. It is not clear what stability the ACR refers to from the Area O fishery as that fishery has existed less than one year and the catch is predominately delivered in the same port (Dutch Harbor). As in the federal p-cod fishery, participants in the GHL fishery are both local and non-local vessels.

The ACR states that the Area O fishery relieved pressure on the South Alaska Peninsula statewater fishery p-cod. This is the fishery the BOF just increased by 20% in 2013 (from 25% to 30%). Additionally, there is considerable movement of p-cod in the Unimak Pass area and genetic studies (Spies 2011) indicate that the p-cod in Unimak Pass and the WGOA (and by extension the South Alaska Peninsula) are of one genetic stock so that increased concentration of harvest in one area may have a deleterious effect on the other.

There is still available harvest for <60' pot/longline in the federal fishery: There is still uncaught TAC and harvest opportunity available for the <60' fixed gear sector in the BSAI federal p-cod fishery. As of **9/23/14**, there was **3811 mt (8.4 million pounds)** of uncaught p-cod TAC in the federal fishery for the <60' pot and hook-and-line sector. And if the <60 sector did catch the available TAC in the federal fishery, the <60' sector would be then be eligible for additional rollovers of uncaught p-cod TAC from other sectors.

NMFS inseason management makes a determination on rollovers (generally in the fall) on whether a sector may not catch its allocation based on effort, and then re-distributes uncaught TAC to sectors that are the most likely to catch the TAC (again based on effort). However, if there is no effort in the sector, the sector does not receive rollovers. Ironically, this ACR would reduce the federal p-cod TAC available to participants in the federal jig and <60 pot and longline sectors as well as other fixed gear sectors. **Sixty-two percent (62.2%) of the federal BSAI p-cod TAC is currently allocated to jig and fixed gear (non-trawl).**

As of 9/20/ 2014, the <60 pot and longline sector has caught 8540 mt (71%) in the federal fishery (out of 12,018 mt). With the new Area O fishery (8103 mt), a total of 20,121 mt (44 million pounds) will have be allocated to the <60' fixed gear sector in 2014. The result of this ACR (if in effect in 2014) would have resulted in a total allocation of 28,000 mt to the <60' sector (16,000 in the GHL statewater and 12,000 mt in the federal fishery) for a total of 62 million pounds. The statewater GHL fishery will be caught entirely in the vicinity of Dutch Harbor and Unimak Pass – the areas of the highest rates of octopus bycatch by the pot cod fishery. As of 9/20/14, **79%** of the BSAI octopus TAC has been caught.

The ACR creates a potential conservation concern that has resulted in previous closure of the BSAI pot cod fisheries.

Statements in ACR 25 are incorrect regarding bycatch and omit information regarding octopus bycatch in pot cod fisheries. Every fishery has some type of bycatch and the pot cod fisheries have the highest amounts of octopus bycatch of any gear type. In 2011, the TAC for BSAI octopus was reached by August 31 and octopus was put on non-retention status. When the octopus bycatch reached the Overfishing Level (OFL), the BSAI directed pot cod fisheries were closed. In 2012, BSAI octopus went on the national list for "overfishing".

This is the first and only groundfish stock in the North Pacific under the NPFMC whose stock status was classified as "overfishing" or "overfished" in the NMFS National Report on the Status of the Stocks. BSAI Octopus remained on the "overfishing" list for two years and was just removed from the "overfishing" list on April 29, 2014.

In the BSAI, for 2003-09, pot gear accounted for 75% of the bycatch of octopus[2] and this proportion has likely increased with the increased proportion of BSAI pot cod harvest. The increased proportion of BSAI pot cod harvest is solely in the <60' pot sector in both the federal fishery and the new Area O fishery. Some of the <60' p-cod federal fishery and all of the state GHL fishery is conducted in close proximity to Dutch Harbor and Unimak Pass by the <60 sector. The 2013 BSAI Octopus SAFE states that the highest bycatch of octopus is found in the pot cod fisheries in the three statistical areas around

[2] Figure 18, NPFMC ACL analysis 2010

Unimak Pass.[3] The ACR would then double the pot cod catch in the Area O fishery – in the statistical area with the highest octopus bycatch.

According to the ADF&G Fishery Management Plan[4], "*In state waters, ADF&G adopts NMFS maximum retainable bycatch allowances applicable in the EEZ for species not actively managed by the State of Alaska."* Octopus is a species that is not actively managed by the State of Alaska. As of 9/20/14, 79% of the BSAI octopus TAC has already been caught. In comparison, 71% of the federal <60 pot cod sector allocation has also been caught. Under current management, a large increase in the pot cod fisheries in the Unimak Pass could lead to future closures of the BSAI pot cod fisheries inseason due to increased octopus bycatch.

The ACR references "reduce bycatch", "less bycatch", and "minimal bycatch" but provides no substantiation or information while omitting any reference to octopus bycatch in the pot cod sector. Additionally, the ACR in part reallocates p-cod TAC from federal pot and jig fisheries to statewater pot and jig fisheries – so the major change is not in gear but in further concentration of harvest in Dutch Harbor/Unimak Pass area. 62% of the federal BSAI p-cod TAC is currently allocated to non-trawl gear. The ACR would double the amount of the GHL (+100%) and concentrate p-cod catch inside of three miles exacerbating concerns for localized depletion of groundfish stocks. Without a robust stock assessment and survey program of groundfish stocks inside of three miles, the BOF should move cautiously with large increases in concentration of groundfish harvest inside of three miles. The ACR would shift p-cod catch from observed to unobserved fisheries.

Additionally, there is considerable movement of p-cod in the Unimak Pass area and genetic studies indicate that the p-cod in Unimak Pass and the WGOA (and by extension the South Alaska Peninsula) are of one genetic stock so that increased concentration of harvest in one area may have a deleterious effect on the other. The three identified p-cod stocks in the BSAI are identified by Spies (2011) as: EBS Pribilof, Aleutian Islands, and EBS Unimak Pass.

"Samples were taken from spawning fish collected from the western Aleutian Islands east to Unimak Pass and as far north as the Pribilof Island area. The data provides evidence for limited connectivity among spawning groups. In particular, there appear to be three distinct populations among the samples studied; Unimak and Pribilof samples were distinct from each other and from the Aleutian Island samples. Overall, dispersal appears to be limited by distance rather than oceanographic features."

There is no effect on the fishery that was not reasonably unforeseen nor is there any error in regulation. The ACR suggests that it was unforeseen that the GHL would be mostly harvested. Like most valuable species that are already fully allocated, it is not surprising that the p-cod GHL was caught. No one is surprised when a king salmon allocation is fully caught; or when a halibut or sablefish allocation is fully taken. These are all valuable species and the expectation is that the target TAC of a fully allocated species will be caught. The fact that someone catches their allocation of a valuable species does not mean that is unforeseen or the allocation should be increased. It is human nature to always want more (hence the three year BOF cycle to consider allocation issues and not under ACRs).

[3] P. 1013, 2013 BSAI Octopus SAFE (Stock Assessment and Fishery Evaluation) and p. 16 of the NPFMC MRA Enforcement Period Discussion Paper, October 2014.
[4] P. 5, Fishery Management Report No. 14-04.

Given that the statewater Area O fishery does not require the purchase of a federal LLP or a state limited entry license (other than a gear card for miscellaneous finfish) and has no observer requirement, it is not unforeseen that there would be considerable participation and effort. It is also not surprising that the allocation is caught as there has been interest expressed regarding limited entry into some GOA statewater p-cod fisheries which creates an atmosphere of vessels fishing for potential history (in the event of limited entry).

It is also not unforeseen the allocation might be caught when also considering the change in the nature of the vessels in the 58' sector. The type of vessels in the 58' fleet is rapidly changing and the catch rate and harvesting power of the 58' fleet has increased considerably. The increased catch rate will result in shorter seasons in the GHL fisheries and they will become compressed derby-style fisheries. In the future, the BOF may have to consider additional measures to regulate the pace of these fisheries such as pot and trip limits as well consideration of support for limited entry.

Formerly, the aforementioned 58' Delta was the industry standard for a 58' combination vessel (see table below). The new wide-body 58'vessels can carry more gear and have more than twice the hold capacity of the older Deltas. The new wide-body 58' vessels are the major contributing factor in accelerating the state GHL fisheries into shortened fisheries. For an idea of just how many of these vessels have been built recently, see http://www.fredwahlmarine.com/New%20Construction7.html.

If BOF members are familiar with the Deadliest Catch and the BS crabber F/V Northwestern (125' LOA), the new super-wide 58' vessels being constructed are less than half the length of the F/V Northwestern but the newer 58' vessels are wider and deeper than the F/V Northwestern. The new 58' X 28.6' vessels will have close to the same gross tonnage of the 125' F/V Northwestern (see table below and attachment).

Table of vessel characteristics (from USCG and CFEC vessel databases)

Vessel Type	LOA	Width	Depth	Gross Tons (GRT)	Fish Hold (cu. ft.)
F/V Northwestern (BS crabber)	125'	27'	10'	194	7500
Delta combination (old)	58'	19'	10'	72	1940
Delta (wide body)	58'	23'	11'	97	2300
FW 22' wide	58'	22.5	11'	92	2800
FW 26' wide	58'	26'	13'	131	3300
FW 28' wide	58'	28.6'	13'	170	4080

Given these considerations, we ask that the BOF not accept ACRs 24 and 25 as ACRs are predominately allocative and do meet the BOF ACR criteria. These allocative proposals should be taken up within the normal BOF cycle.

Thank you for your consideration in this matter.

Sincerely,

Chad I. See
Executive Director
Freezer Longline Coalition

Attachment

FRED WAHL MARINE CONSTRUCTION Inc.
100 PORT DOCK ROAD - REEDSPORT, OR. 97467
TEL: (541) 271-5720 - FAX: (541-271-4349
E-mail: reedsport@fredwahlmarine.com
Web: www.fredwahlmarine.com

FWMC 58x28

Combination Boat
~Outboard Profile~

NEW DESIGN!

PARTICULARS

LENGTH, MOLDED	57'-9"
BREADTH, MOLDED	28'-6"
DEPTH, MOLDED	12'-8"
DRAFT	13'-0"
ENGINE HP	~ 600 BHP

CAPACITIES

FISH HOLD (WET)	~ 4080 cu.ft.
BAIT HOLD	~ 860 cu.ft.
FUEL:	~ 9800 gal.
HYD. OIL:	~ 390 gal.
FRESH WATER:	~ 1750 gal.

*Drawing may show optional equipment. Capacities listed above are approximations.

Alaska Department of F
Boa
P.O. Box 115526
Juneau, AK 99811-5526
(907) 465-4110
www.adfg.alaska.gov

RE: ACR 22

The proposer of ACR 22, Larry Demmert, requested on his original ACR that the herring pound size be **20' X 20' X 30'** deep. Boards Support staff inadvertently typed in 10' X 20' X 30'.

Please find the correct ACR below:

ACR 22 – Limit the size of a closed herring pound as follows: a closed herring pound shall be a no more than 20' X 20' X 30" (should be 30') deep (5 AAC 27.130(e)(1)(B)&(C).

CITE THE REGULATION THAT WILL BE CHANGED IF THIS ACR IS HEARD.
5AAC 27.185.

WHAT IS THE PROBLEM YOU WOULD LIKE THE BOARD TO ADDRESS? STATE IN DETAIL THE NATURE OF THE CURRENT PROBLEM. The large size herring pounds hold too much fish damaging the resource.

WHAT SOLUTION DO YOU PREFER? Herring pound size shall be a maximum of 20' X 20' X 30 " deep.

STATE IN DETAIL HOW THIS ACR MEETS THE CRITERIA STATED ABOVE.

a) **for a fishery conservation purpose or reason:** Since the large pounds have been widely used, the herring resource is overharvested.

b) **to correct an error in regulation:** N/A

c) **to correct an effect on a fishery that was unforeseen when a regulation was adopted:** N/A

WHAT WILL HAPPEN IF THIS PROBLEM IS NOT SOLVED PRIOR TO THE REGULAR CYCLE? All roe on kelp areas may be overharvested or damaged.

STATE WHY YOUR ACR IS NOT PREDOMINANTLY ALLOCATIVE. N/A

IF THIS REQUEST IS ALLOCATIVE, STATE THE NEW INFORMATION THAT COMPELS THE BOARD TO CONSIDER AN ALLOCATIVE PROPOSAL OUTSIDE OF THE REGULAR CYCLE. N/A

STATE YOUR INVOLVEMENT IN THE FISHERY THAT IS THE SUBJECT OF THIS ACR. Fished in fishery since 1992.

STATE WHETHER THIS ACR HAS BEEN CONSIDERED BEFORE, EITHER AS A PROPOSAL OR AS AN ACR, AND IF SO, DURING WHICH BOARD OF FISHERIES MEETING. No.

SUBMITTED BY: Larry Demmert

United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
1011 East Tudor Road
Anchorage, Alaska 99503-6199

IN REPLY REFER TO:

FWS/OSM 14126.CJ

OCT 0 1 2014

Mr. Karl Johnstone, Chair
Alaska Board of Fisheries
Alaska Department of Fish and Game
P.O. Box 115526
Juneau, Alaska 99811-5526

Dear Chairman Johnstone:

The Alaska Board of Fisheries will consider 27 Agenda Change Requests, among other issues, at its work session beginning October 15, 2014.

The U.S. Fish and Wildlife Service, Office of Subsistence Management, working with other Federal agencies, have reviewed these requests and do not believe the decision to accept any of these requests for out-of-cycle regulatory action will have significant impact on Federal subsistence users or fisheries. If any of the requests are accepted and assigned to future meeting dates for deliberation, Federal staff comments will be submitted for proposals which may result in impacts to Federal subsistence users or fisheries. During the meeting, we may wish to comment on other agenda items if issues arise, that may have an impact Federal subsistence users or fisheries.

We appreciate the opportunity to comment on these important regulatory matters, and look forward to working with the Board of Fisheries and the Alaska Department of Fish and Game on these Agenda Change Requests should they be accepted.

Sincerely,

Eugene R. Peltola, Jr.
Assistant Regional Director

CC: Cora Campbell, ADF&G
Tim Towarak, Chair FSB
Jeff Regnart, ADF&G, Anchorage
Hazel Nelson, ADF&G, Anchorage
Charles Swanton, ADF&G, Juneau
Glen Haight, ADF&G, Juneau
Lisa Olson, ADF&G, Anchorage
Drew Crawford, ADF&G, Anchorage
Jennifer Yuhas, ADF&G, Fairbanks
Interagency Staff Committee

September 30, 2014

Alaska Department of Fish and Game
Board Support Section
PO Box 115526
Juneau, Alaska 99811-5526

And

Alaska Board of Fisheries Chairman and members

Good Day to you all,

Welcome back for another cycle of developing regulations for the various fisheries resources of the State of Alaska. I wish you well and safe travels for this upcoming cycle of meetings.

I'm going to comment on two items coming before you at your workshop in Juneau in October.

The first item, ACR 20, asks you to either redo or undo the methodology you passed at the 2014 Upper Cook Inlet meeting which provides for an orderly closure of the Central District Commercial Drift Net Fishery. This regulation has only been in effect for one season and seemed to work well in providing an orderly transition from sockeye harvest into the potential harvest of pink and chum salmon species. The existing regulations also worked very well in providing ADF&G with a tool to manage the coho fishery primarily for the sport and guided sport fisheries, as stated in management plans for Cook Inlet.

I do not feel that ACR 20 meets the criteria mandated for the Board to accept the proposal as an agenda change and ask that you reject it in this out-of-cycle year for Cook Inlet issues. The proposers can resubmit the concept in two more years, in cycle, and the Board can then better deal with the issue, having three years of information and the broadest possible public input in deliberating the concerns expressed. In fact, this approach could be applied to all the Cook Inlet commercial fisheries based ACR's in front of you – let them come up at an in-cycle meeting.

From reading ADF&G's RC 2, Staff Comments, it appears I'm not the only one who feels these nine ACR's do not rise to the level of becoming acceptable ACR's.

The second issue involves the location of the next Upper Cook Inlet (UCI) meeting. I understand that Kenai/Soldotna would like to host this meeting. The last regulatory meeting held on the Kenai Peninsula resulted in some ugly situations and required the police to be called in to maintain order. I know a couple of folks who were present at that

meeting and were eye-witnesses to the problems. This is not a conducive atmosphere for developing and implementing what are often controversial fisheries regulations.

I would suggest that the regulatory meeting be held in Anchorage as the best available "neutral" location with facilities capable of hosting a two-week long board meeting. If Kenai wants a meeting, hold that year's workshop meeting there. Folks can still have access to board members to discuss upcoming proposals and board members can get a feel whether they would be comfortable having a future regulatory meeting on the Kenai Peninsula.

If the Board would prefer to hold a meeting of this controversial nature in an area directly impacted by board actions, then I suggest holding the next meeting in either Palmer or Wasilla in the Matanuska-Susitna Valley. Our area has NEVER hosted a regularly scheduled Upper Cook Inlet regulatory meeting. Furthermore, our area currently has the unwelcome distinction of having eight (8) of the twelve (12) salmon Stocks of Concern statewide, with several other stocks either eligible or almost so for declaration as Stocks of Concern. If that "distinction" alone doesn't qualify us as an affected area, then what would?

Further, the Anchorage and Valley populations of sport anglers and dipnet permit holders outnumbers the similar Kenai Peninsula population 4:1; holding a meeting in Anchorage or the Valley would definitely be in the midst of resource users affected by Board regulations.

Finally, sport anglers and dipnetters have full-time jobs in order to support themselves. Their ability to travel a couple of hundred miles, stay in a hotel/motel, and eat out in order to participate in a Board of Fish meeting is significantly limited. The commercial fleet, for the most part, doesn't have this lost-income burden since their income, or the majority of it, is derived from their seasonal commercial fishing activities. The commercial representatives can also write off the travel expenses as business related or have associations willing to underwrite per-diems, where the sport and personal use folks do not. Holding your meeting in Anchorage allows a large majority of recreational participants, as well as the commercial permit holders who live elsewhere than the Kenai Peninsula, to attend and participate. The local commercial folks will attend wherever the meeting is held.

In summary, I'm asking the Alaska Board of Fisheries to reject ACR 20 and the other Cook Inlet ACR's as not meeting criteria for an out-of-cycle agenda change and that the Board holds their next UCI meeting in Anchorage.

Thank you,

Howard Delo

Kenai Chamber of Comme
11
Kenai, AK 99611
Phone: 907-283-1991
Fax: 907-283-2230
www.KenaiChamber.org

"Connecting Businesses
On the Kenai since 1954"

September 25, 2014

Glenn Haight
Alaska Department of Fish & Game
PO Box 115526
Juneau, AK 99811-5526

Dear Mr. Haight,

The Kenai Chamber of Commerce and Visitor Center is requesting the 2017 Upper Cook Inlet (UCI) Finfish meeting to be held in the Kenai Area. The Kenai Peninsula had not held a UCI Finfish meeting since 1999, and since all Kenai Peninsula residents are affected by the Upper Cook Inlet fisheries, it would stand to reason the 2017 meetings be held here.

In the spring of 2013, the Board of Game meetings were held in Kenai and we just wrapped up the Alaska Fire Fighter Conference in Kenai. Both of these conferences had a large attendance and we were able to meet their lodging and meeting space needs with no troubles.

I have attached letters of support or resolutions from the following entities supporting holding the 2017 UCI Finfish meeting in the Kenai Area:

- Kenai Chamber of Commerce and Visitor Center
- City of Kenai
- City of Soldotna
- Kenai Area Fisherman's Coalition
- Kenai Peninsula Borough
- Kenai Peninsula Economic Development District
- Kenai Peninsula Fishermen's Association
- Soldotna Chamber of Commerce
- Joint Resolution from the City of Kenai, City of Soldotna, City of Seldovia, City of Seward, City of Homer and the Kenai Peninsula Borough

Please do not hesitate to contact me with any questions.

Thank you,

Johna Beech
President/COO
Kenai Chamber of Commerce and Visitor Center

RESOLUTION 2014 - 03

Requesting the Upper Cook Inlet Finfish Meeting 2017, to be held on the Kenai Peninsula.

WHEREAS, The Upper Cook Inlet Finfish meeting has not been hosted on the Kenai Peninsula since 1999; and

WHEREAS, All Kenai Peninsula residents are affected by Upper Cook Inlet fisheries either directly or indirectly; and

WHEREAS, The Kenai Chamber of Commerce and Visitors Center (KCCVC) represents 400 plus local area businesses, including the various fishery user groups; and

WHEREAS, all Kenai Peninsula residents and businesses benefit from healthy fisheries management, strategies and practices; and

WHEREAS, Sound management, strategies and practices are developed by transparent processes, accessible public meetings and user participation, knowledge and representation; and

WHEREAS, the failure of Upper Cook Inlet Meetings to rotate locations and be held on the Kenai Peninsula on a semi-regular basis greatly hampers public participation and local traditional knowledge; and

WHEREAS, all users of public resources should expect reasonable access to public meetings and processes; and

WHEREAS, local traditional knowledge is a great resource to the Board of Fish process; and

WHEREAS, it is in the best interest of the businesses of the Greater Kenai area to maintain healthy well-managed salmon stocks and provide opportunities and access for diverse user groups.

BE IT RESOLVED by the Kenai Chamber of Commerce and Visitor Center:

Section 1. The Kenai Chamber of Commerce & Visitors Center requests the Upper Cook Inlet Finfish meeting 2017 be held on the Kenai Peninsula.

Section 2. The KCCVC supports sound, sustainable fisheries management practices and policies.

Section 3. The KCCVC supports the accessibility of Upper Cook Inlet meetings to local users.

Chairman of the Board: JWarton Date: 3·26·14
Jeff Warton

Board Secretary: KimberleeRStocker Date: 3·26·14
Kimberlee Stocker

Sponsored by: Administration

CITY OF KENAI

RESOLUTION NO. 2014-62

A RESOLUTION OF THE COUNCIL OF THE CITY OF KENAI, ALASKA, REQUESTING THE ALASKA BOARD OF FISHERIES HOLD ITS 2017 UPPER COOK INLET FINFISH MEETING ON THE KENAI PENINSULA AND APPROVING JOINT RESOLUTION 2014-01.

WHEREAS, Upper Cook Inlet finfish are a vital and long-standing component of the City of Kenai economy and community; and,

WHEREAS, all City of Kenai residents are impacted by Upper Cook Inlet finfish fisheries either directly or indirectly; and,

WHEREAS, the Alaska Board of Fisheries Upper Cook Inlet Finfish regular meeting has not been held on the Kenai Peninsula since 1999; and,

WHEREAS, City of Kenai residents and businesses benefit from informed science based fisheries management, strategies and practices; and,

WHEREAS, sound management, strategies and practices are developed by transparent processes, accessible public meetings and user participation, knowledge and representation; and,

WHEREAS, conducting the Alaska Board of Fisheries regular meetings concerning Upper Cook Inlet finfish exclusively in Anchorage instead of rotating locations between Anchorage and the Kenai Peninsula greatly hampers public participation by City of Kenai residents due to the substantial expense and burden of attending multi-day meetings in Anchorage; and,

WHEREAS, all users of public resources are entitled to reasonable access to public meetings and processes concerning matters affecting their economy, livelihood and lifestyle; and,

WHEREAS, holding the 2017 Alaska Board of Fisheries Upper Cook Inlet Finfish meeting on the Kenai Peninsula would improve the amount of testimony about local traditional knowledge to the board, which is a great resource for the Board of Fisheries; and,

WHEREAS, it is in the best interest of the residents and visitors to both the Kenai Peninsula and the Anchorage area to maintain healthy well-managed

salmon stocks and provide opportunities and access for diverse user groups; and,

WHEREAS, Joint Resolution No. 2014-01; A Joint Resolution of the Assembly of the Kenai Peninsula Borough, and Councils of the City of Homer, City of Kenai, City of Seldovia, City of Seward and City of Soldotna, Requesting the Alaska Board of Fisheries Hold its 2017 Upper Cook Inlet Finfish Meeting on the Kenai Peninsula is proposed to be sent to the Alaska Fisheries Board and other interested officials for consideration.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF KENAI, ALASKA:

Section 1. That the Alaska Board of Fisheries is respectfully and strongly urged to schedule its full Upper Cook Inlet Finfish Meeting of 2017 and future such meetings on the Kenai Peninsula on a semi-regular basis.

Section 2. That Mayor Pat Porter is authorized to sign Joint Resolution 2014-01 on behalf of the City of Kenai.

Section 3. That this resolution takes effect immediately upon passage.

PASSED BY THE COUNCIL OF THE CITY OF KENAI, ALASKA, this 3rd day of September, 2014.

Pat Porter
PAT PORTER, MAYOR

ATTEST:

Sandra Modigh
Sandra Modigh, City Clerk

Introduced By: City Manager
Date: September 10, 2014
Action: Adopted
Vote: 6 Yes, 0 No

CITY OF SOLDOTNA
RESOLUTION 2014-037

A RESOLUTION REQUESTING THE ALASKA BOARD OF FISHERIES HOLD ITS 2017 UPPER COOK INLET FINFISH MEETING ON THE KENAI PENINSULA AND APPROVING JOINT RESOLUTION 2014-01

WHEREAS, Upper Cook Inlet finfish are a vital and long-standing component of the City of Soldotna economy and community; and

WHEREAS, all City of Soldotna residents are impacted by Upper Cook Inlet finfish fisheries either directly or indirectly; and

WHEREAS, the Alaska Board of Fisheries Upper Cook Inlet Finfish regular meeting has not been held on the Kenai Peninsula since 1999; and

WHEREAS, City of Soldotna residents and businesses benefit from informed science based fisheries management, strategies and practices; and

WHEREAS, sound management, strategies and practices are developed by transparent processes, accessible public meetings and user participation, knowledge and representation; and

WHEREAS, conducting the Alaska Board of Fisheries regular meetings concerning Upper Cook Inlet finfish exclusively in Anchorage instead of rotating locations between Anchorage and the Kenai Peninsula greatly hampers public participation by City of Soldotna residents due to the substantial expense and burden of attending multi-day meetings in Anchorage; and

WHEREAS, all users of public resources are entitled to reasonable access to public meetings and processes concerning matters affecting their economy, livelihood and lifestyle; and

WHEREAS, holding the 2017 Alaska Board of Fisheries Upper Cook Inlet Finfish meeting on the Kenai Peninsula would improve the amount of testimony about local traditional knowledge to the board, which is a great resource for the Board of Fisheries; and

WHEREAS, it is in the best interest of the residents and visitors to both the Kenai Peninsula and the Anchorage area to maintain healthy well-managed salmon stocks and provide opportunities and access for diverse user groups; and

WHEREAS, Joint Resolution No. 2014-01; A Joint Resolution of the Assembly of the Kenai Peninsula Borough, and Councils of the City of Homer, City of Kenai, City of Seldovia, City of Seward and City of Soldotna, Requesting the Alaska Board of Fisheries Hold its 2017 Upper Cook Inlet Finfish Meeting on the Kenai Peninsula is proposed to be sent to the Alaska Fisheries Board and other interested officials for consideration;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SOLDOTNA, ALASKA:

Section 1. That the Alaska Board of Fisheries is respectfully and strongly urged to schedule its full Upper Cook Inlet Finfish Meeting of 2017 and future such meetings on the Kenai Peninsula on a semi-regular basis.

Section 2. That Mayor Nels Anderson is authorized to sign Joint Resolution 2014-01 on behalf of the City of Soldotna.

Section 3. This resolution shall become effective immediately upon its adoption.

ADOPTED BY THE CITY COUNCIL THIS 10TH DAY OF SEPTEMBER, 2014.

Nels Anderson, Mayor

ATTEST:

Michelle M. Saner, CMC, City Clerk

Ayes: Bos, Sprague, Murphy, Baxter, Whitney, Daniels
Noes: None

Kenai
Area
Fisherman's
Coalition
PROTECTING YOUR FISHING RIGHTS & RESOURCES P. O. Box 375 Kenai, Ak. 99611 (907) 283-1054 dwimar@gci.net

Board of Fisheries
ADF&G/ Board Support
P.O. Box 115526
Juneau, Ak. 99811-5526

August 28, 2014

Dear Board Members,

During your upcoming October work session one of the items on the agenda is the site selection for the future 2017 Upper Cook Inlet (UCI) meeting. We are once again requesting that you consider the Kenai / Soldotna area as the location for this meeting. Historically, 80 – 85 percent of the proposals under consideration during an UCI meeting are relative to the Kenai or Kasilof Rivers and adjacent offshore Cook Inlet waters, however, this meeting has not been held in our area since 1999. That includes the normal cycle meetings of 2002, 2005, 2008, 2011, 2014 and a special meeting in 2003. After the 2005 meeting the Board considered and supported a mandate to hold its meetings in locations most appropriate for the matters under consideration, but that has not occurred to date during the UCI cycle. In the past we have asked the Board to consider a method of fairness whereby the meetings would be alternated between the Anchorage / MATSU area and the Kenai / Soldotna area. This would provide fairness to users in both geographic locations that wish to participate.

In 2008 the Board denied a similar request and once again opted for Anchorage as the location for that meeting. The reason given for this decision was that the Board felt Anchorage was a central location. We would ask, central to whom? It is certainly convenient for Anchorage / MATSU folks that can easily commute from their homes on a daily basis, but not so central for folks from the Kenai Peninsula that must drive over a mountain pass in winter conditions and bare the expenses of travel, lodging and meals for the opportunity to participate in the process. This can easily cost $500 - $1,000 for an individual just to participate through the testimony and committee stages.

Despite the expenses incurred by Kenai Peninsula residents to participate we still find that roughly 75 – 80% of the participants are from the Kenai Peninsula area. Right about now you're probably saying, "so what's the problem"? The problem is that nearly all of these participants are from the well-financed special interest groups that can afford to support many participants with funding to cover their expenses. The ones left out of the process are individual private anglers, personal use and subsistence users from the Kenai Peninsula area. This is not a fair process for these folks and should not continue. Alternating meeting locations would bring fairness to the process for everyone interested in UCI fishery issues.

The biggest reason this continues is because of the lobbying power some influential special interest groups maintain over the process. These groups know that as long as they can continue to have the meetings in the Anchorage area they can control the process because other Peninsula users cannot afford to attend at the same level. Private anglers, commercial fishermen and other user groups have repeatedly asked for a fair resolution of this issue by alternating the meeting locations every other Board cycle, thus providing the value of fairness this idea provides. Additionally, prior to the 2005 meeting, our local legislators requested a price

comparison for holding a meeting in the Kenai / Soldotna area versus Anchorage. Because of lower lodging and meeting room costs in the Kenai / Soldotna area the price was comparable. Since then additional hotels, stores and restaurants have been built and provide plenty of comfort and accessibility for Board members, participants and agency folks.

During the 2014 UCI meeting our KAFC representatives repeatedly asked board members to evaluate the participating audience at various junctures in the meeting process to gauge what percentage of the participants in the room were from the Kenai Peninsula area. It was very obvious that after the "public testimony" portion of the meeting the vast majority of remaining participants were from the Kenai Peninsula area.

We still hear the occasional reference to safety issues regarding a Kenai area meeting. It should be mentioned that those concerns are in reference to a isolated incident that occurred during the 1999 UCI meeting held in Soldotna. In 2013 Kenai hosted the "BOF King Salmon Task Force" meetings without incident. The panel, participants and audience were very cordial in their demeanor during difficult discussions from very diverse groups. This should be testament that our area can host a safe and productive UCI BOF meeting process.

We would encourage you to support an alternating UCI meeting schedule starting with the 2017 meeting being held in the Kenai / Soldotna area.

On behalf of private resource users from the Kenai Peninsula we would like to thank you for consideration in this matter.

Respectfully Submitted,

Ed Schmitt – Chairman
Kenai Area Fisherman's Coalition

cc: Gov. Sean Parnell
Sen. Peter Micciche
Rep. Mike Chenault
Rep. Kurt Olson
Rep. Paul Seaton
Cora Campbell, Commissioner ADF&G
Mayor Mike Navarre, Kenai Pen. Borough
Mayor Pat Porter, City of Kenai
Mayor Nels Anderson, City of Soldotna

Introduced by:	Mayor, Johnson, Bagley
Date:	09/02/14
Action:	Adopted
Vote:	9 Yes, 0 No, 0 Absent

KENAI PENINSULA BOROUGH
RESOLUTION 2014-056

A RESOLUTION REQUESTING THE UPPER COOK INLET FINFISH MEETING 2017 BE HELD ON THE KENAI PENINSULA AND APPROVING JOINT RESOLUTION 2014-01

WHEREAS, the Upper Cook Inlet finfish industry is a vital and long-standing component of the Kenai Peninsula Borough economy and communities; and

WHEREAS, all Kenai Peninsula residents are affected by Upper Cook Inlet fisheries either directly or indirectly; and

WHEREAS, the regular Upper Cook Inlet Finfish Alaska Board of Fisheries meeting has not been hosted on the Kenai Peninsula since 1999; and

WHEREAS, all Kenai Peninsula residents and businesses benefit from healthy fisheries management, strategies and practices; and

WHEREAS, sound management, strategies and practices are developed by transparent processes, accessible public meetings and user participation, knowledge and representation; and

WHEREAS, conducting the full regular Alaska Board of Fisheries meetings concerning Upper Cook Inlet finfish exclusively in Anchorage instead of rotating locations between Anchorage and on the Kenai Peninsula on a semi-regular basis greatly hampers public participation by Kenai Peninsula residents due to the substantial expense of attending those meetings in Anchorage; and

WHEREAS, all users of public resources are entitled to reasonable access to public meetings and processes concerning matters affecting their economy and lifestyle; and

WHEREAS, holding some of these meetings on the Kenai Peninsula would also improve the amount of testimony about local traditional knowledge to the board, which is a great resource to the Board of Fisheries; and

WHEREAS, it is in the best interest of the residents and visitors to both the Kenai Peninsula and the Anchorage area to maintain healthy well-managed salmon stocks and provide opportunities and access for diverse user groups; and

WHEREAS, Joint Resolution No. 2014-01; A Joint Resolution of the Assembly of the Kenai Peninsula Borough, and Councils of the City of Homer, City of Kenai, City of Seldovia, City of Seward and City of Soldotna, Requesting the Alaska Board of Fisheries Hold its 2017 Upper Cook Inlet Finfish Meeting on the Kenai Peninsula is proposed to be sent to the Alaska Fisheries Board and other interested officials for consideration;

NOW, THEREFORE, BE IT RESOLVED BY THE ASSEMBLY OF THE KENAI PENINSULA BOROUGH:

SECTION 1. That the Alaska Board of Fisheries is respectfully and strongly urged to schedule its full Upper Cook Inlet Finfish Meeting of 2017 and future such meetings on the Kenai Peninsula on a semi-regular basis.

SECTION 2. That Assembly President Hal Smalley and Mayor Mike Navarre are authorized to sign Joint Resolution 2014-01 on behalf of the Kenai Peninsula Borough.

SECTION 3. That this resolution takes effect immediately upon its adoption.

ADOPTED BY THE ASSEMBLY OF THE KENAI PENINSULA BOROUGH THIS 2ND DAY OF SEPTEMBER, 2014.

Hal Smalley

Hal Smalley, Assembly President

ATTEST:

John Blankenship

Johni Blankenship, MMC, Borough Clerk

KENAI PENINSULA BOROUGH 1964

Yes:	Bagley, Haggerty, Johnson, McClure, Ogle, Pierce, Smith, Wolf, Smalley
No:	None
Absent:	None

14896 Kenai Spur Highway, Suite 103-A
Phone: (907) 283-3335 • Fax: (907) 283-3913
www.kpedd.org

Leadership to enhance, foster and promote economic development

RESOLUTION 2015-01

Requesting the Upper Cook Inlet Finfish Meeting 2017, to be held on the Kenai Peninsula.

WHEREAS, The Upper Cook Inlet Finfish meeting has not been hosted on the Kenai Peninsula since 1999; and

WHEREAS, All Kenai Peninsula Residents are affected by Upper Cook Inlet fisheries either directly or indirectly; and

WHEREAS, The Kenai Peninsula Economic Development District (KPEDD) represents the Kenai Peninsula community for economic development, including the various fishery user groups; and

WHEREAS, All Kenai Peninsula residents and businesses benefit from healthy fisheries management, strategies and practices; and

WHEREAS, Sound management, strategies and practices are developed by transparent processes, accessible public meetings and user participation, knowledge and representation; and

WHEREAS, the failure of Upper Cook Inlet meetings to rotate locations and be held on the Kenai Peninsula on a semi-regular basis greatly hampers public participation and local traditional knowledge; and

WHEREAS, all users of public resources should expect reasonable access to public meetings and processes; and

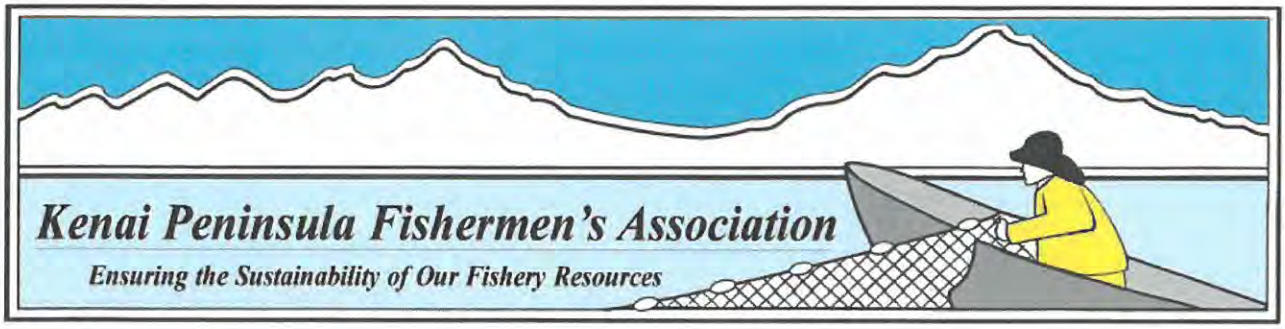
WHEREAS, local traditional knowledge is a great resource to the Board of Fish process; and

WHEREAS, it is in the best interest of the businesses of the Greater Kenai area to maintain healthy well-managed salmon stocks and provide opportunities and access for diverse user groups.

BE IT RESOLVED by the Kenai Peninsula Economic Development District, Inc. requests the Upper Cook Inlet Finfish meeting 2017 be held on the Kenai Peninsula, and the KPEDD supports sound, sustainable fisheries management practices and policies, and the KPEDD supports the accessibility of Upper Cook Inlet meetings to local users.

Brendyn Shiflea, President

Rick A. Roeske, Executive Director



September 3, 2014

Glenn Haight, Executive Director
Alaska Department of Fish and Game
Boards Support Section
P.O. Box 115526
Juneau, AK 99811-5526

Dear Glenn,

The Kenai Peninsula Fishermen's Association requests and strongly encourages the Alaska Board of Fisheries to hold its 2017 Upper Cook Inlet Finfish meetings on the Kenai Peninsula. The Kenai Peninsula is home to the streams and rivers that nurture the great salmon runs of upper Cook Inlet and to the majority of the people who make their livings harvesting, processing, and otherwise capitalizing on these vital fish. Finfish meetings have not been hosted on the Kenai Peninsula for more than 15 years. The men and women represented by KPFA feel that a Kenai Peninsula meeting will give local fishing groups, businesses as well as commercial and private fishers the opportunity to take part in this important public process.

As the organization that represents more than 746 limited entry permit holders and over 500 individual family businesses that operate on the Kenai Peninsula, we feel that a meeting on the Kenai Peninsula is long overdue. These meetings affect all of our members as well as the thousands of people who are directly and indirectly touched by the Peninsula's salmon-driven economy. It's only right that the meeting be held where the majority of these fisheries take place and within reach of the Alaskans who are impacted the most by the decisions made by the Board of Fish.

Five full board cycles—15 years—have passed since the Kenai Peninsula has hosted the Upper Cook Inlet Finfish Meeting. Here are a few of the reasons that we feel it is imperative that they be held here for the 2017 board cycle:

- Citizens of the City of Kenai and the community of Kasilof, who are directly impacted by the tens of thousands of personal use fishers who descend on their communities each summer to harvest salmon, have had few opportunities to give input on management of those fisheries because the meetings are now held exclusively in Anchorage.

43961 Kalifornsky Beach Road • Suite F • Soldotna, Alaska 99669-8276
(907) 262-2492 • Fax: (907) 262-2898 • E Mail: kpfa@alaska.net

- The majority of the sportfishing activities in Upper Cook Inlet occur on the Kenai Peninsula, yet Peninsula residents have repeatedly had limited access to the Board of Fisheries process which grows more and more anchored to Anchorage.
- By holding the meetings far from those who best know the fisheries, and because attending a two-week meeting in Anchorage is cost-prohibitive, the tremendous resource of local and traditional knowledge regarding the 130-year-old commercial salmon fisheries has all but disappeared from the Board of Fish process.
- For those same reasons, the local and traditional knowledge regarding centuries-old subsistence fisheries has all but disappeared from the Board of Fish process.
- Peninsula businesses that prosper from, and support the commercial, sport and subsistence lifestyles throughout the year would benefit from taking part the deliberations made at these meetings.
- If the meeting is held on the Kenai Peninsula, local businesses including hotels, restaurants, B & B's, retail stores, and gas stations among others, will benefit from the winter boost in revenue during an otherwise slow time of year.
- The Kenai Peninsula is home to many of Upper Cook Inlet's Fish and Game Advisory Committees, Aquaculture, Conservation and Fishing associations and their participation will be enhanced.
- The Kenai and Kasilof rivers run through the Kenai Peninsula Borough and thus all of the sport, personal use and subsistence fisheries supported by those rivers occur within the borough.
- The entire East Side Setnet fishery is conducted within the Kenai Peninsula Borough.
- The entire Drift Fishery is conducted in the Kenai Peninsula Borough.
- All Personal Use Fisheries on the Kenai Peninsula occur within the Kenai Peninsula Borough.
- Virtually all Upper Cook Inlet Saltwater Sport Fisheries are conducted within the Kenai Peninsula Borough.

For these reason and many more, the Board of Directors of the Kenai Peninsula Fisherman's Association submits this letter to the Alaska Board of Fisheries and strongly urges them to hold its 2017 Upper Cook Inlet Finfish meetings on the Kenai Peninsula.

For over a decade and a half the people of the Kenai Peninsula have been marginalized, excluded from the Board of Fish process by distance, cost, and inconvenience, please don't let that continue.

Respectfully

Andy Hall

Andy Hall, President
Kenai Peninsula Fishermen's Association

43961 Kalifornsky Beach Road • Suite F • Soldotna, Alaska 99669-8276
(907) 262-2492 • Fax: (907) 262-2898 • E Mail: kpfa@alaska.net

Soldotna Chamber of Commerce
Resolution 2014-03

A RESOLUTION OF THE SOLDOTNA CHAMBER OF COMMERCE REQUESTING CONSIDERATION OF THE 2017 UPPER COOK INLET FINFISH MEETING TO BE HELD ON THE KENAI PENINSULA.

WHEREAS, it is the mission of the Soldotna Chamber of Commerce to represent, educate and advocate for our members; and

WHEREAS, all business members are affected by the Upper Cook Inlet fisheries either directly or indirectly; and

WHEREAS, the Upper Cook Inlet Finfish meeting has not been hosted on the Kenai Peninsula since 1999; and

WHEREAS, all users of the resource should expect reasonable access to public meetings and processes.

NOW, THEREFORE, BE IT RESOLVED BY THE SOLDOTNA CHAMBER OF COMMERCE IS REQUESTING THAT THE ALASKA BOARD OF FISH CONDUCT THE 2017 UPPER COOK INLET FINFISH MEETING ON THE KENAI PENINSULA.

PASSED BY THE SOLDOTNA CHAMBER BOARD OF DIRECTORS ON THE 12TH DAY OF SEPTEMBER, 2014.

President of the Board Ryan Kapp Date 9/19/14
Ryan Kapp

Executive Director Michelle Glaves Date 9/19/14
Michelle Glaves

"Village with a Past, City with a Future"

210 Fidalgo Avenue, Kenai, Alaska 99611-7794
Telephone: (907) 283-7535 / FAX: (907) 283-3014
www.ci.kenai.ak.us

September 23, 2014

Glenn Haight
Alaska Department of Fish & Game
PO Box 115526
Juneau, AK 99811-5526

Dear Mr. Haight:

The purpose of this correspondence is to transmit a joint resolution requesting that the Alaska Board of Fisheries (BOF) hold their 2017 Upper Cook Inlet (UCI) Finfish meeting on the Kenai Peninsula. This resolution was unanimously adopted by political subdivisions of the State of Alaska located on the Kenai Peninsula. These are the Kenai Peninsula Borough, and the Cities of Seward, Homer, Seldovia, Soldotna, and Kenai.

The BOF last held its UCI Finfish meeting on the Kenai Peninsula in 1999, even though approximately 80 percent of the issues and proposals considered are based on Kenai Peninsula Fisheries.

There are several venues on the Kenai Peninsula capable of hosting the 2017 BOF meeting. These include, but are not limited to the Kenai Central High School Auditorium/Challenger Learning Center, and the Soldotna Regional Sports Center. The Kenai Peninsula Borough School District is keenly interested in providing support and utilizing the BOF meeting as a learning opportunity for its students.

There are more than sufficient lodging and other support facilities available to support the BOF meeting.

Upon my return on September 29, 2014, I will provide additional information for the BOF work session packet of October 15 &16. It is also my intent to attend the work session along with Brian Gabriel, a Kenai City Council Member. In the event that public participation is allowed at the work session, both Councilor Gabriel and I would request to address the Board of Fish.

Thank you for your attention in this matter.

Sincerely,
CITY OF KENAI
Mm Schahl for

Rick R. Koch
City Manager

Enclosure

cc: Governor Sean Parnell
Mike Nizich, Chief of Staff
Cora Campbell, Commissioner ADF&G
Senator Peter Micciche
Speaker Mike Chenault
Representative Kurt Olson
Mayor Mike Navarre

KENAI PENINSULA BOROUGH
CITY OF HOMER
CITY OF KENAI
CITY OF SELDOVIA
CITY OF SEWARD
CITY OF SOLDOTNA

JOINT RESOLUTION NO. 2014 - 01

A JOINT RESOLUTION OF THE ASSEMBLY OF THE KENAI PENINSULA BOROUGH, COUNCILS OF THE CITY OF HOMER, CITY OF KENAI, CITY OF SELDOVIA, CITY OF SEWARD AND CITY OF SOLDOTNA, REQUESTING THE ALASKA BOARD OF FISHERIES HOLD ITS 2017 UPPER COOK INLET FINFISH MEETING ON THE KENAI PENINSULA.

WHEREAS, Upper Cook Inlet Finfish issues are vitally important to, and directly impact residents, municipal governments and communities on the Kenai Peninsula; and

WHEREAS, many local residents and businesses of the Kenai Peninsula depend on, participate in, and are otherwise affected by decisions made by the Board of Fisheries with regard to subsistence fisheries, sport fisheries, commercial fisheries, personal use fisheries and conservation measures in Upper Cook Inlet; and

WHEREAS, when making informed decisions regarding finfish issues in Upper Cook Inlet, the Board of Fisheries should consider the comments and interests from residents of the Kenai Peninsula; and

WHEREAS, the costs and travel time to attend meetings outside the Kenai Peninsula pose a significant burden to local residents, limiting participation and the Board of Fisheries' ability to benefit from local knowledge; and

WHEREAS, the Alaska Board of Fisheries has not held its Upper Cook Inlet Finfish meeting on the Peninsula since 1999 despite numerous requests that it do so; and

WHEREAS, holding the meeting on the Kenai Peninsula would show local residents, businesses and communities that the Board of Fisheries listens, cares about and understands the local impacts of its decisions; and

WHEREAS, there are local quality venues of sufficient size with advanced technologic capabilities to host public meetings, as well as exceptional lodging and dining opportunities on the Kenai Peninsula;

NOW, THEREFORE, BE IT RESOLVED BY THE KENAI PENINSULA BOROUGH ASSEMBLY, AND THE COUNCILS FOR THE CITY OF HOMER, CITY OF KENAI, CITY OF SELDOVIA, CITY OF SEWARD AND CITY OF SOLDOTNA:

Section 1. That the Alaska Board of Fisheries is respectfully and strongly urged by the Kenai Peninsula municipal governments representing their constituents to hold the 2017 Upper Cook Inlet Finfish meeting on the Kenai Peninsula.

Section 2. That this Joint Resolution be forwarded to Governor Sean Parnell, Senator Peter Micciche, Senator Gary Stevens, Speaker Mike Chenault, Representative Kurt Olson, Representative Paul Seaton, Governor's Chief of Staff Mike Nizich, Department of Fish & Game Commissioner Cora Campbell, Alaska Board of Fisheries Members – Karl Johnstone, Orville Huntington, Susan Jeffrey, John Jensen, Fritz Johnson, Thomas Kluberton, Reed Moriskey, Alaska Board of Fisheries Executive Director Glenn Haight

Section 3. That this resolution takes effect immediately upon approval by the participating city councils.

APPROVED BY THE ASSEMBLY OF THE KENAI PENINSULA BOROUGH THIS 2nd DAY OF September 2014.

Hal Smalley
HAL SMALLEY,
ASSEMBLY PRESIDENT

Mike Navarre
MIKE NAVARRE,
KENAI PENINSULA BOROUGH MAYOR

KENAI PENINSULA BOROUGH 1964

ATTEST:

Johni Blankenship
Johni Blankenship, Borough Clerk

APPROVED BY THE COUNCIL OF THE CITY OF HOMER this 8th day of September, 2014.

Mary E. Wythe
MARY E. WYTHE, HOMER MAYOR

ATTEST:

Jo Johnson
Jo Johnson, City Clerk

APPROVED BY THE COUNCIL OF THE CITY OF KENAI this 8th day of September, 2014.

Pat Porter
PAT PORTER, KENAI MAYOR

ATTEST:

for Sandra Modigh, City Clerk

APPROVED BY THE COUNCIL OF THE CITY OF SELDOVIA THIS 10 DAY OF September, 2014.

KEITH GAIN, SELDOVIA MAYOR

ATTEST:

For Mary Klinger, City Clerk Deputy Clerk

APPROVED BY THE COUNCIL OF THE CITY OF SEWARD, THIS 11th DAY OF September, 2014.

Jean Bardarson
JEAN BARDARSON, SEWARD MAYOR

CITY OF SEWARD INCORPORATED SEAL JUNE 1, 1912 STATE OF ALASKA

ATTEST:

Johanna Kinney
Johanna Kinney, City Clerk

APPROVED BY THE COUNCIL OF THE CITY OF SOLDOTNA, this 10th day of September, 2014.

NELS ANDERSON, SOLDOTNA MAYOR

ATTEST:

Michelle M. Saner, City Clerk

Groundfish Forum

4241 21st Avenue West, Suite 302
Seattle, WA 98199
(206) 213-5270 Fax (206) 213-5272
www.groundfishforum.org

September 30, 2014

Mr. Karl Johnstone, Chairman
Alaska Board of Fisheries
Alaska Department of Fish and Game
PO Box 115526
1255 W. 8th Street
Juneau, AK 99811-5526

Submitted by Fax to Boards Support Section: (907) 465-6094

Re: Agenda Change Request 24, Alaska Board of Fisheries Work Session, October 2014, Juneau, Alaska

Dear Chairman Johnstone,

Groundfish Forum represents 16 trawl catcher-processor (CP) vessels in the Amendment 80 (non-pollock) sector. Many of our vessels have extensive history in, and dependence on, Gulf of Alaska federal fisheries. We are writing to request that the Board of Fisheries disapprove ACR 24, which would increase the Western Gulf of Alaska (WGOA) Pacific cod GHL from 30% to 50% of the Allowable Biological Catch.

Our comments reflect the concerns contained in the September 29, 2014 letter from Mr. Bruce Weyhrauch on behalf of the Bering Sea Pot Cooperative relative to ACR 25. Similar to ACR 25, ACR 24 is an out-of-cycle request that does not address conservation concerns or errors in previous rulemaking, as required in the guidelines for acceptance of an ACR contained in 5AAC 39.999(a)(1). It is instead a re-submission of Proposals 18-21 from the Board of Fisheries October 2013 meeting, which were designed to reallocate Pacific cod from federal fisheries to State fisheries.

The proposer cites halibut bycatch concerns and consideration of a federal catch share program as the justification for this ACR. However, since the October 2013 meeting, the only change in the federal fishery has been a 15% *decrease* in the halibut PSC cap for the longline CV and trawl CP and CV sectors[1]. The proposed catch share program was already under consideration prior to that meeting[2]. Further, increasing Pacific cod harvest in state waters could raise concerns about localized depletion and Steller sea lion protections.

In short, ACR 24 is an allocative proposal to transfer fish from participants in the Federal and Parallel Pacific cod fisheries to participants in the State Water fisheries. It does not meet the Constitutional requirements for an Agenda Change Request.

Thank you for your consideration.

C. J. Woodley

Chris Woodley
Executive Director

[1] Amendment 95 to the Gulf of Alaska Fisheries Management Plan, approved by the North Pacific Fishery Management Council in June of 2012 and implemented in the 2014 specifications for the Gulf of Alaska. Final Rule at 79FR 9625,February 20, 2014.

[2] North Pacific Fishery Council motion on Gulf of Alaska Trawl Bycatch Management, October 5, 2013 and previous.

UNITED CATCHER BOATS

Washington · Oregon · California · Alaska

October 1, 2014

Mr. Karl Johnstone, Chairman
Alaska Board of Fisheries
P.O. Box 115526
Juneau, AK 99811

RE: ACR 25

Dear Chairman Johnstone and Members of the Board of Fisheries,

On behalf of the members of United Catcher Boats (UCB), we request the Board of Fisheries to reject ACR 25 for the following reasons.

First, ACR 25 does not meet the standards of 5 AAC 39.999 that must be met in order for the Board of Fisheries to approve of an out-of-cycle proposal request. This regulation requires an ACR proposal be for: 1) a fishery conservation purpose or reason; or 2) to correct an error in a regulation.

Regarding conservation, the Bering Sea Pacific Cod stock is very robust and in excellent condition. The North Pacific Fishery Management Council's Groundfish Plan Team just met last week and reviewed the preliminary groundfish survey results. The latest trawl survey for Bering Sea P. cod indicate an increase in abundance of this stock of fish relative to previous year's surveys.

Regarding an error in a regulation, there is no error in the regulations that implemented the Board of Fisheries recommendation from last year to establish the new Area O State water P. cod fishery.

This proposal is a simple allocation battle proposal, nothing more, nothing less. There is no new information other than what has presented at last year's Board of Fisheries meeting (October 2013) to inform the Board of Fisheries of any new developments. Because the federal Bering Sea P. cod fishery is a fully utilized and allocated fishery, establishing a new State water fishery in the Bering Sea is just a re-allocation from the historic federal fishery.

4005 20th Ave. W - Suite 116, Fisherman's Terminal • Seattle, WA 98199 • Tel. (206) 282-2599 • Fax (206) 282-2414

The newly established Area O P. Cod GHL fishery has experienced just one season of a fishery. The ADF&G groundfish managers and the NMFS assessment biologists will need a number of years of fishery effort and data in this new State water fishery to be able to fully understand the biological and economic impacts of establishing new effort and fishery removals from the near-shore range of the Bering Sea P. Cod stock.

The members of United Catcher Boats have been historically dependant on the Bering Sea P. Cod fishery for the past four decades. Currently, there are approximately 110 trawl catcher vessels that participate in the Bering Sea catcher vessel trawl fisheries, of which about half participate in the federal BSAI P. cod trawl fishery. This ACR proposal and the original proposal to establish a Bering Sea State water GHL fishery both have negative effects on our member's fishing operations. If the Board of Fisheries is intent on knowing more about the effects of the establishment of the new Area O P. Cod fishery, then we suggest you have staff provide you with an economic analysis of the loss of over 8,000 metric tons of P. cod to the historic participants in the Bering Sea cod fishery. We also suggest you task the ADF&G or NMFS biologists with analyzing the effects of disproportionate near-shore harvest of P. cod, a stock of fish that exhibit quite a large migration range over the Eastern Bering Sea shelf.

We appreciate your consideration of our comments on this issue, and I plan to be available at the upcoming Board of Fisheries work session in Juneau if you would like additional information.

Sincerely,

Brent C. Paine

Brent Paine

Submitted By
Alex Hills
Submited On
9/25/2014 8:15:22 AM
Affiliation

I request that you take no action on ACR 20, which requests changes be made to the Central District Commercial Drift Net Fishery. In my opinion, ACR 20 does not meet the criteria mandated for the Board to accept the proposal. I make this comment in light of the positive effect the management changes made at the last Board Meeting have had on Northern District Salmon runs, and I support the continued gathering of information prior to the 2017 UCI BOF Meeting.

Submitted By
Andrew Wilder
Submited On
9/29/2014 8:45:56 PM
Affiliation

Dear Mr. Chairman:

I support ACR 25 that would increase the area O Bering Sea state water GHL to 6%. The original proposal back in Oct 2013 was for a stair step approach of 3%, 5%, 7% if the GHL was attained in the prior year. This approach was used for the original state water cod fisheries that were started in the late 90's. ADFG management did not support more than 3% because 1)They did not think the fleet could catch the 3% GHL. 2) They thought the fish inside 3 mi. would be small and the processors might not want them. Neither of these argumements proved to be valid and the fishery was big success.

The pcod TAC is lower than the ABC because of the 2 million metric ton cap in the BSAI, so despite all the opposition from federal lobbyists no federal fishery gave up any allocation. The under 58' fleet as well as processors in Akutan and Dutch Harbor benefitted from this new fishery as almost 18 million pounds of cod were processed generating additional tax revenues and jobs. No Halibut or chinook bycatch was used. This fishery was a great success.

The Board of Fish should increase the GHL and consider expanding area O subdistrict from the Bering Sea Sea Buoy north of False Pass to Umnak pass.

My boat participated for the third year in the GHL Adak cod fishery last winter. We made a commitment to a new processor in Adak before the board created the new area O fishery. So even though we fished Bering Sea in January and February, my boat did not participate in the new area O fishery. We were just recently informed that Adak cod cooperative will not be back to Adak in 2015. This new information will bring 6 more boats back into the Bering sea Area O and AK peninsula GHL fisheries next season, including my boat.

Again I support ACR 25 and hope the board of fish will too!

Sincerely,

Andrew Wilder F/V Claire Oceana

Submitted By
Brent Johnson
Submited On
9/24/2014 6:05:46 AM
Affiliation
Cook Inlet set netter

Phone
(907) 262-4763
Email
ragweb@gci.net
Address
20773 Porcupine Ln
Clam Gulch, Alaska 99568-9706

Chairman Johnstone and Board of Fisheries Members,

Please schedule the 2017 Cook Inlet Board Meeting in the Kenai - Soldotna area. Many of the issues that will be dealt with affect Kenai Peninsula residents and it would be thoughtful of you to make it convenient for them to give public testimony and participate in committees and personal discussions with you.

Thank you,

Brent Johnson

Submitted By
Buck Laukitis
Submited On
10/1/2014 10:10:55 AM
Affiliation

Phone
9072990112
Email
buck.magicfish@gmail.com
Address
59065 Meadow Ln
Homer, Alaska 99603

ACR 26

Dear Mr. Chairman;

I support the board taking up a review of 58 foot vessel length regulations. Although I do not support the proposer's conclusions in ACR 26, I believe there is enough confusion about regulations regarding vessel length, that they should be examined. I believe the problem is that there is no definition of "anchor roller" in regulation. If "anchor roller" as pertaining to 58 foot regulations was defined it would clear up a lot of confusion.

In a September 2014 McDowell Group report on the Alaska Maritime Industry there are approximately 892 vessels in the 50-60 foot length range. I estimate over 100 "58 footers" are 58 feet plus an anchor roller. Some of these vessels built by reputable boat builders have fished in Alaska salmon fisheries every year since 1981. Some are new construction built in the last few years by reputable boat builders. What extends beyond 58 feet is cosmetic, has no buoyancy, can be easily removed by bolts, and does not provide any competitive advantage as fish hold or water tank, etc. There are USCG, federal, American Bureau of Shippiing, etc LOA (length overall) definitions that could all be used. The state has a definition in regulation about length – specifically in Bristol Bay for the 32 foot limit (which excludes anchor roller, but doesn't address "swim steps") and for the 58 foot limit which allows anchor rollers to exceed the 58 foot extremities but does not define what an anchor roller is. Bulbous bow is somewhat defined and does not count for length.

In some ways this is an established practice and should be left alone, but the proposer of ACR 26 is filing complaints against fishermen for length, and there is no clear definition. "The natural pointed end of the bow" is the proposers interpretation of the definition. I think we need more clarity in regulation that provides for existing practices.

Sincerely,

Buck Laukitis

Submitted By
Buck Laukitis
Submited On
9/21/2014 4:51:02 PM
Affiliation

Phone
907-299-0112
Email
buck.magicfish@gmail.com
Address
59065 Meadow Ln
Homer, Alaska 99603

Dear Mr. Chairman;

I support ACR 25 that increases the Area O Bering Sea state water cod allocation to 6%. When the regulation was adopted the public had proposals in that would have increased allocations from 3%, to 5% to 7%. If the GHL was attained then in the subsequent year the GHL amount would step up. This was the approach used in the original state watet cod fishery developed in the late 90's. I was told by ADFG management staff that they did not support any more than 3% for two reasons: they did not think the fleet could catch the GHL in the near term; and they told me they thought the fish inside 3 miles would be small, and potentially the processors wouldn't want them. Neither of these proved to be true, and this new fishery was a success.

Remember that this fishery was not allocative despite all of the opposition from federal lobbyists. The pcod TAC is lower than the ABC because of the 2 million metric ton cap in the BSAI, so no federal fishery gave up any alllocation. The state water under-58 foot fishermen benefitted from this new fishery. Almost 18 million pounds of cod were caught and processed in Dutch Harbor and Akutan generating additional tax revenues. No halibut or chinook bycatch was used. There are complications in many state water fisheries, but this is a straightforward beneficial success story. The state needs more of these.

The Board of Fish should increase the GHL and consider expanding the Area O subdistrict from the Bering Sea Sea Buoy north of False Pass to Umnak Pass.

My boat participated for the third year in the GHL cod fishery around Adak last winter. We had made a committment to the new processor before the board action creating the new fishery, so we did not participate in the new Area O fishery even though we were fishing right there in January and early February during the federal cod season. Adak Cod Coop told us this past week that we would not have a market in Adak because they would not be opening in 2015. That will bring three to six boats (including our boat) into the Area O or Ak Pen cod GHL fisheries next season. Again this is new information and another reason to consider managing more of the states resources for the benefit of state residents.

Sincerely,

Buck Laukitis

Submitted By
Christopher Johnson
Submited On
9/24/2014 11:03:18 AM
Affiliation

Phone
940-435-5783
Email
christopher_johnson@mac.com
Address
2122 Foxcroft Cir
Denton, Texas 76209

The Board of Fisheries has not met in Soldotna since 1999. I would propose Soldotna as the site of the 2017 Cook Inlet meeting.

Submitted By
Deana Moore
Submited On
9/26/2014 9:17:08 AM
Affiliation
GPCC

Please consider the 2017 Upper Cook Inlet Board of Fisheries Meeting being held in Anchorage and not moved to Kenai. We need the discussion to remain on neutral ground and feel Anchorage is the appropriate location.

Thank you!

Submitted By
Dwight Kramer
Submited On
9/19/2014 3:55:01 PM
Affiliation
Self

Phone
907-283-1054
Email
dwimar@gci.net
Address
230 N Fern St.
Kenai, Alaska 99611

~~Dear BOF Board Members,

I would like to take this opportunity to provide comment on your upcoming discussions and decision on the location for the 2017 UCI BOF meeting.

Throughout the 2014 UCI BOF meeting I continually requested various board members to evaluate the attending audience to get a sense of where the attending participants were from. It was very obvious that after the public testimony portion of the meeting almost all in attendance were from the Kenai Peninsula area. This only makes sense because 85% of the nearly 300 proposals are for the Kenai and Kasilof rivers or immediate offshore waters. These are the people that have the most involvement in the issues at hand in UCI fishery decisions.

What doesn't make any sense is that none of these meetings have been held in the Kenai / Soldotna area for nearly 20 years. Please ask yourself how you would like it if meetings for Kodiak, Bristol Bay, Fairbanks or the AYK were always held in Anchorage because a minority of power players want it that way so that they can have a better chance at controlling the outcome if local participation is minimized by time and travel expenses necessary to attend.

The BOF has a mandate to try to hold their meetings closest to the fisheries involved in these critical meetings. By the sheer volume of proposals related to the Kenai Peninsula waters it would infer that the Kenai / Soldotna area should be an obvious location for this meeting.

Our organization, Kenai Area Fisherman's coalition (KAFC), represents private, mom and pop, anglers. Private anglers do not have any commercial interest or concerns in the outcome of these meetings so the financial burdens to attend an Anchorage meeting makes it financially impossible to attend. At the 2014 meeting, Chairman Johnstone, eluded to the fact that people who filed proposals should be present to defend them. That is financially impractical for private anglers from the Kenai area when the meeting is held in Anchorage.

I hope all of you will understand that a private angler is different from a guide or a commercial fisherman in that they do not have any financial gain in the outcome of their proposals, so for them to come to Anchorage to give 3 minutes of testimony and stay around for 4-5 days to serve in the committee process would cost them between 500 – 1,000 dollars. I hope you can see by this example why private anglers from the Kenai area are largely excluded from the process when the meeting is held in Anchorage.

Last year it cost our organization about $2,600 for two of us to attend the meeting in its entirety. Roughly 95% of the attending audience on any given day after public testimony was from the Kenai area so you can imagine the total financial burden on Kenai area individuals and organizations. It has been mentioned in the past that Anchorage is a good central location but central for who? It's a simple fact that Anchorage and MATSU folks simply don't attend these meetings very much.

KAFC has offered a solution to this problem and that is to have alternating meetings between the Kenai / Soldotna area and the Anchorage / MATSU area. We think this is a fair and equitable solution for all concerned with UCI Fishery issues and one that should be adopted by the board.

There is also a stigma, that because of one isolated incident at the 1999 Soldotna meeting, this area is not a safe place to hold these meetings. I hope that concern has been put to rest over the years. The BOF recently held the 2013 King Salmon Task Force meetings here over several timeframes without incident. Throughout these meetings the panel and the audience conducted themselves in a friendly and respectful manner. It should be considered that a UCI BOF meeting in this area would be no different.

Thank you for your time and consideration in this matter.

Respectfully Submitted,

Dwight Kramer
Kanai

Submitted By
Elizabeth Chase
Submited On
9/25/2014 4:05:05 AM
Affiliation
BEACHM FISHERY

Phone
9072623233
Email
beachmfishery@alaska.net
Address
PO Box 39
Kasilof, Alaska 99610

It has been many years since the BOF has held a meeting on the Kenai Peninsula. I would like to respectfully request that you would please hold the 2017 meeting here again.

Thank you for your consideration

Sincerely,

Liz Chase

Submitted By
GARY HOLLIER
Submited On
9/30/2014 9:48:31 AM
Affiliation
NORTH-K BEACH SETNETTER

Dear Members of the Alaska Board of Fish,

I would like to address the ACR's concerning Upper Cook Inlet, that are to be considered in October 2014.

I fel the ACR 17, is the only one that meets the criteria, and should be considered.

I am opposed to all other ACR's. Specifically ACR 13, which asks for a 1/2 mile fishery in the Kasilof section during times of conservation due to low King Salmon returns to the Kenai RIver.

ACR 13 is to be used when the Kaslof RIver Special Harvest Area (KRSHA) is open.

The first time the 1/2 mile fishery in the Kasilof section was used was in 1985. The KSRHA, and its regulations went into effect in Cook Inlet in 1986. Staff from ADF&G has stated that the KRSHA is a "...clean..." fishery and in Staff comments states "... use of the KRSA was an important tool..."

The KRSHA originally went on into regulation:

1. To help harvest large returns of sockeye to the Kasilof River.

2. It was also benifical to harvest Kasilof sockeye, when the lower end of the Kenai River sockeye goal might not be met.

3. It also is a very important tool to help achieve the minimum Late-Run Kenai River King Salmon (LRKRKS) goal, while harvesting Kasilof sockeye.

Fishing 37 miles of beach out to 1/2 mile would harvest more Kenai River King Salmon than what was harveted in the KRSHA.

If this ACR was to be supported by the BOF and passed, there is no doubt in my mind that the minimum goal of LRKRKS would not have been met in 2014.

Thank you,

Gary L. Hollier

Kenai, Ak.

.

Submitted By
Gene J Sandone
Submited On
10/1/2014 10:20:02 AM
Affiliation
Fishery Consultant for Bristol Bay Economic Development Corporation (BBEDC)

Phone
9076316033
Email
gjsandone@gci.net
Address
4950 W Clayton St
Wasilla, Alaska 99623

Agenda Change Request 12

Problem:

In December 2012 the Alaska Board of Fisheries (BOF) established a committee to oversee the analysis of optimum escapement goals (OEGs) for Bristol Bay sockeye salmon. Additionally, at that time, ADF&G agreed to postpone the implementation of recommended Biological Escapement Goals (BEGs) for six sockeye stocks until the 2015 season, pending the results from an the sockeye salmon OEG analysis. Results from this committee are expected prior to the 2015 fishing season. Further, the BOF agreed to receive input from the commercial fishing industry to evaluate escapement goals before the 2015 fishing season. We believe that the BOF intended to deliberate on an out-of-cycle OEGs proposal based on the results from the BOF-sanctioned OEG committee prior to the 2015 salmon season.

In order for the BOF to deliberate on a proposal prior to the 2015 salmon season an out-of-cycle proposal needs to be created so that public notice can be given to satisfy due process. If an out-of-cycle proposal is not created then the ADF&G escapement goals will be implemented for the six sockeye salmon stocks for the 2015 season.

Solution:

This agenda change is not simply requesting to update the BOF on progress made by industry on evaluation of OEGs, as ADF&G states in their response to this ACR. The proposer is specifically asking the BOF to adopt an OEG for some of the river systems in Bristol Bay or make regulation changes to give ADF&G guidance in managing for escapement goals based on the findings of the committee the BOF sanctioned in December 2012.

In order for the BOF to deliberate on the recommended OEGs, an out-of-cycle needs to be created. The BOF can accept ACR 12 and, thereby, generate a proposal that could be heard at a regularly scheduled BOF meeting prior to the 2015 season. Also, the BOF could generate their own out-of-cycle proposal, based on the action taken by the BOF in 2012 when they established the OEG committee and their agreement to receive input from the commercial fishing industry to evaluate escapement goals prior to the 2015 fishing season.

Regardless of the process, we support creation of an out-of-cycle proposal for BOF deliberation to establish Bristol Bay sockeye salmon OEGs based on the results from the OEG committee. Therefore, we support ACR 12. Because the results from the OEG committee may not be available to the BOF prior to the October 15-16 BOF work session, we view this out-of-cycle OEG proposal as a placeholder for BOF deliberations on this subject.

Submitted By
Gene J Sandone
Submited On
10/1/2014 10:05:43 AM
Affiliation
Fishery Consultant for Bristol Bay Economic Development Corporation (BBEDC)

Phone
9076316033
Email
gjsandone@gci.net
Address
4950 W Clayton St
Wasilla , Alaska 99623

Agenda Change Request (ACR) 11

Change the Naknek-Kvichak District boundary line at Graveyard Point to include two historically fished set net sites (5AAC. 06.350).

Problem:

Two set net sites, previously within the commercial fishing area within the Naknek-Kvichak District and fished by a long-time Bristol Bay commercial fishing family since 1954 and 1980, have been either partially or totally included in closed waters within the Naknek-Kvichak District, respectively. We believe that these sites were inadvertently excluded from the commercial fishing area by the Alaska Board of Fisheries (BOF) when the boundary definition method was changed in 2001. Note that boundary definition of closed waters included language referring to "in 1980*… a line from Graveyard Point…*"; in 1992 "*…a line bet een ADF&G regulatory markers located* near Graveyard Point at Loran C coordinates…"; and in 2001 "*..a line from an ADF&G regulatory marker located at 58° 52.07' N. lat., 157° 00.89 W. long. near Graveyard Point…".* Accordingly, the family who have historically fished these sites are now prohibited from fishing these sites because of this unforeseen result of the change in definition of the Naknek-Kvichak District boundary to GPS coordinates.

Solution:

ACR 11 seeks to amend the Global Positioning System (GPS) contained in 5 AAC 06.350 (b)(1) closed waters, so that the new GPS coordinates correspond to the historical location of the upper Graveyard Point marker as defined in the 1980 boundary definition. This change will probably factor in the significant shoreline erosion that is and has been occurring. In their response to this ACR, ADF&G state, "*The intent as not to change the location of the boundary line; ho ever changes in ho the boundary line is defined unintentionally resulted in changing the location of the boundary line*". We believe that the current boundary should more nearly reflect the boundary line, as defined in 1980, and totally include these specific set net sites in the commercial fishing district. Therefore, we support ACR 11.

Submitted By
Joan Nininger
Submited On
9/9/2014 10:42:47 AM
Affiliation

Phone
907-357-1606
Email
nininger@alaska.net
Address
P.O. Box 877944
Wasilla, Alaska 99687

Dear Board of Fish Members, September 9, 2014

I would like to express my delight in the successful outcome of this fishing season due to the wise decisions of last winter's Upper Cook Inlet Board of Fisheries meeting in Anchorage.

Numbers don't lie and the fact is in the weir count. Over 23,000 Coho salmon passed through to their spawning grounds on the Little Susitna River this past summer. Last year there were approximately 13,000 that passed through the weir.

As a resident of this great state for the past 35 years and now representing the senior populace on a set income, my husband and I were able to lighten the financial burden on the grocery budget by harvesting food for our freezer to assist us in getting through the winter with a healthful diet of Coho salmon.

As grandparents, we were able to pass on the joy of fishing to our six year old granddaughter as we watched her catch her first and second Coho salmon. To share and teach the grandchildren about nature and the wilderness is an important legacy we should all be taking time to do before they are lost and completely consumed by technology of personal use devices.

Sport fishing has a positive effect on our local tourism industry. We had family from out of state visit this past summer. They not only had a successful once in a life time experience with a local river guide service, they purchased groceries, ate at our local restaurants, did some local sight- seeing, visited some local points of interest with local businesses.

Thank you again, for making the important decisions you made at your last meeting. It has already made a big difference in one season. I look forward to the years ahead of balance that you have brought back to our rivers and communities.

Lastly, I ask that you bring your next Board of Fish meeting to the Mat-Su Valley. It has been held in Anchorage and the Kenai Peninsula. I know the Valley community would appreciate the opportunity to host the Board.

Respectfully,

Joan C. Nininger

Submitted By
Kenneth Tarbox
Submited On
9/23/2014 6:54:00 PM
Affiliation

Phone
9072627767
Email
tarbox@ptialaska.net
Address
33270 Community College Drive
Soldotna, Alaska 99669

I am writing to support the next regular cycle Upper Cook Inlet salmon meeting be held in Soldotna/Kenai Alaska.

Having attended numerous UCI Board meetings it is obvious that those with the political and financial resources have greater participation and therefore influence on the Board decisions. As a private citizen, who is not affiliated with any user group, the cost of attending a meeting is prohibitive. While one could drive 300 miles round trip to Anchorage to give 3 minutes of testimony we all know that the real decisions happen in committee work and in the hall ways. For some, in the bar at the Captain Cook Hotel. To participate at that level would require an expenditure of over a thousand dollars for a private citizen from Soldotna.

Therefore, in the interest of fairness it seems only logical that the playing field would be more level if once every decade a meeting was held in the Kenai/Soldotna area. Residents of Mat/Su only drive 120 miles round trip and can stay at home at night. Anchorage residents travel a few miles and stay in their home at night. One would think that at least one meeting outside Anchorage would be appropriate given that most proposals deal with the Kenai Peninsula Fisheries.

But given the political power of Kenai Sport Fishing and various guide organizations to stifle local input I am not counting on a favorable decision. I hope you prove me wrong.

Submitted By
Ralph Renzi
Submited On
9/26/2014 10:57:21 AM
Affiliation

Phone
907-354-2886
Email
ralph@morningshire.com
Address
2640 N. Hematite Dr.
Wasilla, Alaska 99654

Regarding the 2017 Upper Coi BOF Meeting: I would request the above meeting be held in Anchorage rather than in Kenai. Anchorage is centrally located in AK and allows convenient access to all parties. The public would be afforded easy access to the proceedings. Moving the meeting to Kenai would, in effect, reduce the transparency of the process. Please keep the meeting in Anchorage.

Submitted By
Robert Toll
Submited On
9/24/2014 7:31:15 AM
Affiliation
Cook Inlet east side setnet

Phone
907-262-7050
Email
btoll@alaska.net
Address
PO Box 96
Kasilof, Alaska 99610

I'm requesting that the Alaska Board of Fisheries discuss holding the scheduled 2017 Cook Inlet meetings on the Kenai Peninsula. This would make it easier for locals to attend the meetings and participate in the process. The Kenai and Kasilof river management plans affect us locally as commercial fishermen, sports fishermen, personal use fishernen, commercial guides/clents, business owners, land owners and participants in educational fisheries. Proposals that relate to this area will consume the bulk of the Board's time and energy during the 2017 meetings. Please consider having these meetings in the Kenai/Soldotna area.

Submitted By
Terry Nininger
Submited On
9/8/2014 12:07:20 PM
Affiliation

Phone
907-357-1606
Email
nininger@alaska.net
Address
P.O. Box 877944
Wasilla, Alaska 99687

Dear Member of the Board of Fisheries,

I strongly oppose the Agenda Change Request ACR 20, regarding making specific changes to the Central District Management Plan. For the first time in years we have finally had a decent return of Coho salmon to the Mat Valley streams. This illustrates that the changes made at the last BOF meetings are working. I remind you that the managment plan specifically states that Fish and Game is to manage the Coho runs primarily for sports and guided sports anglers of Cook Inlet. This plan is now working and doesn't need any tinkering.

Secondly, I believe it's very important that the BOF continue to hold it's regulatory meeting in Anchorage, the best neutral place for this meeting, and not on the Kenai Peninsula which will have a built in bias for local commercial fishermen. Further, the extended travel distance will make it very difficult for some folks to attend.

Respectfully,

Terry Nininger

Submitted By
Stephen Bartelli
Submited On
9/17/2014 12:01:58 PM
Affiliation
MatValley Advisory Committee

Phone
907-232-1597
Email
bartelli@mtaonline.net
Address
370 W Gerondale Cir
Wasilla, Alaska 99654

It has been brought to my attention that there is an effort to move the UCI board of fisheries meeting from it's scheduled place of meeting to the Kenai/Soldotna area. I oppose moving the venue for this important meeting. Anchorage represents the closest area for all interested parties for this meeting with the largest diversity of different user groups. Moving the venue too far north or south from this venue unfairly tips the scales in either direction. A "middle ground" is more representative of a broader spectrum of interests for these fisheries issues.

Thanks,

Stephen Bartelli

October 1, 2014

Board Support

Department of Fish & Game

Chair Johnstone and Board Members,

My name is Christine Brandt and I am the composer of ACR 13 and 15. My family has commercial setnet in the Kasilof District for over 40 years and we are now a 4 generation setnet family.

I would like to address ACR 13. 5AAC 21.364. Kasilof River Management Plan. (a) This management plan governs the harvest of the Kasilof River salmon excess to spawning escapement needs. **It is the intent of the Board of Fisheries that Kasilof River salmon be harvested in the fisheries that have historically harvested them, including the methods, means, times and locations of those fisheries.** Openings in the areas historically fished must be consistent with escapement objectives for upper Cook Inlet salmon and with the Upper Cook Inlet Salmon Management Plan (5 AAC 21.363).

The Kasilof River Special Harvest Area (KRSHA) is not a historical fishery.

(f)... **it is the intent of the Board of Fisheries (board) that the KRSHA should rarely if ever, be opened under this subsection** and only for conservation reasons. Before the commissioner opens the KRSHA, it is the Board's intent that additional fishing time be allowed in the remainder of the Kasilof Section first, and secondly that the mandatory closures specified in regulation be reduced in duration if necessary to meet the escapement goals contained within this and other management plans.

The only conservation referred to in this plan ((c)(3)) is if the Kenai and East Forelands Section are not open for the fishing period; if the commissioner determines that further restrictions are necessary to aid in achieving the lower end of the Kenai River escapement goal. 5AAC 21.360 Kenai River Late-Run Sockeye Salmon Management Plan. (c)

Should rarely if ever, be used. The Department has used this as the only tool for harvesting Kasilof River sockeye when the upper end of the escapement goal is going to be exceeded. The ½ mile or the 600 ft. fishery should have been utilized to the fullest extent during the 2014 season. It was not, 17 days of fishing in the KRSHA. These openings had a negative impact on the historical fishery in 2014, as well as, negatively impacting the personal use and inriver fisheries, and migration of Kasilof River king salmon.

The Department has grossly reallocated Kasilof sockeye salmon to a very small percentage of ESSN commercial fishermen.

The KRSHA is a disruptive and disorderly fishery, closing off the river by gear being set net to net 1200 ft. and drift gillnets out to 1 mile, do not let any escapement of sockeye for personal use or inriver fishermen the opportunity to harvest and does not allow for kings to migrate into the river to spawn.

In the historical harvest areas net are set 600 ft from each other and drifters are not allowed to come into the area. In the KRSHA there is no distance between nets and drifters are allowed to cross setnet gear creating a disruptive and contentious fishery. In 2014 lines (gear) was cut by drifters after they crossed them and became entangled.

Using the ½ mile or 600 ft. fishery allows for an orderly and effective fishery for all users. It allows for fish to migrate into the river and be harvested or for kings to spawn.

During the 2014 UCI BOF meeting and petition hearings the BOF reiterated that the Department could go outside of the plan when sockeye goals were going to be exceeded. The Kasilof River has over escaped in 2013 by 150,000 and 2014 by 100,000. The ½ mile fishery catches the equivalent number of sockeye as the KRSHA but with less time in the water, allowing kings to make their way to the spawning grounds in either system. Whether in the KRSHA or the ½ mile fishery Kenai and Kasilof king salmon will be caught but not targeted.

ACR 15 addresses the hours during king conservation in which the ESSN fishery is opened, again a contentious regulation. Which stock is more important? I believe that all stocks are important and that each system should be managed separately and biological, this cannot be accomplished when the Kenai has not met their goal and the Kasilof is over escaping theirs. A separation of hours should be used so area managers can manage individual systems, more so on the 12 hours than on the 36 hours. An allowance of a 12 hour period for each area when the goals for sockeye are going to be exceeded should be included in the Kenai River Late-Run King Salmon Management Plan.

I believe these ACR's have merit to be readdressed, after this season there were unforeseen circumstances that came to light in management of a diverse area.

I will be present at the worksession in Juneau, October 15 and 16. I will also have photos of the KRSHA north line fishing area and photos of our area during an opening showing how far the beach goes out on a high tide. The photos are also indications how reduced our gear is on these tides.

Thank you for your time.

Christine Brandt

Christine Brandt

(907) 252-1080

"Village with a Past, City with a Future

210 Fidalgo Avenue, Kenai, Alaska 99611-7794
Telephone: 907-283-7535 / Fax: 907-283-3014
www.ci.kenai.ak.us

the city of
KENAI, ALASKA

September 30, 2014

The Alaska Board of Fisheries
Alaska Department of Fish & Game
PO Box 25526. M/S 1100
Juneau, AK 99802-5526

Subject: Alaska Board of Fisheries 2017 Upper Cook Inlet Finfish Meeting

Karl S. Johnstone, Chair
John E. Jensen
Reed J. Morisky
Orville H. Huntington
Frederick T. Johnson
Susan Jeffrey
Thomas G. Kluberton

Dear Chairman Johnstone and Members of the Board:

Thank you in advance for your consideration of the Kenai Peninsula for the location of the above referenced Board of Fisheries (BOF) meeting.

As stated in previous correspondence, there are several venues of adequate size, equipped with adequate technical support equipment, and supported by communities with more than sufficient lodging, dining, retail, and other support facilities to support the BOF meeting and attendees.

The Kenai Central High School Auditorium seats over 900. The Kenai Peninsula School District is keenly interested in utilizing the BOF meeting as a learning tool for government and other classes. Kenai Central High School has already committed to the availability of the Auditorium for the BOF meeting.

Additionally the Challenger Learning Center, located contiguous to the Auditorium, provides break out rooms, a full catering kitchen, and high technology audio-visual equipment, including video conferencing equipment. Video conferencing is also available at the Kenai Community Library located in proximity to the Auditorium.

The Soldotna Sports Center is also a facility capable of supporting the BOF meeting. It has a large central room capable of seating in excess of 900, break-out rooms, a catering kitchen, and I/T & communications support.

Regardless of location on the Kenai Peninsula, the City of Kenai is committed to providing streaming audio and video for the entire meeting.

The Kenai Municipal Airport is a full-service airport providing over 40 regular commercial passenger service flights to and from Anchorage each day. The average flight time is 25 minutes. There are transportation services available at the airport, which include rental cars, taxi cabs, and bus transportation.

There are well over 400 rooms of lodging, and dozens of restaurants available in the Kenai-Soldotna area fully capable supporting the BOF meeting. I have attached preliminary listings for available lodging, dining, and transportation.

Again, thank you for your consideration of the Kenai Peninsula as the location for your 2017 Upper Cook Inlet Finfish Meeting. If you have any questions, I will be at your October 15-16 Work Session, or feel free to call me at your convenience.

On behalf of the residents of the Kenai Peninsula, I feel comfortable in saying, "we look forward to being your hosts."

Sincerely,

CITY OF KENAI

Rick R. Koch
City Manager

attachments

Lodging in the Kenai Soldotna Area

NAME	ADDRESS	CITY, STATE, ZIP	TEL #	ROOMS AVAILABLE	Number of Beds
Aspen Suites Hotel	10431 Kenai Spur Hwy.	Kenai, AK 99611	283-2272	49	105
Aspen Hotel	326 Binkley Cir	Soldotna, AK 99669	260-7736	63	130
Best Western King Salmon Motel & Restaurant	35546 Kenai Spur Hwy	Soldotna, AK 99669	262-5857	47	100
Captain Bligh's	1035 Angler Dr.	Kenai, AK 99611	283-7550	14	30
Eagle Rock Lodge	5679 Kenai Spur Hw	Kenai, AK 99611	283-1951	10	18
Kenai Airport Hotel	230 N. Willow	Kenai, AK 99611	283-1577	6	13
Kenai River Raven Lodge	48630 Funny River Rd	Soldotna, AK 99669	262-5818	21	40
PRL Logistics (Old Kenai Landing	Old Cannery Road	Kenai, AK 99611		30	60
Main St. Tap & Grill	10800 Kenai Spur Hwy.	Kenai, AK 99611	283-0394	31	60
Potters Lodge	43880 Supreme Ct	Kenai, AK 99611	252-4579	3	5
Quality Inn	10352 Kenai Spur Hwy	Kenai, AK 99611	283-6060	52	100
Soldotna Inn & Mykels Restaurant	35042 Kenai Spur Hwy.	Soldotna, AK 99669	262-9169	18	36
Stillwaters Chalet	42737 Sterling Hwy	Kenai, AK 99611	252-4991	6	8
Tanglewood B&B	2528 Beaver Lp.	Kenai, AK 99611	283-6771	8	18
The Duck Inn (Lodging & Restaurant)	43187 Kalifornsky Beach Rd	Soldotna, AK 99669	262-1849	18	28
Uptown Motel-Louie's Restaurant	47 Spur View Dr.	Kenai, AK 99611	283-3660	49	106
Other Facilities with cabins, rooms, studios can accommodate up to:					71
		TOTALS		425	928

Restaurants and Dining in the Kenai Soldotna Area

NAME	ADDRESS	CITY, STATE, ZIP	TEL #
Acapulco	44578 Sterling Hwy.Ste A.	Soldotna AK 99669	260-4999
Arby's	10733 Kenai Spur Hwy.	Kenai, AK 99611	283-5636
Arby's - Soldotna	44433 Sterling Hwy.	Soldotna, AK 99669	260-5648
Buckets Sports Grill	43960 Sterling Hwy.	Soldotna, AK 99669	283-9611
Burger Bus	Overland Ave	Kenai, AK 99611	283-9611
Carl's Jr.	10640 Kenai Spur Hwy.	Kenai,AK 99611	283-3538
Charlotte's Restaurant	115 S.Willow St. #102	Kenai, AK 99611	283-2777
Don Jose's	205 S.Willow St.	Kenai,AK 99611	283-8181
Don Jose's	44109 Sterling Hwy.	Soldotna AK 99669	262-5700
Duck Inn Restaurant	K--Beach Rd	Soldotna AK 99669	262-1849
Fine Thyme Café	43965 Sterling Hwy	Soldotna, AK 99669	262-6620
Froso's	35433 Kenai Spur Hwy.	Soldotna AK 99669	262-5356
Jersey Subs	Willow St.	Kenai, AK 99611	283-9898
Katina's	11888 Kenai Spur Hwy	Kenai, AK 99611	283-4403
Kenai River Pizza Company	10544 Kenai Spur Hwy.	Kenai, AK 99611	335-2555
King Salmon Restaurant	35455 Kenai Spur Hwy.	Soldotna AK 99669	260-8292
Louie's Restaurant	47 Spur View Dr.	Kenai, AK 99611	283-3660
Main St. Tap & Grill	10800 Kenai Spur Hwy.	Kenai, AK 99611	395-0394
Maria's Mexican Food	47245 E. Poppy Ln.	Soldotna AK 99669	262-6777
McDonald's - Soldotna	4462 Sterling Hwy	Soldotna, AK 99669	262-1074
McDonald's of Kenai	10447 Kenai Spur Hwy.	Kenai, AK 99611	283-4008
Mykels Restaurant	35041 Kenai Spur Hwy.	Soldotna, AK 99669	262-4305
New Peking Restaurant	145 S. Willow St.	Kenai,AK 99611	283-4662
Niko Gardens	36100 Kenai Spur Hwy.	Soldotna AK 99669	262-7122
Odie's Deli	44315 Sterling Hwy.	Soldotna, AK 99669	260-3255
Odie's Deli	305 N. Willow St.In Kenai Airport	Kenai,AK 99611	283-7551
Paradisos Restaurant	811 Main St.	Kenai, AK 99611	283-2222
Playa Azul	104 Haller St	Kenai,AK 99611	283-2010
St. Elias Brewing Company	434 Sharkathmi Dr.	Soldotna, AK 99669	260-7837
Taco Bell	43845 Sterling Hwy.	Soldotna AK 99669	262-3555
Thai Town	106 S. Willow St.	Kenai,AK 99611	283-7250
Veronica's Café	604 Petersen Way	Kenai, AK 99611	283-2725

Transportation in the Kenai-Soldotna Area

NAME OF BUSINESS	ADDRESS	CITY, STATE, ZIP	Tel #
Alaska Cab	47623 West Point Ave	Soldotna, AK 99669	907-283-6000
Avis Car Rental	305 N Willow St #114	Kenai, AK 99611 (airport)	283-7900
Budget Rental	305 N Willow St #114	Kenai, AK 99611 (airport)	283-4506
Budget Rental	245 Trading Bay	Kenai, AK 99611	283-4506
Grant Aviation	305 N. Willow St - Kenai Municipal Aiport	Kenai, AK 99611	283-6012
Midway Auto Park Rentals	37452 Kenai Spur Hwy.	Soldotna, AK 99611	260-3722
Payless	305 N Willow St #114	Kenai, AK 99611 (airport)	283-6428
Ptarmigan Taxi & Courier Service	PO Box 2342	Kenai, AK 99611	(907) 598-4242
RAVN	305 N. Willow St. - Kenai Municipal Airport	Kenai, AK 99611	800-866-8394
Budget Rental	43965 Sterling Hwy/	Soldotna, AK 99611	335-3970

Aleutian Pribilof Island Community Development Association (APICDA)
302 Gold Street, Suite 202 | Juneau, Alaska 99801 | Phone: (907) 586-0161 | Fax: (907) 586-0165
717 K Street | Anchorage, Alaska 99501 | (907) 929-5273 | Fax: (907) 929-5275 | www.apicda.com

October 1, 2014

Mr. Chairman and Members of the Alaska Board of Fisheries:

The Aleutian Pribilof Island Community Development Association (APICDA) appreciates the opportunity to comment on the proposed Agenda Change Requests. APICDA works in partnership with six remote coastal communities to increase their long term sustainability through the development of fisheries related economic opportunities and social programs.

APICDA supports ACR 25 which would increase the GHL in area O from 3% to 6%. We believe that an increase to state quota in this new fishery is justified as it would provide significant and immediate benefits to fisheries dependent communities with minimal impact to federal participants. We respectfully urge the board to consider the proposal before the next statewide pacific cod review process due to unforeseen effects on the fishery when it was adopted.

The Board established the area O fishery at a conservative 3 % last fall because the level of effort for this new fishery was uncertain. However, in its first year nearly all of the 18 million pounds of GHL was harvested and there was broad participation from local fishers. During the 2013 Statewide Pacific Cod meetings the board discussed using a stepped up approach to allow for more information about effort and resource availability. After this first season, we have witnessed a significant success and clear opportunity to expand the state water P Cod fishery in the Bering Sea.

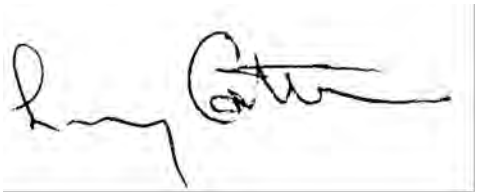
There was also concern from some agency staff that the cod fish within three miles would be of smaller size and less marketable. This appeared not to be the case and the landings provided new and important tax revenue to Aleutian communities and the Borough.

Additionally, the plant in Adak will not be processing P. Cod in 2015. This will decrease Alaska benefits from shore-side deliveries of P. Cod in the west and will likely translate into escalated effort from the small boat pot cod fleet in area O, further justifying an increase to the GHL.

We believe that the expansion of this fishery would result in substantial benefits to the APICDA communities of Akutan and False Pass and their local fish processing investments. Access to more state water cod would allow for year round processing in False Pass, which is a key component to achieving stable economies in the region. Furthermore, evaluating an area line adjustment to the Sea Buoy north of False Pass may expand access for fishers based in False Pass.

We commend the Board of Fish for its previous support in the creation of a state water Bering Sea P. Cod fishery and ask that you to consider an expansion of the GHL and an area line adjustment closer to False Pass during your upcoming ACR process.

Sincerely,



Larry Cotter
Chief Executive Officer, APICDA

Submitted By
Greg Shepard
Submited On
10/1/2014 6:24:52 PM
Affiliation

Phone
907-414-9456
Email
Greg@AKHomeSeller.com
Address
320 South Megan Way
Palmer, Alaska 99645

To whom it may concern:

2014 marked a significant change in the way that state manages it's salmon resource by changing the way that commercial fisheries run their nets. The purpose of this change was to allow for a greater number of fish to make it through the Cook Inlet in order to return to their native rivers by which to increase natural reproduction and to allow for a more productive sport fishery season.

By all counts the changes were positive in accomplishing those goals. Understandably, this has caused a highly contested change and this is going to continue to be a highly debated topic for the next couple of years.

Knowing that having a productive sport fishery in the Matsu is a benefit for those of us that live here, as well as the thousands of anglers from all over the world that come to Alaska each year, it's important that we continue to monitor the runs to see if these changes are accomplishing their intended purpose. Alaska tourism is once again on the rise, and we in the Matsu wish to continue to be a part of the growth of the state's tourism industry and to play a larger part in the sport fishing industry.

Understandably, there must be a balance that is acceptable to not only the sport fisherman, but the commercial fisherman as well. I'm not of a mind that it's one way or another...but am hoping that we can find the middle ground where we all can take part in the resource.

In under 3 years, the board will once again meet to determine what the next move should be. By moving the meetings to the Kenai Borough, it is likely that the response may fall more in favor of the commercial fisheries and result in an attempt to do away with the changes that were achieved earlier this year. Conversely, holding the meeting in the Matsu would likely result in the scales being tipped more toward the sport fishery's interests.

By continuing to hold the meeting in Anchorage as it was this spring, it is likely that the greatest number of people can share their opinions and will represent the largest cross sampling of Alaska's residents to determine how best to manage the resource.

Although I wasn't able to get out and fish this year, the reports were much more favorable for those that did in the Matsu. Given that many of the people that move to the Matsu do so to take advantage of the natural beauty of our area and to be able to productively fish for salmon without having to fly to other parts of the state in order to catch fish that are a resource for all Alaskans...not just one fishery over another.

We have the benefit of watching the results over the next 2 runs to determine if these efforts were successful, and I am hopeful that with more fish returning to their native rivers to spawn, that the overall numbers of fish that make their way up the Cook Inlet in the future will dramatically increase allowing both the commercial and sport fisheries even greater success.

Thank you for your consideration,

Greg Shepard

October 1st, 2014

Alaska Department of Fish and Game
Board Support Section
PO Box 115526
Juneau, Alaska 99811-5526

and

Alaska Board of Fisheries Chairman and Members

Hello,

I would like to express my support for holding the 2017 Upper Cook Inlet Board of Fisheries Meeting in Anchorage. It is important that all stake holders have an opportunity to provide input and to accomplish this the meeting should take place in a neutral location. Aside from being a geographically neutral location, Anchorage also has numerous options for travel and lodging that are conducive to a meeting of this size.

Secondly I would like to request that No Action be taken on ACR 20 as it does not meet the criteria mandated for the Board to accept the Proposal out of cycle.

Respectfully,

Jehnifer Ehmann

LAW OFFICE OF
BRUCE B. WEYHRAUCH, LLC
whyrock@gci.net
114 S. FRANKLIN ST.
SUITE 200
JUNEAU, ALASKA 99801
TELEPHONE: (907) 463-5566 FAX: (907) 463-5858

September 30, 2014

Mr. Karl Johnstone, Chairman
Alaska Board of Fisheries
Alaska Department of Fish and Game
P.O. Box 115526
1255 W. 8th Street
Juneau, AK 99811-5526

RE: Agenda Change Request 26.

Dear Chairman Johnstone:

We represent Bob Briscoe and ask the Board of Fisheries to reject ACR 26.

ACR #26 does not comply with 5 AAC 39.999. 5 AAC 39.999(a)(1) sets forth the Board's policy for changing the Board's agenda. That regulation is specific on the guidelines that the Board must employ before it accepts an ACR, and provides that the Board will accept an agenda change request only for specific reasons including:

(A) for a fishery conservation purpose or reason;
(B) to correct an error in a regulation . . . .

ACR 26 does not touch on any fishery conservation purpose or reason. The Board violates 5 AAC 39.999(a)(1)(A) if it considers ACR 26 on that basis. There is no error in any regulation that would allow the Board to accept ACR 26.

5 AAC 39.999(a)(1)(C) provides that the Board may accept an ACR if that ACR is intended to "correct an effect on a fishery that was unforeseen when a regulation was adopted." There is no unforeseen effect on any fishery that provides a basis for adding ACR 26 to a future agenda. Instead, the ACR is asking law enforcement to do something differently than it is doing. (See problems statement in the ACR.) That is not a basis for adding ACR 26 to the Board's agenda.

Thank you for considering these comments.

Very Truly Yours,

Bruce B. Weyhrauch