PACIFIC SALMON COMMISSION
TRANSBOUNDARY TECHNICAL
COMMITTEE REPORT

SUMMARY OF THE TRANSBOUNDARY GENETIC STOCK ID WORKSHOP: January 18-19, 2007.

REPORT TCTR (07)-02

This report was finalized at the April 17-18, 2007 meeting of the
Transboundary Technical Committee
Whitehorse, Yukon

April 2007

Summary of the Transboundary Genetic Stock ID Workshop:
Transboundary Rivers Technical Committee
January 18-19, 2007.
Pacific Salmon Commission Board Room.

Northern Fund Project: NF-2006-I-21

Introduction

Various genetic stock ID (GSI) proposals have been submitted to the Northern Fund in previous years to examine the utility of using genetic stock ID to increase knowledge and improve management of Transboundary and Boundary Area salmon stocks. Most proposals have been developed and submitted independently and it has become apparent that a more collaborative approach is required to avoid duplication and unnecessary competition for funding, and to promote the development of a common plan to guide the development of stock ID to benefit Canada and the U.S.

Northern Fund Project NF-2006-I-21 was developed in this context specifically to examine how genetic stock ID can be used to improve the management of Chinook and sockeye salmon stocks of the Transboundary rivers (Appendix I).

Objectives

The objectives of this project are as follows:

1. to jointly develop a genetic stock ID program for use in the inseason abundance-based management of Transboundary Chinook and sockeye salmon;
2. to examine existing baselines for Chinook and sockeye to determine if additional sampling is required;
3. to determine if further standardization of baselines is required and if so, commence that standardization; and
4. to develop collaborative proposal(s) for Transboundary genetic stock ID project(s) in the next NF funding cycle.

To meet these objectives, a workshop was held by the Transboundary Rivers Technical Committee on January 18th and 19th, 2007 in the Pacific Salmon Commission board room in Vancouver to address the objectives identified in Northern Fund Project NF-2006-I-21. The agenda for the workshop included the following primary components (Appendix II):

1. Review of needs for genetic stock ID in management/stock assessment;
2. Review of databases;
3. Future approach; and
4. Northern Fund proposals 2007.

Workshop participants

Canadian Participants	U.S. Participants
Sandy Johnston, DFO, Whitehorse (TTC co-chair)	Scott Kelley, ADF&G, Juneau (TTC co-chair)
Terry Beacham, DFO Nanaimo	Lisa Seeb, ADF&G, Anchorage
John Candy, DFO, Nanaimo	Bill Templin, ADF&G, Anchorage
Ian Boyce, DFO, Whitehorse	Richard Wilmot, NMFS, Auke Bay
Steve Cox-Rogers, DFO, Prince Rupert	Glen Oliver, ADF&G, Juneau
Peter Etherton, DFO, Whitehorse	Kevin Monagle, ADF&G, Juneau
Bill Waugh, DFO, Whitehorse	Troy Thynes, ADF&G, Petersburg
Richard Erhardt, FN consultant, Whitehorse	Kathleen Jensen, ADF&G, Juneau
	Eric Volk, ADF&G, Anchorage

Results & Discussion

1. Review of needs for genetic stock ID in management/stock assessment

   a. PST obligations

   Chinook arrangements for Stikine and Taku rivers require the development and implementation of a stock ID program by 2008 to assist in management of the stocks (Annex IV, Chapter 1, paragraphs 3(a)(3)(viii) and 3(b)(3)(vii)). Chinook arrangements for the Alsek River also require the development of a stock identification program by 2008 and there is a requirement obtain tissue samples in a Dry Bay test fishery for genetic stock ID in 2005-2008 (Annex IV, Chapter 1, paragraphs 3(c)(iii)(b).

   For sockeye salmon, arrangements for the Alsek River imply the development of a genetic stock ID program through requirements to: "*explore methods for determining inriver abundance (such as genetic stock ID)*"; and, sample for tissues in the Dry Bay commercial fishery (Annex IV, Chapter 1, paragraphs 3(c)(iv)(a &b). On the Taku and Stikine rivers, managing fisheries to achieve catch shares as provided by the PST requires estimates of the composition of U.S. catches so that projections of total allowable catch can be made and fisheries can be managed inseason to achieve catch and escapement objectives. Inseason sockeye catch estimates currently based on historical weekly stock compositions (from scale patterns analysis (SPA)), are often unreliable and tend to differ significantly from post season estimates which take considerable time to finalize. This can result in significant errors in inseason run size and TAC projections which are provided to guide inseason fisheries management, and serious delays in post season run reconstructions.

   b. Needs other than PST obligations

   Better ability to identify stocks will allow improved run reconstructions of stocks which are intensively assessed (for example, the stocks for which there are weir estimates of escapement and associated age, size and sex composition data) and enable the development of stock assessment databases which can increase knowledge

about the productivity of stocks and establishment/refinement of biologically-based escapement goals.

Canada's Wild Salmon Policy requires the identification and monitoring of conservation units (CU) which are defined as groups of wild salmon sufficiently isolated from other groups that, if lost, are unlikely to recolonize naturally within an acceptable timeframe. The number of CU's will vary depending upon species; for sockeye, different lake spawning populations may constitute separate CU's, whereas for chum salmon, there may be only one or two CU's per drainage. Once the identification of CU's in the Transboundary rivers has been completed, genetic stock ID combined with inriver abundance estimates may provide a cost effective means of monitoring CU's.

c. Linkage to broader initiatives

There is close linkage of Transboundary stock ID to other initiatives within the Pacific Salmon Treaty infrastructure. The Chinook Technical Committee has included some Transboundary populations in the coast wide Chinook database. Significant efforts have been expended standardizing the microsatellite database (through an initiative entitled *Genetic Analysis of Pacific Salmon* (GAPS)) and it is in use coast-wide by several genetics laboratories. The GAPS initiative is continuing (but as yet, not quite as inclusive as it was with microsatellites) with the exploration and development of single nucleotide polymorphism (SNP) markers as well as adding additional populations to the baseline.

The Northern Boundary Area is intending to move away from SPA (due to issues with timeliness and cost) in favour of genetic stock ID. It is expected that ADF&G, NMFS and DFO will need to collaborate on the provision of samples and development of baselines. Transboundary stocks should be included in the baselines for stock composition estimates in the Boundary area since previous tagging studies have indicated they are present there; similarly, Boundary area stocks should be included in the baselines for stock composition estimates in Transboundary fisheries.

Genetic stock ID programs have been, and continue to be developed in the Yukon River. The Yukon River Joint Technical Committee is interested in developing a sample and data sharing protocol that exemplifies the intent of the U.S. and Canada to cooperatively pursue these programs. Also related to the Yukon River is increasing interest within the Yukon River Panel regarding the stock composition in marine by-catches in the Bering Sea which have escalated in recent years.

2. Review of databases

a. Baseline sample inventory

Prior to the workshop, Canadian and U.S. genetics personnel compiled inventories of samples held in respective genetics laboratories. These lists were reviewed at the workshop and then combined to summarise current holdings. Table 1 summaries the sample inventory for Chinook salmon; sockeye salmon samples are listed in Table 2. Some samples collected in 2006 have not yet been included in the inventories and for sockeye, additional information about sample collection years needs to be added. Most Canadian samples have already been shared with U.S. agencies, however, some of these are not useable by U.S. labs. Canada is missing several of the U.S. samples from areas adjacent to the Transboundary rivers. Genetics lab personnel will continue to examine and update the inventories and will arrange to swap samples to bring respective inventories up to par.

b. Gaps in baseline samples

Once the baseline sample inventories had been reviewed, workshop participants identified where samples were either missing, or where sample sizes fell below the target of 200 samples per population. Gaps identified for Chinook salmon appear in Table 3; Table 4 identifies the gaps in the sockeye baseline samples.

The number of samples required represents the maximum required by either the U.S. or Canadian genetics labs to bring respective lab sample inventories up to the target level for each population (n=200). Situations where one Party had more samples of a given stock than the other were discussed to clarify if additional sample sharing is needed, or to determine if the difference is due to some samples being unusable by either Party, for example, due to poor quality of shared tissue. It was agreed that the objective is to provide at least 200 usable samples for each lab; this will require new samples to be collected from some populations already thought to be adequately sampled.

Approximate costs per sampling visit are given for some of the priority sampling needs (column E, Tables 3 and 4). In most cases, it is likely that more than one visit will be needed to get the full complement of samples. This explains why the expected sample collections per visit (column D) are usually below the number of samples required (column C). This is due to many factors such as spawning populations being spread over a wide area, prolonged in-migration timing of many stocks, difficulties in capturing fish and the inability of sampling crews to adequately cover a wide area in one visit. The remoteness of all sampling sites poses logistical problems; in many cases, a helicopter is needed to access the populations and it is too costly to keep a helicopter waiting for long periods of time waiting for sample collections. Hence, it usually best to grab what samples are readily available then move on to another site.

Table 1. Genetic sample inventory of Chinook salmon populations for the Transboundary and adjacent areas.

Location/Population		No. of samples held by US	Canada	Collection Year(s)
Boca De Quadra				
Keta River		207		89, 03, 04
Behm Canal				
Blossom River		380		03, 04, 05
Chickamin River				
	South Fork	219		89, 90, 03, 05
	Leduc River	87		89, 90, 04
	Humpy Creek	140		89, 03
	King Creek	183		03
	Butler Creek	194		04
Unuk River Drainage				
Clear Creek		194		89, 03, 04
Cripple Creek		153		88, 03
Gene's Lake Creek		152		88, 03, 04
Boundary Creek		24		03
Kerr Creek		154		03, 04
Lake Creek		27		03
Bradfield Canal				
EF Bradfield River		39		06
Farragut		186		89,93,94
Harding River		45		89
Stikine River Drainage				
North Arm Cr (US section)		18		89
Andrews Cr (US section)		348		89, 04
			25	00
Shakes Creek			169	00, 01, 02
Little Tahltan River		409		89, 90, 91, 05
			130	99, 01, 04
Johnny Tashoots			26	01, 04
Christina			205	00, 01, 02
Craig			113	01
Verrett			472	00, 02, 03
Northwest Admiralty Island				
King Salmon River		200		88,89,90,92,93
Taku River Drainage				
Nakina River		198		89, 90
			76	01, 04

Table 1 (cont'd)

Location/Population	No. of samples held by US	No. of samples held by Canada	Collection Year(s)
Kowatua/Little Trapper	321		89, 90
		78	99
Tatsatua/Tatsamenie	437		89, 90, 03
		299	99
Dudidontu River	189		90, 02, 04, 05
Tseta Creek	132		89, 03
Upper Nahlin River	210		89, 90, 04
Chilkat River Drainage			
Big Boulder Creek	175		91,92,93,95,04
Tahini River	286		89-92, 95, 04
Kelsall River	202		92, 95, 04
Alsek River Drainage			
Klukshu River	250		89, 90, 91
		73	87, 00, 01
Blanchard River		373	00,01,02,03
Takhanne River		188	00,01,02,03
Tatshenshini		12	01
Situk River Drainage			
Situk River	174	132	88, 90, 91, 92
Hatchery populations			
Chickamin River			
Little Port Walter	228		93, 05
Whitman Lake	603		92,94,97,98,05
Unuk River			
Little Port Walter	250		93,05
Andrew Creek			
Crystal Lake	659		92,94,97,98,05
Hidden Falls	309		93, 94,98
Gastineau	386		98, 05
Medvejie	429		97, 98, 05
Tahini River			
Gastineau	267		00, 01, 04,05
Mixed			
Tamgas	200		93, 94

Table 2. Genetic sample inventory of sockeye salmon populations for Transboundary and adjacent areas.

Location/Population	No. of samples held by US	No. of samples held by Canada	Collection Year
Situk/adjacent Alsek River Drainages			
Ahrnklin River	94		
East River	90, 103, 60		
Lost/Tahwah Rivers	37, 56, 94		
Situk Lake	40		
Old Situk	40		
Alsek River Drainage			
Klukshu River	155		
Early	100	228	
Late	100	311	
Blanchard Lake		23	
Detour		22	
Kudwat		83	
O'Connor		22	
Tatshenshini			
Lower		79	
Upper		324	
Stinky		64	
East Alsek (US)	100		
Adjacent SE Alaska - Taku			
Chlikat	45		
Mule Meadows	183		
Tahini	25		
Chilkoot	202		
Berners	200		
Steep	249		
Windfall	56		
Speel	200		
Crescent	200		
Falls Lake	372		
Taku River Drainage			
Kowatua/Little Trapper	100, 190, 25	106	
Tatsatua/Tatsamenie	67, 25	151	
Little Tatsamenie Lake	100, 100, 200	199	
Upper Nahlin River	50	65	
Tuskwa		334	
Tulsequah		43	
Yonakina		48	
Takwahoni		31	
Kuthai	202	371	

Table 2 (cont'd)

Location/Population	No. of samples held by US	No. of samples held by Canada	Collection Year
King Salmon		271	
Hackett		91	
Stikine River Drainage			
Little Tahltan River	100, 197		
Christina		51	
Craig		39	
Verrett		327	
Bronson Slough		26	
Bugleg		42	
Chutine		371	
Devil's Elbow		58	
Iskut	30, 24	87	
Katete		25	
Porcupine Slough		70	
Scud		376	
Mainstem		144	
Tahltan		474	
Tuya		166	
Twin		23	
Adjacent SE Alaska - Stikine			
Kutlaku	206		
Hugh Smith	300		
Bushmann	400		
Cobb	200		
Kah Sheets Lake	213		
Karta River	99		
Kegan Lake	300		
Mahoney Creek	64		
McDonald Lake	268		
Petersburg Lake	209		
Red Bay Lake	243		
Salmon Bay Lake	139		
Thoms Lake	227		

Table 3. Summary of gaps in Transboundary genetic baseline samples of Chinook salmon.

(A) Drainage	(B) Stock	(C) # samples required	(D) Expected # samples/ visit	(E) Est'd cost per visit ($000)	Comments
Stikine	Tahltan R	200	100	15	radio tag samples may be available
	Chutine	200	75	15	radio tag samples may be available
	Tuya	200			get if terminal harvest resumes
	Beatty	200	50		collect in conjunction with Tahltan
	Bear	200	25		collect in conjunction with Tahltan
	JT Creek	174	75		Tahltan weir crew/combine with Tahltan
	Shakes	31	31	2	use local contractor
	Craig	87	50	2	use local contractor
	Katete	200	25		small stock, could take several years
	Stikine (above Chutine)	200			opportunistic
	Stikine (below Chutine)	200			
	N. Arm (US section)	182	20	1.5	small stock, could take several years
	Goat (US section)	200	20	1.5	small stock, could take several years
	Alpine/Clear (US section)	200	20		small stock, could take several years
Stikine adjacent	Farragut	14			US (ADFG) to collect- opportunistic
	East Bradfield	161			US (NMFS) to collect
	North Bradfield	200			US (NMFS) to collect
	Harding	155			US (ADFG) to collect- opportunistic
	Aaron Cr	200			collections to be made by US
	Eagle	200			collections to be made by US
	Unuk - Boundary Cr	176			
	Unuk - Lake Cr	173			
	Unuk - Clear Cr	6			
	Unuk - Cripple Cr	47			
	Unuk - Gene's Lake Cr	48			
	Unuk - Kerr Cr	46			
	Unuk - Eulachon	200			
Stikine area sub-total		4100	491	37	
Taku	Hackett	200	200	10	check for scales; partial weir to collect
	King Salmon	200	100	10	
	Yeth	200	50	5	
	Tseta	68	68	7	lower priority, check for scales
	Dudidontu	11			opportunistic
	Sloko	200			opportunistic
	Inklin	200			opportunistic
	mainstem Taku	200			opportunistic
	Sutlahine	200			opportunistic
Taku adjacent	Whiting	200			opportunistic
	Chilkat - Big Boulder Cr	25			opportunistic
Taku sub-total		1704	418	32	

Table 3 (cont'd)

(A) Drainage	(B) Stock	(C) # samples required	(D) Expected # samples/ visit	(E) Est'd cost per visit ($000)	Comments
Alsek	Lofog	200	20	3	
	mainstem Tats (lower)	200	25	3	
	mainstem Tats (middle)	200	25	3	
	mainstem Tats (upper)	200	25	3	
	mainstem Alsek	200	25	3	
	Goat	200	25		opportunistic
	Takhanne	12	12		opportunistic
Alsek adjacent	Situk	26			
Alsek sub-total		1238	157	15	
Total Chinook		7042	1066	84	

Table 4. Summary of gaps in Transboundary genetic baseline samples of sockeye salmon.

(A) Drainage	(B) Stock	(C) # samples required	(D) Expected # samples/visit	(E) Est'd cost per visit ($000)	Comments
Stikine	Tahltan R	200	50	5	
	L. Tahltan R	100	100		get from weir
	Tuya	200			get if terminal harvest resumes
	Christina	200	75	4	check for scales (DFO)
	Scud	200	200	4	check for scales (DFO)
	Chutine Lake	200	50	5	check for scales (ADFG)
	Chutine R.	200	50	5	
	Porcupine	200	75	5	
	Stikine mainstem - Scud	200	100	3	
	Stikine ms - Devils Elbow	200			
	Stikine m.s.- Porcupine	200	100	3	
	Katete	200	50	4	
	Iskut - Verret	200	200	4	check for scales (DFO)
	Iskut - Inhini	200	100	5	
	Iskut - Bronson Slough	200			
	Iskut - Bugleg	200			
	Iskut - Twin	200			
	Craig	200	100	5	
	Shakes Sl (US section)	150	25		opportunistic
	Andrew Cr (US section)	200	20		opportunistic
	Alpine (US section)	200	20		opportunistic
	N. Arm (US section)	200			
Stikine adjacent	Virginia	200	100		augmentation by US (Forest Service)
	Karta	101	50		opportunistic
	Salmon Bay Lk	61	50		augmentation (m-r project- ADFG)
	Hatchery Cr	200			opportunistic
	Mahoney Cr	136			
	Hugh Smith - Cobb	100			
SEAK s outside	Eek Cr.	168			
	Fillmore Lk - Hoffman Cr	145			
	Sarkar - Five Finger Cr	145			
	Sarkar Lakes	155			
Stikine sub-total		4498	1365	47	
Taku	Hackett	200	200	5	get with chinook; check for scales
	Samotua	200	50	5	
	Tulsequah	200	25	5	
	upper Nahlin	150	75	5	
	King Salmon	200	200	5	
	Taku mainstem				opportunistic (DFO)
	Tuskwa	200			
	Yonakina	200			opportunistic (DFO)

Table 4 (cont'd)

(A) Drainage	(B) Stock	(C) # samples required	(D) Expected # samples/visit	(E) Est'd cost per visit ($000)	Comments
	Takwahoni	200			opportunistic (DFO)
	Dudidontu River	200			check sockeye presence/absence
	Tseta Creek	200			check sockeye presence/absence
	Nakina	200			
	Yehring (US section)	200	75		opportunistic (ADFG)
	Johnson (US section)	200	75		opportunistic (ADFG)
	Fish Cr (US section)	200	75		opportunistic (ADFG)
Taku	Whiting	200			
adjacent	Windfall	144			opportunistic (ADFG)
	Chilkat	155			ADFG to get in 2007
	Mule Meadows	17			
	DIPAC hatchery	200			
Taku sub-total		3466	775	25	
Alsek	Alsek mainstem (Can)	168	75	15	try to get with mainstem Tatshenshini
	Alsek mainstem (US)	163	75		
	Basin (US section)	200			logistical problem
	Tanis (US section)	200	100	2	
	m.s.Tatshenshini (lower)	121	121		
	m.s.Tatshenshini (upper)	100			
	Blanchard Lake	177	177	5	radio tag samples available
	Takhanne	200	50		try to get using Klukshu weir crew
	Neskataheen Lk	200	100	3	
	Tats Lake	200	25		radio tag samples available
	Detour	178		10	
	Kudwat	117			try to get with Detour
	O'Connor	178			try to get with Detour
	Stinky	136			try to get with Detour
	Klukshu early	200			get from Klukshu weir
Alsek	Situk Lk	160			check for scales (ADFG)
adjacent	Old Situk	160			check for scales (ADFG)
	Ahrnklin R	106			check for scales (ADFG)
	Akwe	200			check for scales (ADFG)
	Italio	200			check for scales (ADFG)
	Lost	13			check for scales (ADFG)
	Dangerous	200			
Alsek sub-total		3577	723	35	
Total sockeye		11541	2863	107	

c. Genetic stock ID baselines

Microsatellite baselines:

For Chinook salmon there is one joint, standardised microsatellite baseline which resulted from the GAPS initiative. This baseline is available from an FTP site currently managed by ADF&G and is soon to be web accessible through NMFS in Seattle (Paul Moran, Northwest Fisheries Science Center). DFO had previously developed a microsatellite baseline which has been published by the Molecular Genetics Laboratory (MGL) in Nanaimo. This baseline is available through the following MGL website: (http://www.pac.dfo-mpo.gc.ca/sci/mgl/data_e.htmand); or through the MGL at the Pacific Biological Station, 3190 Hammond Bay Road, Nanaimo, B.C. V9T 6N7, attention Dr. Terry Beacham.

For sockeye salmon, as yet there is no standardised microsatellite baseline. DFO's MGL has developed a Transboundary and Northern Boundary sockeye baseline which is described and available on the aforementioned MGL website and/or through the Pacific Biological Station in Nanaimo (see above).

SNP baselines:

Through the continuation of the GAPS initiative, a coast-wide Chinook SNP baseline is being developed with funding provided to U.S. laboratories through the U.S. section of the Chinook Technical Committee, and to Canada's DFO laboratory by the Northern Fund. Due to funding constraints, DFO was not involved in this project prior to 2007.

Sockeye salmon SNP baselines are currently under development by ADF&G in collaboration with NMFS, Auke Bay Lab and the majority of the sequences have been published. Unpublished SNPs have been shared with DFO. DFO is also developing some sockeye SNPs. This project is still in progress and those SNPs are not yet available to the U.S. The data resulting from these endeavours have not yet been fully shared nor made fully available.

3. Future Approach

a. Sample and data sharing:

There is an existing agreement between AFG&G and DFO concerning Pacific Salmon genetic tissue sampling and data sharing (Appendix III). The intent of the agreement was to: a) promote the timely exchange of tissues when one Party has tissue(s) that are lacking in the other Party's inventory; and b) to promote capability for one Party to evaluate stock composition estimates when a baseline is used by the other Party for estimation of stock composition. Although the sample and data sharing protocol is being employed by both Canadian and U.S. genetics labs, improvements in communication and collaboration are needed. To assist in this, the co-chairs of the Technical Committee will be included in any requests for genetic samples and/or data to improve tracking of responses and assist in clarification of

what is being requested and why. For the Transboundary genetics programs, the TTC intends to not only share existing baseline tissues as per the October 2004 agreement, but also to share new tissues collected for baselines and from fisheries that harvest Treaty stocks.

Besides agreeing to share existing and new samples, it was further agreed that:

- the target sample size is 200 samples per population;
- the preferred tissue to sample is the axillary appendage and each fish will be sampled for two appendages; one to be sent to the DFO lab and the other to the ADF&G lab;
- if opercular punches are taken, two punches will be taken from each fish, again one for each of the respective labs. To eliminate problems associated with potential delamination of punches in composite samples i.e. where punches from one population and/or location are all stored in one vial as has been the practice, opercular punches will now be stored in individual labelled vials.
- although it is recognised that there are potential efficiencies in terms of effort, time, storage, shipping and archiving associated with using scale samples for GSI, this should not be a tissue of choice when obtaining fishery or other samples for GSI (e.g. out of a tote) until the issue of cross contamination of genetic material, for example through slime, is investigated. Work in this regard is planned for the Northern Boundary area and further review on the use of scales for new samples should await results from this work. This is not meant to deter or defer the use of scales in temporarily filling in baseline gaps or in attempts to investigate past fisheries and/or stock assessment problems (for example, the ongoing investigation for Alsek sockeye which includes Dry Bay fishery samples, or the reconstruction of stock-specific runs for use, say, in stock:recruitment analyses).

b. Development of baselines

Regarding the development and sharing of marker baselines, the workshop did not spend much time debating the merits of microsatellites over SNP's or vice versa: the current abilities of the techniques were summarised. Microsatellites and SNPs for sockeye salmon appear to have the capability now to provide acceptable resolution at a reasonable cost, although the costs vary between labs. SNP's have not been developed to the point that microsatellites have in Chinook salmon, but show promise. However, reasonable cost comparisons cannot be made until the abilities of the techniques are brought to par. Other than for Chinook microsatellites, which were standardised through the GAPS initiative, both techniques lack jointly developed, or standardised, baselines for other species. Whichever techniques of stock ID are selected by the Parties, renewed emphasis should be put on ensuring analyses are based on standardised baselines.

It seems logical to adopt a common method for stock ID; however, this seems unlikely at this time and may not be practical. Currently, to address stock ID questions for the Transboundary and Northern Boundary areas, the U.S. has developed a SNP baseline for both Chinook and sockeye salmon in Alaska and will expand the sockeye salmon baseline to Canada as soon as additional samples become available. Development of the sockeye salmon SNP baseline has been delayed because the majority of the original samples received from Canada were not useable by the U.S. laboratories. ADF&G is not resourced to develop any standardised microsatellite baselines for these stocks. Canada is cautiously interested in SNP's but is also not resourced sufficiently to collaborate on development on this technique. Since Canada's major investment to date has been in microsatellite development, there are concerns about abandoning it for another technique that has less well known capabilities and costs. In addition, the microsatellite-based stock composition estimates for sockeye salmon have been endorsed by the Fraser River Technical Committee, Northern Boundary Technical Committee, and the Pacific Salmon Commission. In the end, it may be best to have the ability to apply both/additional techniques depending on the problem(s) to be solved. Stock compositions estimated under both techniques can be evaluated by exchanging the information listed in the 2004 Sample and Data Sharing Agreement.

4. Review of proposals to the Northern Fund for genetic stock ID projects in 2007

There are two proposals directly related to Transboundary stock ID submitted for support from the Northern Fund in 2007. Project I-7: *Stikine, Taku and Alsek river sockeye, Chinook and coho salmon baseline DNA profiles*; and Project I-8: *Taku River Chinook and sockeye salmon stock identification.* The first project, I-8, will allow for baseline sample collection and laboratory analysis; samples will be shared by U.S. and Canadian genetic laboratories as per the protocol developed in this workshop. The second project will allow for the analysis of 2005 and 2006 mixed stock samples collected in the lower Taku River. Both projects are consistent with the direction the Transboundary Technical Committee wishes to go with respect to stock ID. Project I-8 was judged to be of higher priority at this time given the importance the Committee places on baseline sample completion. Within Project I-8, the priority for baseline sample completion is Chinook and sockeye salmon; coho is a lower priority.

Other NF proposals less directed towards Transboundary river stocks were also discussed briefly. These included: Project I-4: *Chinook salmon SNP development*; Project I-22: *Canadian Northern Boundary sockeye stock ID supplemental sampling*; Project I-25: *Northern Boundary Area sockeye genetic stock identification*; Project I-30: *Chinook salmon stock composition of southeast Alaska fisheries, 2008*; and Project I-32: *Northern and Transboundary salmon matched scale-tissue sampling*. Three general observations ensuing from these discussions were: a) there are still significant gaps in baseline sample inventories; b) there is potential for considerable development of non-collaborative, independent baselines; and c) there appears to be willingness to collaborate more in baseline marker development.

5. Recommendations:
    a. A Transboundary genetics subcommittee (TBGSC) needs to be officially appointed/recognised;
    b. Inventories of baselines samples should be reviewed annually and gaps identified/updated. A joint database/spreadsheet containing this information needs to be maintained by the TBGSC;
    c. Concerted efforts to bring laboratory sample inventories up to par should be taken on a regular basis;
    d. Gaps in baseline samples should be prioritised and plans developed/refined annually to fill them through collaborative proposals;
    e. Baseline samples and samples from fisheries that harvest Treaty stocks will be shared upon request. Sample collections and data sharing should follow both existing protocols and additional provisions developed in this workshop – e.g. sample size, preferred tissues. The effectiveness of protocols needs to be reviewed frequently and any problems reported to the TTC co-chairs;
    f. When Transboundary stocks are involved, requests made under the sample and data sharing protocols will be sent to the co-chairs of the Transboundary Technical Committee who will then forward it to the responsible laboratory/office;
    g. Baselines used to support stock ID programs, whether they are independent or joint programs, need to be able to be evaluated for stock composition estimation. Ideally they should be shared, developed transparently and standardised. Collaborative development of baseline markers is highly recommended;
    h. Future proposals to the Northern Fund for Transboundary stock ID projects should be submitted through the Transboundary Technical Committee to ensure collaboration is optimized and duplication is minimised.

Appendix I: Northern Fund Project NF-2006-I-21

PSC Northern Fund 2006 Application Form

PROPONENT IDENTIFICATION

Proponent Name:	**Mr. Sandy Johnston on behalf of the Transboundary Technical Committee**		
Affiliation:	**DFO, Whitehorse, Yukon**		
Title:	Chief, Stock Assessment and Fisheries Management, Yukon/Transboundary Area. Canadian co-chair of Transboundary Technical Committee.		
Proponent Address:	DFO, Suite 100-419 Range Road, Whitehorse, Yukon, Canada. Y1A 3V1.		
Phone:	867-393-6729	**Fax:**	867-393-6738
E-mail Address:	johnstons@dfo-mpo.gc.ca		

PROJECT IDENTIFICATION

Project Title: ***Transboundary Chinook and sockeye genetic stock ID planning***

Project Type (*Check one):*

Development of improved information for resource management, including stock assessment; data acquisition & scientific understanding of limiting factors.	X
Habitat restoration; rehabilitation or improvement.	☐
Enhancement of wild stock production through low technology techniques.	☐

Project Location: **Nanaimo, B.C., Juneau, Alaska; and Whitehorse, Yukon.**

Start Date:	**Upon approval**	**End Date:**	**Sept. 30, 2006**	**Duration:**	**9 months**

Total PSC Funding Requested:	$CAN/US $24,900 Cdn

Total Other Funding & In-Kind Contributions:	$CAN/US $45,800 Cdn
Total Project Cost:	$CAN/US $70,700 CDN

Part 1. RELEVANCE AND SIGNIFICANCE

1. **Relevance and Significance:** Provide a brief overview of the project: what is being proposed; what are the reasons for the project (purposes; goals; objectives); what issue is being addressed or specific problem is to be resolved. Describe the relevance and significance of these to the Pacific Salmon Treaty generally and /or specifically to the call for proposals issued by the Northern Fund Committee.

   Various stock ID proposals have been submitted for funding in the past; however there is a need to develop a common and collaborative approach. It is proposed that a sub-committee of the Transboundary Technical Committee be formed to examine how genetic stock ID can be used to improve the management of Chinook and sockeye salmon stocks of the Stikine and Taku Rivers.

   This project will provide funding for meeting travel and to commence standardization of databases, where required. The outcome of the project will be recommendations on how to proceed with Stikine and Taku Chinook and sockeye stock ID proposals for the next NF cycle, i.e. unified collaborative proposal for 2007 funding.

2. **Priority of Need:** Explain why you believe the needs or problems addressed by this proposal should be given priority over other possible uses of the available funds. Cite the source of any plan or prioritization scheme that you may have relied upon to assign priority to this need or problem.

   More precise inseason stock specific management of Stikine and Taku Chinook and sockeye salmon is required to meet stock specific spawning goals and harvest shares. New chinook arrangements negotiated in 2005 committed the Parties to develop and implement (by 2008) through the Transboundary Technical Committee an agreed Chinook stock identification program to assist in the management of Stikine and Taku Chinook salmon. In addition, inseason sockeye catch estimates currently based on historical stock compositions (from SPA), primarily for Stikine sockeye, are often unreliable and tend to differ significantly from post season estimates. This leads to significant errors in inseason run size and TAC projections which are provided to guide inseason fisheries management. There is also a desire to "truth" the present stock identification techniques used in the management of Stikine and Taku sockeye salmon. The techniques presently used include scale pattern analysis, egg diameter measurement, and some brain parasite presence/absence.

3. **Context:** Describe the relationship, if any, of the project to local or regional plans (e.g. watershed plans; sub-basin plans; recovery plans, etc.) and/or established management goals (e.g. enhancement plans; management models; research priorities, etc) and how these relate to the purposes of the Northern Fund and/or implementation of the Pacific Salmon Treaty.

Abundance-based management regimes developed for Stikine and Taku Chinook and sockeye require the ability to project inseason run sizes to ensure escapement and harvest sharing targets are achieved. Inseason run projections require accurate and timely estimates of stock ID.

Part 2. TECHNICAL IMPLEMENTATION DETAILS

4. Objectives: Describe the specific objectives expected to be achieved by the end of this project.

a) to jointly develop a genetic stock ID program for use in the inseason abundance-based management of Stikine and Taku Chinook and sockeye salmon;
b) to examine existing baselines for Chinook and sockeye to determine if additional sampling is required;
c) to determine if further standardization of baselines is required and if so, commence that standarisation.
d) to develop collaborative proposal(s) for Transboundary genetic stock ID project(s) in the next NF funding cycle.

5. Approach: Describe the techniques and methods to be employed.

This is largely a planning exercise utilizing existing agency personnel to develop a common approach for future Transboundary stock ID work. The majority of the work will involve attending meetings, summarizing existing data and commencing new standardization of baselines, if required.

6. Schedule: Describe the schedule of key activities for the project and how progress towards successful completion will be monitored. Describe contingency plans, if any, to deal with unanticipated delays or problems.

- Nov. 8-9: Transboundary Technical Committee meeting – nominations for sub-committee (no cost to this project).
- January PSC meeting: confirmation of sub-committee membership and identification of sub-committee chairs (no cost to this project).
- Early April: inaugural 1-2 day meeting of sub-committee at the DFO genetic lab in Nanaimo or in Juneau in close proximity to the genetics lab– scoping meeting.
- Early to mid-May: second meeting (this would be a tele-conference) of sub-committee members – review of sample inventory and requirements for further standardization.
- Mid May – early August: preliminary standarisation of baselines.
- Early August: final 2 day meeting of sub-committee in Whitehorse to develop recommendations for further work.
- Sept 15: draft conceptual proposal circulated for comments. Final CP to be submitted by NF Committee deadline.

7. Assumptions: Describe any assumptions made in the development of the proposal and the effect and significance of these assumptions. Describe any risks or other factors which might affect the success of the project or must be taken into account during the project.

This is largely a research planning project aimed at developing a jointly agreed approach to genetic stock ID for Stikine and Taku River stocks. It is expected that sub-committee membership will involve existing agency personnel and only costs for travel and sample analysis (for standardization) will be required. It is assumed that sample analysis costs will be no more than $US20/sample.

Part 3. HUMAN RESOURCES

8. **Key Personnel:** Identify key project personnel, the nature and extent of their role in implementation, and their relevant qualifications. If any component of the proposal will be provided by others, identify these persons, the nature of their involvement, and their relevant qualifications.

Key personnel will be determined at the upcoming Transboundary Technical Committee meeting in Nov., 2005. At a minimum, it is conceived that lead personnel will appointed from genetic laboratories in Canada and the U.S. that could potentially be involved in Transboundary stock ID as well as fishery managers involved in Taku and Stikine chinook and sockeye management.

9. **Consultation; coordination and approvals:** Describe the steps taken during project planning to collaborate and consult with others where appropriate and to gain their support where needed. Describe applicable regulatory requirements and how these will be addressed.

Appropriate fishery management and stock genetics personnel of ADF&G, NMFS, USF&W and/or DFO will be kept in the loop through the Transboundary Technical Committee. The Tahltan and Taku River Tlingit First Nations will also be apprised of this project through the Committee.

10. **Partnerships:** Describe the extent to which the project may involve or foster partnerships with other agencies, organizations and/or other interested parties.

This is meant to be a collaborative project involving U.S and Canadian agencies. Eventually, this project may lead to hands on involvement of fishers, contractors, First Nations and/or community members particularly to meet sampling requirements.

Part 4. BENEFITS

11. **Measures of Success:** Describe any specific objective standards, quantifiable criteria and quality control measures that will be used to assess the actual performance of this proposal against expectations.

Ultimate measure of success will be a jointly developed, cost effective and accurate stock ID program that will provide timely inseason estimates of stock composition. The stock ID program should have the capability of distinguishing stocks at least to the level of conservation units and/or fishery management units as described in current and emerging policies (e.g. DFO's wild salmon policy).

12. **Monitoring and Assessment:** Describe the expected duration of the benefits of the project, and how the tangible results of the project will be monitored, maintained and protected over the long-term.

Long term benefits to improved management of Stikine and Taku Chinook and sockeye salmon are expected if genetic stock ID is incorporated into the inseason management of these stocks.

13. **Beneficiaries:** Explain who will benefit from the proposal and how they will benefit.

Beneficiaries include fishers, the stocks and managers who will have better tools to manage runs inseason with.

Part 5. COST EFFECTIVENESS

14. **Costs:** From the budget template provided, describe the proposed budget for this project, including appropriate details about the larger cost items, especially capital acquisitions.

The proposal is in response to the NFC's request that consideration be given to developing a coordinated approach to the further development of the TBR DNA baseline with a budget of approximately $20k US. The funding requested herein from the NF is to be used mostly for meeting travel. Remaining funds will be used in further developing standardized baselines – it is expected that additional funds to complete this will be required.

15. **Cost-sharing:** Describe the sources and amounts of any additional sources of funding or in-kind contributions that are being relied upon to support this proposal.

Significant in kind support is expected from agencies to allow existing personnel to be involved in this project.

16. **Long-term funding:** Describe the long-term funding needs of the proposal if any (i.e. beyond the period for which this proposal applies) and the prognosis for obtaining funds from sources other than the Northern Fund.

This project will ultimately lead to the development of a collaborative proposal(s) for the next funding cycle of the NF. Once the common approach has been developed and implemented, it is expected that increased pressure will be put on agencies for long term implementation.

Appendix II: Workshop agenda

Transboundary Technical Committee
Genetics Sub-Committee Workshop
January 18, 19, 2007.
PSC boardroom, Vancouver

Meeting to commence 08:00 January 18 and end noon-ish January 19, 2007.

Draft Agenda

Introductions:

Review of needs for genetic stock ID in management/stock assessment:

- Obligations in PST
- Needs other than in obligations
- Linkage to broader initiatives

Review of databases:

- US baselines
- Cdn baselines
- Gap
- Sample sharing

Future approach:

- Techniques available
- Resolution required
- Timeliness
- Best approach - collaboration
- Sampling – sharing, preservation
- Data sharing

Northern Fund proposals 2007

Appendix III. Sample and Data sharing agreement between DFO and ADF&G (October 2004).

Agreement Between the
Alaska Department of Fish and Game, Gene Conservation Laboratory
and the
Department of Fisheries and Ocean, Pacific Biological Station, Aquaculture Division
Concerning Pacific Salmon Genetic Tissue Sample and Data Sharing

October 19, 2004

The Alaska Department of Fish and Game, Gene Conservation Laboratory (ADF&G) and the Department of Fisheries and Oceans, Aquaculture Division (DFO) maintain frozen and preserved tissue archives of Pacific salmon to support genetics investigations and fishery management decisions. ADF&G and DFO also support large databases of allele frequencies of salmon for use in compositional analyses of fisheries or other mixed aggregations of stocks. It is in the best interest of ADF&G and DFO to share sample archives and genetic data. This agreement is intended to facilitate these mutually beneficial interests.

Tissue Sample Sharing

ADF&G and DFO agree to the following conditions of tissue sample sharing:

1. When either laboratory desires baseline Pacific salmon tissue samples held in archive by the other laboratory, a written request will be made including species, locations, desired sample sizes, and tissue type.

2. Mutually agreeable arrangements will be developed for the sampling required to fulfill tissue sample requests, with the requesting laboratory responsible for supplying personnel or covering reasonable sampling costs.

3. ADF&G and DFO will meet the tissue sample sharing requests made under this agreement within three months.

Data Sharing

Estimation of the stock composition of samples taken from salmon fisheries is frequently conducted by management agencies in the Pacific Northwest and Alaska. The key outputs from the stock composition analysis are the estimated proportions of either specific populations or stocks (regional groups of populations) of interest (accuracy), and a measure of the variance associated with the estimated proportions (precision). When estimated stock compositions are produced by one agency, it is often necessary for other agencies to independently evaluate the quality of the estimated stock compositions for fisheries samples. The following list of data will allow for an independent assessment of

the quality of the estimated stock compositions. ADF&G and DFO agree to provide these data to each other upon request.

1. A list of all populations included in the baseline;
2. A listing of the number of individuals screened from each population by locus;
3. The observed allele frequencies at each locus in each baseline population;
4. The sample sizes for each mixture-sample analyzed;
5. A summary of Hardy-Weinberg equilibrium test results for each locus to identify any loci that are significantly out of equilibrium;
6. A summary of pair-wise tests of gametic disequilibrium to identify any locus pairs that don't appear to be independent;
7. The name and version of the computer program used to generate the mixed-stock analysis (MSA) estimates, as well as a listing of the program settings that were used when the MSA estimates were generated;
8. To the extent that alleles listed in point 3 are binned prior to the analysis, details on the binning procedures employed;
9. Information, if available, on population structure of the baseline populations;
10. Levels of accuracy and precision of estimates of stock composition for simulated mixtures as well as any known-origin mixtures analyzed by the originating agency and;
11. Multi-locus genotypes of each individual fish analyzed from the mixed-stock sample provided in an electronic format.

This agreement is entered into by Lisa Seeb and John H. Clark on behalf of ADF&G and Terry Beacham and John Pringle on behalf of DFO upon signature below.

Lisa Seeb — Date: 11/18/04
Alaska Department of Fish and Game

John H. Clark — Date: 11/15/04
Alaska Department of Fish and Game

Terry Beacham — Date: 22 Oct. 2004
Department of Fisheries and Oceans

John Pringle — Date: 28/10/04
Department of Fisheries and Oceans