Exxon Valdez Oil Spill
Restoration Project Final Report

Genetic Diversity of Sockeye Salmon (*Oncorhynchus nerka*) of Cook Inlet, Alaska, and its Application to Restoration of Injured Populations of the Kenai River

Restoration Projects 93012 and 94255-2
Final Report

Lisa W. Seeb
Christopher Habicht
William D. Templin
James W. Fetzner, Jr.
Richard B. Gates
James E. Seeb

Alaska Department of Fish and Game
Division of Commercial Fisheries Management and Development
Genetics Laboratory
333 Raspberry Road
Anchorage, Alaska 99518

November 1995

Genetic Diversity of Sockeye Salmon (*Oncorhynchus nerka)* of Cook Inlet, Alaska, and its Application to Restoration of Injured Populations of the Kenai River

Restoration Projects 93012 and 94255-2
Final Report

Study History: This study was initiated in 1992 as Restoration Project Number 59 "Assessment of Genetic Stock Structure of Salmonids." The project effort continued under Restoration Project Number 93012 "Genetic Stock Identification of Kenai River Sockeye Salmon." In FY94 the project was combined with Restoration Project Number 93015 into the genetics portion (94255-2) of Restoration Project Number 94255 "Kenai River Sockeye Salmon Restoration." A final report for Restoration Project Number 59 was printed under the title Assessment of Genetic Stock Structure of Salmonids.

Abstract: Genetic data from sockeye salmon (*Oncorhynchus nerka*) were collected from all significant spawning populations contributing to mixed-stock harvests in Cook Inlet. A total of 68 allozyme loci were resolved from 37 populations. Mitochondrial DNA data from the NADH subunits 5 and 6 were collected from 19 of the populations. Both allozyme and mtDNA reveal a substantial amount of genetic diversity among populations and suggest that significant local adaptation has occurred. Mixed-stock analyses using maximum likelihood methods with 27 loci were evaluated to estimate the proportion of Kenai River populations in Central District drift fisheries. Simulations indicate that Kenai River populations can be identified in mixtures at a level of precision and accuracy useful for restoration and fishery management. Mixed-stock samples from Cook Inlet drift net fisheries were analyzed both inseason (48 hr) and post-season. The contribution of Kenai River populations varied from 88.2% to 52.7%. Samples from fish wheels from the Kenai, Kasilof, Yentna, and Susitna River systems were also analyzed. Inclusion of mtDNA data in the analysis is being investigated to determine if it improves precision and accuracy. Results from this study are currently being used in the management and restoration of Kenai River sockeye salmon injured in the 1989 *Exxon Valdez* oil spill.

Key Words: Alaska, allozymes, Cook Inlet, genetic diversity, mtDNA, *Oncorhynchus nerka*, sockeye salmon.

Project Data: *Description of Data* - The data collected during the course of this project were the relative frequencies of variation within three classes of genetic markers: 1) Allozyme - variant proteins formed by allelic forms of the same locus, 2) Mitochondrial DNA - genetic material found within the mitochondria with strict maternal inheritance and haploid nature, 3) Microsatellites - highly polymorphic variable number of tandem repeat nuclear DNA sequences that are distributed throughout the genome at intervals of approximately 10 kilobase pairs. *Format* - These data are stored in ASCII text format. *Custodian* - Contact Lisa W. Seeb at the Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Genetics Laboratory, 333 Raspberry

Rd., Anchorage, Alaska 99518. *Availability* - A complete set of the data are reported either in this report (allozyme and microsatellite) or in the final report for restoration projects 93012 and 94255 (mitochondrial DNA). Electronic copies of these data are available upon request.

Citation:

Seeb, L.W., C. Habicht, W.D. Templin, J.W. Fetzner Jr., R.B. Gates, and J.E. Seeb. 1995. Genetic diversity of sockeye salmon (*Oncorhynchus nerka)* of Cook Inlet, Alaska, and its application to restoration of injured populations of the Kenai River, *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Projects 93012 and 94255-2), Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Genetics Laboratory, Anchorage, Alaska.

TABLE OF CONTENTS

STUDY HISTORY/ABSTRACT/KEY WORDS/PROJECT DATA/CITATION 2
LIST OF TABLES 5
LIST OF FIGURES 6
LIST OF APPENDICES 7
EXECUTIVE SUMMARY 8

INTRODUCTION 13
Genetic diversity of Cook Inlet sockeye salmon 14

OBJECTIVES 14

METHODS 15
Sampling methods 15
Allozyme methods 15
DNA methods 16
Statistical analyses 17

RESULTS 19
Heterogeneity within regions 19
Kenai River 19
Kasilof River 20
Susitna River 20
Western Cook Inlet 21
Northeastern Cook Inlet 22
Knik Arm 23
Heterogeneity among regions 23
Mixed-stock analyses 24
Mitochondrial DNA 25
Haplotype variation 25
Heterogeneity among populations 25
Mixed-stock analyses 26

DISCUSSION 26
Genetic diversity of Cook Inlet sockeye salmon 26
Mitochondrial DNA insights on colonization of Cook Inlet 29
Mixed-stock analyses (MSA) 30
Utility of mtDNA in mixed-stock analyses 31

CONCLUSIONS 32
ACKNOWLEDGEMENTS 33
LITERATURE CITED 34

LIST OF TABLES

Table — Page

1. Sockeye salmon populations sampled for genetic studies. All populations originate from Upper Cook Inlet, 1992-1994 41
2. Enzymes or proteins screened in Cook Inlet sockeye salmon. Enzyme nomenclature follows Shaklee et al. (1990), and locus abbreviations are given. Buffer abbreviations are as described in the text 46
3. Hierarchical G-statistic log-likelihood analysis for Cook Inlet 49
4. Gene diversity analysis of Cook Inlet sockeye salmon 59
5. Results of simulated mixtures of Cook Inlet sockeye salmon with 100 bootstrap resamplings and a simulated sample size of 400. Standard deviations are given in parentheses 60
6. Results of Cook Inlet Central District drift fishery mixed-stock analysis, 1992-1994 . 61
7. Results of inriver mixed-stock analyses for Cook Inlet, 1992-1994 62
8. Russian River contribution to mixture samples collected at the Kenai River fish wheel site. The Russian River results include contributions from both the early- and late-run populations 63
9. Sample sizes, composite mtDNA haplotype counts, and nucleotide diversity for sockeye salmon populations sampled from Cook Inlet. Map #'s refer to locations on Figure 1 64
10. Restriction enzymes and fragment sizes detected among Cook Inlet sockeye salmon 66
11. Pairwise nucleotide divergence estimates between populations of sockeye salmon from Cook Inlet 67
12. Analysis of geographic heterogeneity in mtDNA frequencies using a Monte Carlo simulation (Roff and Bentzen 1989) with 10,000 replicate simulations 69
13. Results of simulated mixtures of Cook Inlet sockeye salmon using allozyme and mtDNA data sets. Each region comprises 100% of the mixture, simulation sample size is 400, and 100 bootstrap resamplings were conducted. Results from the combined allozyme and mtDNA simulations are given first followed by results from simulations with allozyme data only 70

LIST OF FIGURES

Figure		Page
1.	Sockeye salmon genetic samples originating from Upper Cook Inlet, 1992-1994	71
2.	Locations of mixed-stock and inriver samples from Upper Cook Inlet, 1992-1994	72
3.	UPGMA phenogram for Cook Inlet sockeye salmon using Cavalli-Sforza and Edwards (1967) chord measure of genetic distance	73
4.	Neighbor-joining tree for Cook Inlet sockeye salmon based on Cavalli-Sforza and Edwards (1967) chord measure of genetic distance	74
5.	UPGMA phenogram for Cook Inlet sockeye salmon populations examined for mtDNA variation using nucleotide divergence estimates among populations (Nei and Tajima 1981)	75

LIST OF APPENDICES

Appendix		Page
A.	Allele frequency estimates for Cook Inlet sockeye salmon	77
B.	Allele frequency estimates for mixed-stock samples of Cook Inlet sockeye salmon	128
C.	Heterogeneity analysis within Kenai River	138
D.	Heterogeneity analysis within Kasilof River	142
E.	Cavalli-Sforza and Edwards (1967) chord distances among sockeye salmon populations in Cook Inlet	144
F.	Box plots (ranges, and 95% confidence intervals for the median) from allele frequency distributions among populations of sockeye salmon from seven regions of Cook Inlet, Alaska.	147
G.	Final report, University of Montana	160
H.	Final report, University of Alaska Fairbanks	167

EXECUTIVE SUMMARY

- In July of 1989, fishing time in Upper Cook Inlet was greatly reduced due to the presence of oil from the *Exxon Valdez* spill. As a result, sockeye salmon (*Oncorhynchus nerka*) spawning in the Kenai River system exceeded optimal escapement goals by three times, resulting in overproduction and greatly reduced survival of juvenile sockeye salmon.

- Refined stock-identification techniques are needed to increase knowledge of the diversity and abundance of sockeye salmon and to improve the management of injured populations in Cook Inlet. Closely regulating the number of spawning adults may be the only way to restore the productivity of injured rearing areas and control sockeye salmon fry production. Previous stock-identification studies of Cook Inlet sockeye salmon concentrated on the use of scale pattern analysis techniques to delineate sockeye salmon stocks, but the accuracy of this technique was not reliable.

- Genetic data have proven extremely effective for stock management in recent years to delineate lineages and to discriminate among populations in mixed-stock aggregations. Earlier studies found considerable heterogeneity among sockeye salmon populations inhabiting Cook Inlet and were successful at classifying populations from the Kasilof River and Susitna River drainages, but incomplete baseline data confounded Kenai River classifications.

- In this study, we present data to further delineate Cook Inlet sockeye salmon populations and evaluate the use of genetic information as a tool for stock identification during inseason management of the Cook Inlet fishery. The objectives of the study were as follows:

    - Obtain baseline genetic data from all significant spawning populations contributing to mixed-stock harvest of sockeye salmon in Cook Inlet.

    - Use Mixed-Stock Analysis (MSA) algorithms to estimate the proportion of Kenai River populations in drift and set-net fisheries inseason so that managers may modify the area and timing of harvest in order to protect these injured populations while targeting surplus Kasilof River and Susitna River stocks.

    - Investigate the added utility of DNA-level markers to discriminate among Cook Inlet populations.

- Baseline samples for allozyme analysis were collected from spawning populations representing all major sockeye salmon-producing systems of Upper Cook Inlet. Approximately 7,400 sockeye salmon from spawning populations were sampled during the 1992, 1993 and 1994 field seasons. Mixed-stock samples were collected from

central Cook Inlet drift net fisheries and from mainstem fish wheel sites on the Yentna River, Susitna River, Kasilof River and Kenai River. Samples of muscle, liver, retinal fluid, and heart were dissected from freshly killed individuals.

- A comprehensive examination for discriminating gene markers was conducted using allozyme electrophoresis. A total of 68 allozyme loci were resolved, of which 24 were found to be invariant and were surveyed for only a single year at each site. Statistical analyses were based on the remaining set of 44 loci. For the mixture analysis, the set was reduced to 27 loci based on the information content of the locus and its ability to be adequately resolved from lesser quality tissues, a common occurrence in fishery samples.

- DNA was extracted from liver and heart tissue. The NADH dehydrogenase subunits 5 and 6 (ND5/ND6) region of mitochondrial DNA (mtDNA) was amplified using the polymerase chain reaction and restricted with thirteen commercially available restriction endonucleases. Additional development of nuclear and mtDNA markers was conducted through contractual arrangement with the University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, Juneau Center and the University of Montana, Missoula.

- Individual allozyme genotypic data were summarized into allelic frequencies, heterozygosity values were calculated, and collections were tested for departure from Hardy-Wienberg equilibrium to test for random mating. A log-likelihood G-statistic analysis was used to test for homogeneity of allelic frequencies among the various collections, both spatially and temporally. If no significant differences were detected, collections were pooled for all further statistical analyses. Genetic distance measures were calculated between all pairs of spawning locations to summarize the multi-locus data into a single measure of similarity.

- Composite mtDNA haplotypes for each individual and each population were used to calculate genetic distances among haplotypes, haplotype and nucleotide diversity, and within and among population variability. To test for geographic heterogeneity, ten thousand Monte Carlo simulations were performed, and F-statistics were calculated.

- Stock contributions to the mixture samples were estimated via maximum likelihood using a conjugate gradient searching algorithm with square root transformations. To test regional identifiability, simulations were executed with mixtures composed entirely of individuals from the region being examined. One hundred bootstrap iterations were executed to provide sufficiently accurate estimates of standard error. Simulations were also run to examine the contribution that mtDNA data make when added to the analysis. For the analysis, populations were grouped in the following seven regions based on river drainage and geographic proximity: Kenai River, Kasilof River, Susitna River, Yentna River, Western Cook Inlet, Northeastern Cook Inlet and Knik Arm.

- Analysis of the allozyme data revealed the following regional characteristics:

  Kenai River -

  the collections from the mainstem of the Kenai River including Kenai Lake and Skilak Lake showed a high level of similarity with exceptions being the Russian River above-the-falls, Hidden Creek, and Moose Creek collections. Considerable divergence was detected within the Russian River collections between spawning sites above- and below-the-falls and between run times in the above-the-falls spawning locations. However, the Russian River above-the-falls collections were more similar to each other than to any other collections within the Kenai River drainage.

  Kasilof River-

  the Kasilof River collections showed a remarkable amount of similarity, with collections from three sites (Bear Creek, Moose Creek and Seepage Creek) being indistinguishable. Some heterogeneity appears when comparisons are expanded to include Nikolai Creek, Glacier Flat Creek, and two Tustumena Lake shore-spawning sites, but the Kasilof River collections form a distinct unit relative to other Cook Inlet sockeye salmon populations.

  Susitna River-

  collections from the Susitna River system were split into two groups: the Yentna River drainage and the Susitna River-mainstem drainage. Extensive divergence exists within the Susitna River system, both within and between the Yentna River and Susitna River-mainstem drainages. Within the Yentna River drainage there is a wide spectrum of loci at which one or more populations have exceptionally divergent allele frequencies. The same is true for Susitna River-mainstem drainage collections. Populations from these regions do not form a distinct group relative to other Cook Inlet populations.

  Western Cook Inlet-

  unlike the Kenai River, Kasilof River, and Susitna River populations, these populations do not generally share a common fresh-water migration pathway. Collections showed similarity within collection sites, but considerable regional heterogeneity.

  Northeastern Cook Inlet-

  only two sites were sampled in this region. While they are distinct from each other, their similarity to each other is far greater than their similarity to other populations within Cook Inlet.

  Knik Arm-

  there is considerable heterogeneity within this region, as well as within the Fish Creek collections. This population has been supplemented with hatchery-produced sockeye salmon, which appears to be reflected in the instability of allozyme frequencies.

- There is no regional trend in the heterozygosity level in the populations sampled, and all populations showed conformity to Hardy-Weinberg expectations. Hierarchical gene diversity analysis of 28 loci (isoloci and phenotypically scored loci were excluded)

stratified by population, site, and region showed the greatest variation within populations (88.3%), little variation among populations or (year-classes) within sites (0.3%), and more variation among sites within regions (7.6%) and among regions (3.8%).

- The Kenai River, Kasilof River, Yentna River, Knik Arm and Northeastern Cook Inlet regions showed a high degree of regional fidelity in the mixed-stock analysis simulations with correct allocations of greater than 89%. The Susitna River-mainstem region was not as clearly definable (80%), but when the entire Susitna River system (Yentna River and Susitna River-mainstem combined) was considered, the allocation rose to 88%. Western Cook Inlet, a heterogeneous grouping based on geographic proximity, was only identifiable at a lower level (83%). A similar simulation composed entirely of Russian River above-the-falls genotypes was correctly allocated better than 99% of the time.

- Estimates of the Kenai River contribution to the Central District Drift fishery varied from a high of 88.2% to 52.7%. The Susitna/Yentna group contributed up to 21.2% in some samples, while the highest contribution of the Kasilof group was 10.6%.

- Inriver estimates for the Kenai River ranged from 64.8% to 93.1%. Similar results were found for the Susitna River-mainstem (75.1% to 92.2%), Yentna River (79.9% to 98.2%) and the Kasilof River (54.6% to 91.7%). In each case the low values were obtained from the earliest sampling each year indicating that some early-run populations with unique genetic profiles have not been included in the baseline.

- A total of ten composite mtDNA haplotypes were detected. Three composite haplotypes appear to correlate with geography; haplotype I is present in a high proportion of Kenai River and Kasilof River samples, haplotype II is present in a majority of Knik Arm, Susitna River, Yentna River, Northeastern Cook Inlet and Western Cook Inlet samples, and haplotype V is more common in the Kenai River and Kasilof River drainages when compared with other regions. The remaining haplotypes were found at low frequencies.

- Nucleotide divergence among populations (based on mtDNA) differentiates two very distinct groups: 1) Kenai River and Kasilof River, and 2) Northeastern Cook Inlet, Knik Arm, Susitna River, Yentna River and Western Cook Inlet. The exceptions are Packers Lake (a Western Cook Inlet population that clusters with Russian River above-the-falls populations) and Shell Lake (a Yentna River population that clusters with Kenai River populations). Monte Carlo simulations used to test for geographic heterogeneity in mtDNA haplotype frequencies within regions, among regions, and among populations indicate that significant heterogeneity exists within all regions (P = 0.000) except the Kasilof River (P = 0.837). Heterogeneity in haplotype frequencies (P = 0.000) and the F_{st} statistic of 0.333 indicate that only a third of the variation can be attributed to differences among populations, while the remainder is distributed

within populations.

- Because the degree of mtDNA differentiation among sockeye salmon populations from Cook Inlet is high, addition of mtDNA was expected to improve the mixed-stock analysis. In simulation studies, the mtDNA data improved the mean allocation estimates to the correct region with the exception of the Knik Arm region. A corresponding reduction in standard deviation of the mean showed an improvement in precision as well.

- It has been suggested that the nursery lake is the primary unit of genetic structuring in sockeye salmon, an idea that is supported by their lacustrine freshwater rearing phase. This may explain their great fidelity to their natal streams. The data support this model of differentiation. Within the Kenai River and Kasilof River, populations sharing a common nursery lake tend to be genetically similar, while populations from regions without common nursery lakes tend to be much more heterogeneous. Exceptions to this pattern are the Crescent Lake shore-spawning sites, which are significantly different from each other, and the divergence of early-run from late-run populations that spawn above-the-falls on the Russian River.

- This study represents the most comprehensive analysis of sockeye salmon from Cook Inlet, confirming previous observations and greatly expanding the database. The allozyme and mtDNA data reveal substantial diversity among Cook Inlet sockeye salmon populations which has most likely arisen from isolation and genetic drift. These data are currently being used to restore Kenai River populations injured in the spill. Conservation of genetic diversity should be incorporated into all restoration and management efforts.

INTRODUCTION

The *T/V Exxon Valdez* hit Bligh Reef in Prince William Sound on March 24, 1989 spilling 11.2 million gallons of oil. In the ensuing days oil spread in a southwesterly direction through the Gulf of Alaska. Oil reached the Cook Inlet region, an area that supports large populations of Pacific salmon and extensive commercial and recreational fisheries. Fisheries on sockeye salmon *(Oncorhynchus nerka)* in Cook Inlet have been prosecuted since the late 1800's, and harvest levels have ranged from 400,000 to 9.5 million (personal communication, Paul Ruesch, Alaska Dept. Fish and Game, Soldotna). However, in July of 1989, fishing time in the Upper Cook Inlet area was greatly reduced due to the presence of oil from the *Exxon Valdez* spill.

As a direct result of the reduced exploitation, sockeye salmon spawning in the Kenai River system exceeded optimal escapement goals by three times. Data were collected by Natural Resource Damage Assessment (NRDA) Fish/Shellfish Study 27, Sockeye Salmon Overescapement (Schmidt and Tarbox 1993) to test the hypothesis that this overescapement would result in overproduction and greatly reduced survival of juvenile sockeye salmon during the winter-spring rearing period. This extremely high escapement may have produced enough fry to deplete invertebrate prey populations, causing high fry mortality, and to alter the species composition and productivity of prey populations for several years.

Refined stock identification techniques are needed to improve management capability of injured stocks and to increase knowledge of the diversity and abundance of sockeye salmon in Cook Inlet. Knowledge of stock structure is critical to increase the productivity of mixtures of stocks in mixed-stock harvests (Walters 1975), and to allow managers to assess the impacts of harvest regulations during the season (Mundy 1985; Mundy et al. 1992). Closely regulating the number of spawning adults may be the only way to restore the productivity of injured rearing areas and manage sockeye salmon fry production.

Cook Inlet sockeye salmon have been the focus of a number of stock identification studies. Extensive efforts were made during the 1980's to delineate populations through scale pattern analyses, and Marshall et al. (1987) investigated this technique as a means to identify river-of-origin of Cook Inlet sockeye salmon. However, the accuracy of scale patterns alone has not been reliable, and additional stock identification techniques are warranted.

Genetic data have proven extremely effective for stock management in recent years (Seeb et al. 1986, 1990, chum salmon (*O. keta*); Shaklee and Phelps 1990, chum salmon; White and Shaklee 1991, pink salmon (*O. gorbuscha*); Wood et al. 1989, 1994, sockeye salmon), and many genetic markers have been found which delineate genetic lineages of populations. These markers can also be used to discriminate populations in mixed-stock aggregations, and a considerable statistical framework (Mixed-Stock Analysis, MSA) based on maximum likelihood estimates (MLE) has been developed to identify individual stocks within mixtures (Milner et al. 1981; Fournier et al. 1984; Millar 1987, 1990; Pella and Milner 1987;

Smouse et al. 1990; Gomulkiewicz et al. 1990; Pella et al. 1994). In this study, we present genetic data to delineate populations and evaluate the model as a tool for stock identification on an inseason basis in Cook Inlet.

Genetic diversity of Cook Inlet sockeye salmon

One of the earliest genetic studies of sockeye salmon focused on Cook Inlet, where Grant et al. (1980) found considerable heterogeneity among populations inhabiting the region. In evaluations of their resulting mixed-stock model, Grant et al. (1980) demonstrated a high degree of success using *LDH-4** (*LDH-B2**; current nomenclature in parentheses), *PGM** (*PGM-2**), and *GPT** (*ALAT**) to classify populations from the Kasilof River and Susitna River drainages, but incomplete baseline data was thought to confound the Kenai River classifications. Additional data from the Russian River, one of the Kenai River drainages, was presented by Wilmot and Burger (1985). They found significant differences between early and late runs from the Russian River based on *LDH-4*, PGM-1* (PGM-2*)*, and *ACO** (*sAH**). Recent work by the National Biological Service (Carl Burger, National Biological Service, Anchorage, AK; personal communication) provided additional information on Tustumena Lake populations. Their data, based on mitochondrial DNA (mtDNA) and allozymes, suggest that outlet spawners are differentiated from tributary and lake spawners. However, no comprehensive genetic survey of Cook Inlet has been undertaken since the 1970's (Grant et al. 1980).

OBJECTIVES

The goal of this project is to restore Kenai River sockeye salmon injured by the oil spill. This will be accomplished through improved stock assessment capabilities, more accurate regulation of spawning levels, and modifications to human use. The specific objectives are to:

1. Obtain baseline genetic data (during 1992-1995) from all significant spawning populations contributing to mixed-stock harvests of sockeye salmon in Cook Inlet.

2. Use Mixed-Stock Analyses (MSA) algorithms to estimate the proportion of Kenai River populations in drift and set net fisheries so that managers may modify area and time of harvest in order to protect these injured populations while targeting surplus Kasilof River and Susitna River stocks. Stock composition estimates will be provided within 48 hours post-fishery.

3. Investigate the added utility of DNA-level markers to discriminate among Cook Inlet populations.

METHODS

Sampling methods

Baseline and mixed-stock samples for allozyme analysis were collected by personnel of Alaska Department of Fish and Game from spawning populations of sockeye salmon using gill nets and beach seines (Restoration Study 93015). Target sample size for baseline collections was set at 100 to maximize the precision around the allele frequency estimates (Allendorf and Phelps 1981; Waples 1990). Tissue samples from spawning populations were collected from all major sockeye salmon-producing systems of Upper Cook Inlet (Fig. 1). Approximately 7,400 individual sockeye salmon from spawning populations were sampled during the 1992, 1993, and 1994 field seasons (Table 1, Fig. 1). Most spawning populations were sampled in at least two separate years.

Mixed-stock samples originating from central Cook Inlet (ADF&G Central District) drift net fisheries were made twice during July of 1992 and 1993 and once during July of 1994 (Table 1, Fig. 2). In addition, mixed-stock samples were collected from four mainstem fish wheel sites (Yentna River, river mile 4; Susitna River, river mile 80; Kasilof River, river mile 7; and Kenai River, river mile 19; Table 1, Fig. 2). In 1993 and 1994 two collections each year were processed within 48 hours to demonstrate that results could be available inseason for incorporation into management decisions. Target mixed-stock sample sizes were set at 200 for inriver samples and 400 for drift net fisheries (Pella and Milner 1987), although these were not always achieved.

Samples of muscle, liver, retinal fluid, and heart were dissected from freshly killed individuals. Individual sample numbers were assigned to uniquely identify all genetic tissues. Tissues were extracted into cryovials, and the cryovials were stored in liquid nitrogen until transferred to -80°C storage where they remained until laboratory analysis.

Allozyme methods

A comprehensive examination for discriminating gene markers was conducted using allozyme electrophoresis. Allozyme techniques followed those of Harris and Hopkinson (1976), May et al. (1979), and Aebersold et al. (1987); nomenclature rules followed the American Fisheries Society standard (Shaklee et al. 1990). A photographic record of each gel was made, and a collection of mobility standards for all scored alleles was constructed and used to verify alleles.

A total of 68 allozyme loci were resolved (Table 2) using seven buffer systems. Buffer system abbreviations and descriptions are as follow: 1) **ACE 7.0** or **ACE 7.2**; N-(3-aminopropyl)-morpholine, citrate (pH 7.0 or 7.2) with EDTA (Clayton and Tretiak 1972); 2) **ACN 7.0**; N-(3-aminopropyl)-morpholine, citrate (pH 7.0) with NAD (Clayton and Tretiak 1972); 3) **KG**; Tris, glycine HCl (pH 8.5; tray concentration modified to 0.075 M Tris; Holmes and Masters 1970); 4) **TBCL**; Tris, borate, citrate, LiOH (pH 8.2; Ridgway et al.

1970); 5) **TBCLE**; Tris, borate, citrate, LiOH with EDTA (pH 8.2; Selander et al. 1971); 6) **TBE**; Tris, borate, EDTA (pH 8.7; Boyer et al. 1963); and 7) **TC4**; Tris citrate, NaOH (pH 5.9; Selander et al. 1971).

Of the 68 loci, 24 loci (*ADA-1*; mAH-3*; CK-A1*; CK-C1*; CK-C2*; ESTD*; FBALD-4*; FH*; βGALA*; GAPDH-3*; GAPDH-4*; GAPDH-5*; βGLUA*; G3PDH-3*; GR*; LDH-A1*; LDH-B1*; LDH-C*; sIDHP-2*; αMAN*; mMDH-1*; mMDH-2*; mMDH-3*; sMEP-1**) were found to be invariant and were surveyed for only a single year from each site. Statistical analyses for all populations were based on the remaining set of 44 loci. A reduced set of 27 loci (*mAAT-1*; mAAT-2*; mAH-1,2*; mAH-4*; sAH*; ALAT*; GAPDH-2*; G3PDH-4*; GPI-B1,2*; GPI-A*; sIDHP-1*; LDH-B2*; sMDH-A1,2*; sMDH-B1,2*; mMEP-1*; PEPA*; PEPB-1*; PEPC*; PEPLT*; PGM-1*; PGM-2*; TPI-1,2**) was used in the majority of the admixture analyses. Loci in this set were chosen for their information content and for the ability to be adequately resolved from lesser quality tissues, a common occurrence in fishery samples. However, we were unable to resolve some loci (*mAAT-2; GPI-B1,2; G3PDH-4*) from all mixtures; in those cases estimates were based on all remaining loci.

DNA methods

In studies conducted in our laboratory, DNA was extracted from liver and heart tissue using a high salt precipitation method for separating proteins from crude DNA extracts (Gentra Systems, Minneapolis, MN) following the manufacturer's instructions. The resulting purified DNA was quantitated and diluted (100ng/µl) for use in the polymerase chain reaction (PCR).

PCR reactions were conducted in a total volume of 100 µl and contained the following: 3mM $MgCl_2$, 200µM each dNTP, 1µM each primer, 2.5 U *AmpliTaq* DNA polymerase (Perkin Elmer, Foster City, CA) and 0.7 - 1.0 µg of DNA template. Cycling conditions using a GeneAmp PCR System 9600 Thermocycler (Perkin Elmer, Foster City, CA) included an initial denaturation at 97°C for 1 min and 15 s, followed by 45 cycles at 96°C for 20 s, 57°C for 30 s, and 72°C for 2 min. A final extension was performed at 72°C for 5 min to minimize partial extension products. The primers of Cronin et al. (1993) and Park et al. (1993) were used to amplify the mitochondrial NADH dehydrogenase subunits 5 and 6 (ND5/ND6).

The PCR product obtained was restricted using thirteen commercially available restriction endonucleases (*Apa I, Ase I, Ava II, BstE II, BstU I, EcoR I, EcoR V, Hha I, Hinf I, Kpn I, Sau96 I, Stu I, Taq I*) following the manufacturer's recommendations (New England Biolabs). Each restriction digest contained 10µl of PCR product, 2U of enzyme, and was conducted in a total volume of 20µl. Digested products were run on 0.8% (high melting) agarose gels at 5V/cm for approximately 1 h and resulting banding patterns were visualized utilizing ethidium bromide under UV light (312nm). The most common haplotype for each enzyme was designated as 'A'. Haplotypes detected for each enzyme were pooled into

composite haplotypes.

Additional development of nuclear and mitochondrial DNA markers was conducted through contractual arrangement with the University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, Juneau Center, and the University of Montana, Missoula (Appendices G and H).

Statistical analyses

Genotypes were scored from enzyme phenotypes and then summarized into allele frequency estimates (Appendices A and B). Only homozygote alternate phenotypes could be scored for null allele variation at *PGM-1** (**100/null* scored as **100/*100*). Hardy-Weinberg expected frequencies were calculated for this locus and are listed in Appendix A. Expected frequencies were used for heterogeneity, gene diversity, and tree analyses, but phenotypic frequencies were used for the mixture analysis. Similarly, for *sIDHP-2**, only homozygote alternate phenotypes were scored for the **75* allele. Hardy-Weinberg expected frequencies were calculated for this allele and used in all analyses (*sIDHP-2** was not used in the mixture model). One other allele, **95*, was observed at this locus at low frequencies in two Kenai River populations; it was pooled with the **100* allele. Frequencies at isoloci (*sAAT-1,2*; mAH-1,2*; G3PDH-1,2*; sMDH-A1,2*; sMDH-B1,2*; GPI-B1,2*; TPI-1,2**) were calculated assuming the variation occurred with equal frequency at both loci. Tests for departure from Hardy-Weinberg equilibrium were made for each population at each single locus ($\alpha = 0.05$; adjusted for the number of tests) to test for random mating within each population. Isoloci were excluded from these tests.

Homogeneity of allelic frequencies among the various collections, both spatially and temporally, were tested using a log-likelihood ratio G-statistic analysis (modified from Weir 1990) with $\alpha = 0.01$. This statistic is distributed approximately chi-squared with $(n - 1)(m - 1)$ degrees of freedom, where n is the number of alleles and m is number of populations in the test. The likelihood values (G) can be summed over all loci to obtain a total value at each level of analysis. The total gene frequency dispersion at each locus was subdivided into within- and among-region components in a hierarchical fashion. Hierarchical levels were organized to test for homogeneity 1) within drainages of river systems/regions, 2) among drainages within river systems/regions, and 3) among river systems/regions. Rejection of the null hypothesis of homogeneity is indicative of discrete spawning populations. If no significant differences were detected, collections were pooled for all further statistical analyses including admixture analysis. This analysis detects heterogeneity on a macro scale as degrees of freedom reflect the entire pattern of diversity around Cook Inlet. We also performed pair-wise and region-wide analyses which resulted in fewer degrees of freedom and a finer scale analysis ($\alpha = 0.001$, adjusted for multiple tests; see also Appendices C and D).

To further describe the subdivision of genetic diversity, a hierarchical gene diversity analysis (Nei 1973) was conducted to test for the distribution of variability among drainages and regions. Isoloci, *PGM-1** and *sIDHP-2** were excluded from the diversity analyses.

Genetic distance measures (Cavalli-Sforza and Edwards 1967), which summarize multi-locus data into a single number, were calculated between all pairs of spawning locations. These values were used to construct a branching diagram using numerical taxonomic techniques (UPGMA, Sneath and Sokal 1973) which provide a representation of overall phenetic similarity. A neighbor-joining tree (N-J tree; Saitou and Nei 1987) with Cavalli-Sforza and Edwards (1967) distance measure was constructed using PHYLIP (Version 3.5, Felsenstein 1993). This method allows for unequal rates of molecular change among branches.

To facilitate rapid collation, analysis, and reporting of genetic data, applications for scoring and data analysis were developed using the Windows 3.1 environment. An on-line scoring program (Score 2.0) was written which provided error checking capability and allowed for extensive documentation of results. In addition, a set of genetic analysis functions were written in *S-Plus* (Mathsoft, Inc., Seattle, WA) to calculate allele frequency estimates, fit to expected genetic models, and genetic variability and distance measures.

Stock contributions to the mixture samples were estimated via maximum likelihood (MLE; Pella and Milner 1987; Masuda et al. 1991) using a conjugate gradient searching algorithm with square root transformations (Pella et al. 1994). This algorithm provides good performance with large baselines and small stock differences (Pella et al. 1994). The precision (standard error) of the stock composition was estimated by an infinitesimal jackknife procedure (Millar 1987). Individuals missing data at two or more loci were deleted. Individual population or stock estimates were first calculated, then summed into regional groupings (allocate-sum procedure, Wood et al. 1987). Simulated mixtures were used to evaluate the accuracy of the stock composition estimates and to determine optimal reporting regions. These hypothetical mixtures (N = 400) were generated using the baseline allele frequencies assuming Hardy-Weinberg equilibrium. The precision (standard error) of the simulated mixtures was estimated by a parametric bootstrap (Efron and Tibshirani 1986), where the observed multilocus genotype frequencies were assumed to be distributed multinomial as were the allele frequencies in the baseline. One hundred bootstrap iterations were executed to provide sufficiently accurate estimates of standard error (Masuda et al. 1991).

Composite mtDNA haplotypes for each individual and each population were entered into the *REAP* package (McElroy et al. 1992) to calculate genetic distances among haplotypes, haplotype and nucleotide diversity, and estimates of within- and among-population variability. A pairwise matrix of nucleotide divergence between populations was used as input into the UPGMA tree building algorithm to examine population-level relationships based on mtDNA data. To test for geographic heterogeneity, a Monte Carlo simulation with 10,000 replicates was performed (Roff and Bentzen 1989), and F-statistics were calculated using BIOSYS-1 (Swofford and Selander 1981).

RESULTS

Heterogeneity within regions

Populations were grouped regionally based on river drainage and geographic proximity. Seven regions were identified: Kenai River, Yentna River, Susitna River, Western Cook Inlet, Kasilof River, Northeastern Cook Inlet, and Knik Arm. The Yentna River, a major tributary to the Susitna River, was considered to be a separate region for the analyses for two reasons. First, it is a reasonable division of the vast Susitna River drainage (49,000 km^2) which is a magnitude larger than the next largest drainage in Cook Inlet, Kenai River (5,200 km^2). Second, finer-scale resolution may provide valuable information for fishery managers.

Kenai River.--Rearing of sockeye salmon occurs in Upper and Lower Russian Lakes, Kenai Lake, Skilak Lake, Hidden Lake, Tern Lake, and Trail Lake. Spawning occurs in tributaries of these lakes as well as the mainstem Kenai River. Beach spawning, if present, is not thought to be extensive. Collections were made on the Kenai River with all major known producing tributaries included. Considerable effort was made to collect multiple samples from areas of highest spawning concentration. The outlet of Skilak Lake and the area between Kenai and Skilak Lakes were sampled intensively with consideration for site, year, and timing of return.

Considerable divergence was detected within the Russian River. Spawning populations above and below Russian River falls exhibited a distinct discontinuity in allele frequencies (Appendix A). Loci exhibiting the divergence between populations spawning above and below the falls included: *sAH*100* (above 0.26 - 0.30, below 0.95), *ALAT*100* (above 0.82 - 0.86, below 0.64), *LDH-B2*100* (above 0.50 - 0.73, below 0.92), and *PGM-1*100* (above 0.00 - 0.01, below 0.38). The population below the falls closely resembled populations inhabiting the mainstem Kenai River (Fig. 3). In addition, temporal differentiation was detected between early- and late-run spawners above the falls with significant heterogeneity ($P < 0.001$; Appendix C) at *LDH-B2*, mAAT-1*, mAAT-2** and *mAH-1,2**.

Sockeye salmon spawning between Kenai and Skilak Lakes were sampled at six sites over the three year period, 1992-1994. Both the early- and late-spawning components were sampled at sites 1, 2, 3, and 6. At these sites, no significant heterogeneity ($P > 0.001$; Appendix C) was detected either between years or between run times within years. Samples were pooled by site for further analyses.

Temporal divergence within the collections was also examined at Ptarmigan Creek, Tern Lake, Quartz Creek, Hidden Creek, Outlet of Skilak Lake, and Moose Creek (Kenai River drainage) (Appendix C). Because no significant divergence between years was detected at the $\alpha = 0.001$ level, these populations were pooled for further analyses.

Overall similarity among populations from the Kenai River drainage is apparent from the phenogram (Fig. 3). Populations showing high levels of similarity and forming a monophyletic cluster include Outlet of Skilak Lake, populations between Kenai and Skilak Lakes, Ptarmigan Creek, Russian River below-the-falls, Quartz Creek, and Tern Lake. Additional divergent populations outside this cluster also exist within the Kenai River drainage. While the Russian River above-the-falls populations are the most divergent, Hidden Creek also appears to be highly distinct not only from the Russian River above-the-falls populations but also from the other Kenai River populations. Hidden Creek is characterized by higher frequencies of *mAAT-2*(-73)*; *ALAT*100*; *sIDHP-2*75*; and *PGM-2*100*; compared to mainstem Kenai River populations (Appendix A). Moose Creek also is a distinct lineage within the drainage with high frequencies of *ALAT*91* and *sIDHP-2*92*.

Kasilof River.--Populations returning to the Kasilof River drainage spawn in tributaries and along the shoreline of Tustumena Lake. Five tributaries (Bear, Moose, Glacier Flat, Nikolai, and Seepage Creeks) were sampled. Bear, Moose, and Nikolai Creeks were sampled over two years; Glacier Flat Creek was sampled over three years. Seepage Creek was sampled in a single year. Lake spawners utilizing the beach were also sampled (Tustumena Lake sites 1 and 2).

Comparisons within site across years were performed first. Some heterogeneity among Glacier Flat Creek samples was apparent at *GPI-B1,2** and *mIDHP-1**, but heterogeneity analysis within the Kasilof River drainage allowed pooling across all three years ($P = 0.123$; Appendix D). Similarly, multi-year populations from Bear Creek, Moose Creek (Tustumena Lake), Nikolai Creek, and the two lake-spawning sites in Tustumena Lake were pooled ($P > 0.001$; Appendix D).

In comparisons among populations, Bear Creek, Moose Creek, and Seepage Creek, were statistically indistinguishable ($P = 0.921$; Appendix D). We could detect no evidence that these populations were not a single panmictic unit. Heterogeneity within the region appears when comparisons are expanded to include Glacier Flat Creek, Nikolai Creek, and Tustumena Lake populations ($P < 0.001$; Appendix D).

Relative to other Cook Inlet sockeye salmon populations, the Kasilof River drainage populations are more similar and represent a single distinct cluster on the phenogram. Overall heterogeneity within the region when all Cook Inlet populations were considered was not significant ($P = 1.00$, Table 3). As a group, Kasilof River drainage populations exhibit a high frequency of *ALAT*95* (frequencies range from 0.09 to 0.16) and consistent presence of rare alleles (*G3PDH-4*108; GPI-B1,2*132*).

Susitna River.--The Susitna River is composed of the Yentna River and mainstem Susitna River drainages. Within each of these systems are many smaller lakes and tributaries that support sockeye salmon spawning and rearing. Because little is known about the sockeye populations of the Susitna River drainage, sampling sites were chosen based on escapement sizes to represent what were thought to be the largest spawning populations within the system.

Spawning locations in the Yentna River drainage were sampled in 1992 and 1993, as was Larson Lake in the Susitna River mainstem drainage. Hewitt and Whiskey Lakes were considered a single population. Between year comparisons at each site showed little variation ($P > 0.001$; Table 3), so multiple-year collections at each site were pooled.

Multiple-year collections were also made at Stephan Lake in the Susitna River mainstem drainage. In 1994 the Stephan Lake sample was a composite of spawners from two sites (n = 25 per site), but pairwise comparisons between the sites (G = 36.8, df = 12, $P < 0.001$) precluded pooling. When each of the sites was compared to the 1993 sample, site 1 was statistically distinct (G = 49.2, df = 13, $P < 0.001$), but site 2 could be pooled with the 1993 sample (G = 16.4, df = 12, $P = 0.174$). This similarity is supported by the proximity of site 2 to the 1993 site. The site 1 sample was dropped from the analysis, because a sample size of 25 is considered too small to adequately represent the true allele frequencies of a population. The site 2 sample was pooled with the 1993 sample for the analysis.

Extensive divergence exists within the Susitna River system, both within and between the Yentna and Susitna Rivers (Table 3). Within the Yentna River drainage is a wide spectrum of loci at which one or more populations have exceptionally divergent allele frequencies (Table 3, Appendices A and F). The most dramatic difference occurs at *PGM-2** where Shell and Trinity/Movie Lakes have frequencies of the **100* allele of 0.25 and 0.28 respectively, while Hewitt/Whiskey Lakes have a frequency of 0.63 and the remaining populations have frequencies greater than 0.80. Other loci that display a large amount of heterogeneity are: *PEPC** (general trend, **105* < 0.01; Hewitt/Whiskey Lakes, **105* = 0.13; Shell Lake, **105* = 0.31), *PGM-1** (generally, **100* < 0.10; Judd Lake, **100* = 0.36), *PEPB-1** (generally, **130* = 0.00; Trinity/Movie Lakes, **130* = 0.15), *ALAT** (generally, **100* < 0.59; Trinity/Movie and Hewitt/Whiskey Lakes, **100* > 0.70), and *mAAT-1** (generally, **100* > 0.83; Judd Lake, **100* = 0.62).

Populations in the Susitna River mainstem also show considerable heterogeneity at several loci (Table 3, Appendices A and F.). At *PGM-1**, most of the populations have frequencies of the **100* allele between 0.19 and 0.45, but in Red Shirt Lake a frequency of 0.03 was estimated. The **100* allele was absent in the pooled Stephan Lake collections, but it was found in Stephan Lake site 1 at a frequency of 0.11. Other loci that display a large amount of heterogeneity are: *PEPC*105* (frequencies ranging from 0.00 to 0.17), *ALAT** (generally, **95* < 0.02; Byers Lake, **95* = 0.10; Stephan Lake pooled, **95* = 0.13), *sIDHP-1** (generally, **94* = 0.00; Stephan Lake site 1, **94* = 0.06; Stephan Lake pooled, **94* = 0.13), and *mAAT-1** (generally, **-83* > 0.18; Birch Creek, **-83* = 0.06; Red Shirt Lake, **-83* = 0.00). The degree of differentiation is most easily seen in the phenogram and N-J tree (Figs. 3 and 4) where Susitna River populations can be found on many different branches and occasionally by themselves.

Western Cook Inlet.--Populations assigned to the Western Cook Inlet region spawn in the river/lake systems that drain the west side of Cook Inlet from the mouth of the Susitna River south to the Crescent River. These are generally cold, high-energy streams fed by the

glaciers and snowpack in the mountains that line the coast. An exception is the Packers Lake population which returns to Kalgin Island, a large island located in the middle of the inlet west of the mouth of the Kasilof River. Unlike the Kenai River, Kasilof River and Susitna River populations, these populations do not generally share a common fresh-water migration pathway (Fig. 1).

Samples from two years are available for these populations except McArthur River and Wolverine Creek. In the Packers Lake 1993 collection, *mAH-1,2* could not be resolved, but a pairwise comparison showed very little difference between the yearly samples ($G = 8.77$, $df = 10$, $P = 0.554$). The Packers Lake collections were subsequently pooled for the remainder of the analyses. Some heterogeneity was seen at *LDH-A2** and *PEPC** between years in the Chilligan River samples and at *ALAT** between years in the Coal Creek samples (Table 3), but the overall similarity was such that these collections were also pooled across years at each site.

The Crescent River drainage was sampled in 1992, 1993 and 1994. The first two samples were obtained from migrating lake-spawners in Crescent River. In 1994, samples ($N = 50$) were taken from two spawning sites along the shore of Crescent Lake. Pairwise comparisons of the four collections showed minimal differentiation between the yearly Crescent River collections ($G = 12.8$, $df = 10$, $P = 0.235$), a large difference between the Crescent Lake site 1 and site 2 collections ($G = 42.2$, $df = 10$, $P < 0.001$), and a large difference between each of Crescent Lake sites and the pooled Crescent River collection (site 1: $G = 35.2$, $df = 11$, $P < 0.001$; site 2: $G = 32.1$, $df = 10$, $P < 0.001$). For this reason, the Crescent River samples were pooled across years and the Crescent Lake site 1 and site 2 samples were left as individual collections. The Crescent River collections were not used in the mixed-stock analysis as it did not represent a spawning population.

As might be expected from the geography of the region, the Western Cook Inlet populations contain considerable regional heterogeneity (Table 3). The phenogram and N-J trees (Fig. 3 and 4) indicate that some of these populations are similar to Kasilof River populations and others are similar to Susitna River populations, while still others are unique (Coal Creek and Wolverine Creek). A large part of the heterogeneity within the region can be attributed to a few loci within a few populations. The *ALAT*95* allele occurs much more frequently in McArthur River (frequency = 0.17) than in the remaining populations (frequency < 0.08). In this region, *sMDH-B1,2*65* allele occurs only in Coal Creek and Packers Lake, while the **116* is a private allele for Packers Lake. The frequencies of the null allele for *PGM-1** range from 0.54 to 1.00, and the *PGM-2*136* allele frequencies range from 0.03 to 0.37 through all the populations in this region.

Northeastern Cook Inlet.--Only two sites were sampled in the Northeastern Cook Inlet region: Daniels Lake and Bishop Creek. Both sites are in the Bishop Creek drainage located north of the mouth of the Kenai River on the Kenai Peninsula. Of the two, only Daniels Lake was sampled in more than one year and, although heterogeneity was found at *GPI-A** between years at this site, overall there was not enough difference ($P > 0.001$; Table 3)

between these two collections to preclude pooling.

Because heterogeneity was found at *ALAT** and *mAAT-1** between Bishop Creek and the pooled Daniels Lake collections, the two collection sites were left separate ($G = 100.93$, $df = 10$, $P < 0.001$, pairwise comparison). When looking at Cook Inlet as a whole, though, there is relatively little heterogeneity within the Northeastern Cook Inlet collections ($P = 0.521$, Table 3). Their similarity to each other is far greater than their similarity to other populations can be seen in the phenogram and N-J trees (Fig. 3 and 4). Northeastern Cook Inlet populations are marked by a high frequency of *PEPLT*88* alleles, a low frequency of *PGM-2*100* alleles, and the lack of *LDH-B2** and *PEPC** variant alleles which are seen in every other region.

Knik Arm.--Like the populations in Western Cook Inlet, the Knik Arm populations do not share a common freshwater migration path (Fig. 1). For this reason sampling sites were chosen based on drainage and escapement sizes to best represent the region. In addition to being a large producer and draining a wide area, Fish Creek has also been the broodstock source for the Big Lake Hatchery.

While Nancy Lake and Cottonwood Creek were sampled in only one year, Fish Creek was sampled over three years, 1992-94. Pairwise comparisons of the three samples show that only the 1993 and 1994 collections can be pooled ($G = 16.78$, $df = 13$, $P = 0.210$). Heterogeneity at *ALAT**, *LDH-B2**, and *sMDH-A1,2** precludes combining the 1992 collection with the pooled 1993-94 collection ($G = 61.4$, $df = 14$, $P < 0.001$). Although these differences are smaller when examined at the regional level ($P = 0.99$; Table 3), it was decided that the differences were sufficient to consider the 1992 collection as separate from the 1993-1994 pooled collection.

Heterogeneity among regions

Observed and expected heterozygosities were calculated for all individual populations (Appendix A). Observed heterozygosities varied from a low of 0.020 in Chilligan River (1992) to a high of 0.059 in Stephan Lake (1993). There is no regional trend in heterozygosity level in the populations sampled. All populations showed conformity to Hardy-Weinberg frequency expectations.

A hierarchical gene diversity analysis was performed using 28 loci (isoloci and loci scored phenotypically were excluded) and unpooled populations. The hierarchical analysis was stratified by population, site, and region. The greatest amount of variation (88.3%) occurred within populations (Table 4) and was heavily weighted by variability at *mAAT-2**, *sAH**, *PEPC**, *PEPLT**, and *PGM-2** with *sAH** contributing the greatest amount. Little variability (0.3%) was detected among populations or year-classes within sites. However, considerable heterogeneity (7.6%) existed among sites within regions, and the remaining 3.8% of the variability was accounted for by the among region component.

Relationships among populations are depicted in the UPGMA phenogram and N-J tree (Figs. 3 and 4). Two clusters of related populations are evident from both diagrams. Mainstem Kenai River populations, including Ptarmigan Creek and Russian River below-the-falls, cluster in both diagrams although the placement of Tern Lake and Quartz Creek differs. A second cluster composed of the Tustumena Lake populations from the Kasilof drainage is also apparent in both diagrams. Joining this group are Crescent Lake site 1 and McArthur River. The divergence between Crescent Lake site 1 and Crescent Lake site 2 is apparent from both diagrams. In both diagrams, the Northeastern Cook Inlet and Knik Arm (except Nancy Lake) populations cluster regionally. Little regional structuring is apparent in the remaining populations, and populations from divergent regions often cluster together rather than with populations from the same drainage.

Mixed-stock analyses

The performance of the MSA model for Cook Inlet sockeye salmon was investigated through simulation studies of various reporting regions. We simulated a mixed-fishery sample of 100% of the individual group under study from the seven previously-identified reporting regions: Kenai, Kasilof, Susitna, Yentna, Western Cook Inlet, Northeastern Cook Inlet, and Knik Arm. Fishery managers desired reporting regions that showed at least 90% allocation to the region of origin. Within the region, the individual populations were constrained to contribute equally to the sample (no allowances were made for differential abundances).

The Kenai River region, the group of greatest concern, showed 92% allocation in the simulation studies (Table 5). Northeastern Cook Inlet, Kasilof River and Knik Arm also showed a high degree of regional fidelity (99.0%, 91.4% and 89.5% respectively). The Yentna River performed well with an allocation of 89.2%, but the Susitna River misallocated to both the Yentna River and Western Cook Inlet with a resulting allocation of 80.4%. When the Susitna and Yentna regions were combined, the allocation was 87.9%. Only Western Cook Inlet, a heterogenous grouping based on geographic proximity, performed at a level considerably below the 90% objective (83.4%). Chilligan River and Crescent Lake sites 1 and 2 appear to contribute significantly to the poor performance.

MLE estimates were calculated for all samples collected from the Central District Drift fishery (Table 6). Estimates of Kenai River contribution varied from a high of 88.2% on July 13, 1992 to a low of 52.7% and 52.8% on July 12, 1993 and July 15, 1994. The Susitna/Yentna group contributed up to 21.2% in some samples, while the highest contribution of the Kasilof group was 10.6%.

MLE estimates were also calculated from samples originating from inriver fish wheels (Table 7). These samples were collected in 1992 and 1994 from the Kenai, Kasilof, Susitna Mainstem, and Yentna River drainages. These inriver estimates assume all contributing populations from a particular drainage have been included in the baseline and that there is no straying into the river drainage. Estimates for the Kenai inriver samples ranged from 64.8%

to 93.1%. The low value was for July 10, 1994 and was the first sample for that year. Similar results were obtained for the Susitna River mainstem (75.1% and 92.2%), Yentna River (79.9% to 98.2%), and Kasilof River (54.6% to 91.7%). In each case the low values were obtained from the earliest sampling each year. This may indicate that some early-run populations with unique genetic profiles have not been included in the baseline, or that early in the season fish may be entering non-natal systems prior to correctly homing to their natal stream ("nosing in").

Finer scale estimation is also possible for some populations within some river drainages. A 100% simulation was conducted on the Russian River above-the falls populations alone. The results indicate that the Russian River can be identified in mixtures of Cook Inlet populations with a very high degree of accuracy and precision. The simulation result was 99.8%, S. D. 0.3%. MLE estimates for the inriver mixtures from Kenai River were made to estimate the combined early- and late-runs of Russian River fish above-the-falls (Table 8). As expected, the estimates vary through time. Four estimates were possible in 1994, and they varied from 4% to 30.1%. The results suggest a pulse of early-run fish, a lull, and then a large pulse of late-run fish (Table 8).

Mitochondrial DNA

Haplotype variation.--A total of ten composite haplotypes were detected using the 13 restriction enzymes screened in all populations (Table 9). Of these 13 enzymes, six (*Apa I*, *Hha I*, *Hinf I*, *Kpn I*, *Stu I*, and *Taq I*) were polymorphic (Table 10). The two composite haplotypes representing variation in the *Apa I* enzyme (I and II, Table 9) were encountered most frequently (i.e., in 78% of the samples) in Cook Inlet. The distributions of these two haplotypes appear to correlate with geography, with haplotype I being present in a high proportion of the Kenai (56.2%) and Kasilof (30.0%) River samples while haplotype II is present in a majority of the Kink Arm (55.4%), Susitna (57.5%), Yentna (55.4%), Western Cook Inlet (61.9%) samples, and in 100% of the Northeastern Cook Inlet samples. The composite haplotype V (a *Taq I* variant) was much more common in the Kenai and Kasilof River drainage (22% and 44%, respectively), when compared to other regions (Susitna, 20%; Knik Arm, 9%; Yentna, 2%; Western Cook Inlet, 1%; Northeastern Cook Inlet, absent). The remaining composite haplotypes were found at low frequencies overall (<5%), but within regions two were detected at much higher frequencies (i.e., haplotype VI at 10% in Kasilof River and haplotype IX at 22.5% was unique to Knik Arm).

Heterogeneity among populations.--The pairwise matrix of nucleotide divergence among populations (Table 11) was used to construct a UPGMA phenogram (Fig. 5). The phenogram differentiates two very distinct groups: 1) Kenai and Kasilof Rivers, and 2) Northeastern Cook Inlet, Knik Arm, Susitna River, Yentna River, and Western Cook Inlet. The two populations that do not conform to this regional clustering are Packers Lake (classified as a Western Cook Inlet population but clusters with the Upper Russian River) and Shell Lake (a Yentna River tributary that clusters with Kenai River populations). While there is also some interregional mixing of populations within these two distinct clusters, it may be a

result of limited population sampling from some of these regions. Further analysis of additional populations may reveal additional divergence.

Monte Carlo simulations (Roff and Bentzen 1989) were used to test for geographic heterogeneity in mtDNA haplotype frequencies within regions, among regions, and among all populations sampled. The among-region test was conducted by pooling populations within regions. A total of 10,000 replicates were examined for each simulation. Results for the within region tests indicate that significant heterogeneity exists within all regions ($P = 0.000$), except among Kasilof River samples ($P = 0.837$) (Table 12). Significant heterogeneity in haplotype frequencies was also detected ($P = 0.000$) in both the among region and among population tests (Table 12). This is also reflected in the F_{st} statistic of 0.333 which indicates that a third of the variation can be attributed to among populations while the remainder is distributed within populations.

Mixed-stock analyses.--The mtDNA data was tested for its ability to improve allozyme-based MSA estimates within Cook Inlet. This testing procedure involved running two sets of simulations. The first set of simulations used allozyme data only from the same subset of populations that were analyzed for mtDNA variation. For all simulations, the region being tested comprised 100% of the mixture (N = 400) and 100 bootstrap resamplings were conducted. In this way, regional misallocations could be examined. Simulations were conducted for each region, and regional allocations were tabulated (Table 13). Once the simulations were completed with only the allozyme data, the mtDNA data, consisting of haplotype frequencies, were included and the simulations were repeated following the same protocol. In all cases, with the exception of Knik Arm, the mtDNA data improved the mean allocation estimates to the correct region (Table 13, bold numbers). The standard deviations of the mean estimated allocations to the correct regions showed a similar decreasing trend with the addition of mtDNA data (again with the exception of Knik Arm), indicating an improvement in precision.

DISCUSSION

The objective of this study was to improve stock assessment capabilities for sockeye salmon in an effort to protect and restore populations injured in the spill. Our goal was to obtain baseline genetic data from all significant spawning populations contributing to mixed-stock harvests in Cook Inlet. A comprehensive analysis of the genetic diversity of Cook Inlet sockeye salmon was conducted. We surveyed approximately 7,400 individuals representing about 50 putative populations for up to 68 allozyme loci. Our mtDNA analysis included a subset of 22 populations and 920 individuals. The allozyme data combined with the mtDNA data give a detailed picture of the genetic diversity of Cook Inlet sockeye salmon, and the data can be used not only to describe the diversity of the Inlet, but also to assess the contribution of injured populations to mixed-stock aggregations.

Genetic diversity of Cook Inlet sockeye salmon

This study represents the first comprehensive analysis of sockeye salmon from Cook Inlet since that of Grant et al. (1980). Grant et al. (1980) identified six informative of 26 total loci from 13 populations from the Kenai, Kasilof, and Susitna River drainage. They documented heterogeneity among both the Kenai and Susitna drainage, while little heterogeneity was detected among Kasilof River populations. Wilmot and Burger (1985) surveyed Russian River populations and documented significant differences between the early- and late-run populations from the Russian River at *LDH-B2** and *sAH**. This study confirms the previous observations of Grant et al. (1980) and Wilmot and Burger (1985) and greatly expands the database both in terms of loci and number of populations.

Sockeye salmon typically spawn in rivers or smaller creeks associated with nursery lakes, and it has been suggested that the nursery lake is the primary unit of genetic structuring (Utter et al. 1984; Wood et al. 1994). This may reflect the tendency of sockeye salmon to home with great fidelity to their natal streams, presumably to a greater extent than other Pacific salmon (Quinn 1985; Quinn et al. 1987). Juveniles will typically rear from one to two years in a nursery lake before undergoing smoltification and migration to the sea.

The Kenai River drainage includes several nursery lakes. Early- and late-run Russian River populations rear in Upper and Lower Russian Lakes, "mainstem" spawning populations (outlet of Skilak Lake, between Kenai and Skilak Lake, Russian River below the falls, Quartz Creek) are believed to rear in Kenai and Skilak Lakes, Moose Creek rear in Upper Trail Lake, Tern Lake rear in Tern Lake itself, Ptarmigan Creek rear in Ptarmigan Lake, and Hidden Creek juveniles rear in Hidden Lake. The genetic diversity among Kenai River populations is clearly far greater than previously documented. Two separate lineages corresponding to an early- and late-run occur above the falls in the Russian River. The falls serve as an effective isolating barrier with populations below the falls joining a large aggregation of mainstem populations that rear in Kenai and Skilak Lakes. This aggregation is supported by both the allozyme and mtDNA data sets. A third highly divergent lineage is represented by the Hidden Creek population, and an additional outlier with distinct genetic profiles occurs in Moose Creek. Tern Lake and Quartz Creek populations appear to be somewhat intermediate, not joining any distinct grouping.

Sockeye salmon from four spawning tributaries as well as two beach spawning sites were surveyed from Kasilof River and Tustumena Lake. Little heterogeneity among populations rearing in the lake was apparent with three populations (Bear, Moose, and Seepage Creeks) being nearly indistinguishable. Tustumena Lake has been only fully deglaciated for about 2,000 years, so that any divergence of these populations may have occurred relatively recently.

The National Biological Service (NBS) presently has unpublished data from Tustumena Lake suggesting that the tributary spawners are distinct from beach spawners (Carl Burger, National Biological Service, Anchorage, personal communication), but we could not detect a similar relationship. Their conclusions are based on allozyme data but are not reflected in their mtDNA data. They have also detected a distinct late run of river-spawners

that appear near the end of September at the outlet of Tustumena Lake (Burger et al. 1995). These outlet-spawners have a distinct genetic profile based on both mtDNA and allozyme data (Carl Burger, personal communication). No outlet spawners were included in this study.

We did detect heterogeneity between multiple collections from Glacier Flat Creek. Glacier Flat served as an egg source for enhancement of Tustumena Lake, so the allele frequencies could have been influenced by enhancement activities. Temporal instability of allele frequencies from hatchery populations has been noted by many authors (Waples 1991; Winans et al. 1994; Phelps et al. 1994). This same phenomenon was also observed at Fish Creek in Knik Arm. Fish Creek served as the broodstock for the Big Lake Hatchery and at one time received eggs from Tustumena Lake. Interestingly, the genetic effects of this egg transfer may still persist. *G3PDH-4*108* consistently occurs in the Kasilof drainage populations, but the only occurrence outside the drainage is in a Fish Creek collection.

The high level of divergence of Susitna River and Western Cook Inlet populations was not completely unexpected, as Grant et al. (1980) also noted significant divergence of Susitna River populations. Unlike the Kenai and Kasilof River drainage, there are no large nursery lakes that support multiple tributary-spawning populations. Rather, there are a number of isolated smaller lake systems. This isolation has likely lead to the considerable divergence evident in both regions.

The data from the Kenai, Kasilof, and Susitna River drainages support the model of differentiation of populations based on nursery lakes. This differentiation among nursery lakes is reflected in the gene diversity analysis where 7.6% of the variability existed among sites within regions while only 3.8% of the variability could be attributed to the among region component. Wood et al. (1994) report similar results from a study of variation in 83 distinct spawning sites representing all major sockeye-producing river systems in Canada. They report extensive differentiation among nursery lakes attributed to founder effects and isolation through strict homing behavior. The results from their genetic analysis were quite similar to this study. They found 7% of the variation to be attributable to differences among lakes within drainage with lesser amounts attributed to among drainage within systems and among river systems components.

The Crescent River drainage diverges from this general pattern. In this case, the two sampled sites on Crescent Lake are significantly different from each other. Colonization of these two sites may have stemmed from different lineages or the founders could have undergone a severe bottleneck event. A third site, Crescent River, was also analyzed early in the study, but is probably a mixed-stock sample not representative of a single spawning population. Further investigation of this system is warranted as there may be additional distinct lineages inhabiting Crescent Lake which have not been surveyed.

Divergence within a nursery lake is seen in this study between the early- and late-run Russian River populations, between sites in Crescent Lake, and possibly between sites in Stephan Lake. Temporal divergence within lakes has been noted for other sockeye salmon

populations. Wilmot and Burger (1985) report differences between early- and late-run sockeye salmon returning to Karluk Lake. Varnavskaya et al. (1994a) studied the population structure within nine lake systems in North America and Russia and found differentiation among subpopulations exhibiting different run timing (earlier vs. later) or utilizing different spawning habitat (tributary vs. beach). They attribute the differentiation to precise homing to the natal streams, not just to the lake systems.

Multiple studies have examined the relationship of sockeye salmon across a large portion of the range (Utter et al. 1980; Wood et al. 1994; Varnavskaya et al. 1994b; Bickham et al. 1995; Beacham et al. *In press*). These studies support the hypothesis that present sockeye salmon population structure is probably the result of interactions among several colonizing groups that survived the last ice age in isolated refugia with different habitat characteristics. Refugia where sockeye salmon are known to have survived include the Pacific Refugium (Columbia River) and Beringia (McPhail and Lindsey 1970).

The authors of these studies used different techniques and sampled different populations but arrived at the same conclusion that sockeye populations were recolonized from two separate refugia. Utter et al. (1980) collected allozyme data from populations from throughout the Pacific Rim. The conclusions of Varnavskaya et al. (1994b) were also based on allozyme data compiled from populations ranging from Kamchatka, Bristol Bay, Kodiak Island, Cook Inlet, and south through Southeast Alaska and British Columbia. Similar conclusions were reached by Beacham et al. (*In press*) and Bickham et al. (1995). Beacham et al. (*In press*) examined nuclear DNA divergence using minisatellites in 10 populations across six drainages ranging from Kuril Lake in Russia, Bristol Bay in Alaska, British Columbia, and Washington. Bickham et al. (1995) surveyed the cytochrome *b* gene of mitochondrial DNA in populations similar to Beacham et al. (*In press*).

Mitochondrial DNA insights on colonization of Cook Inlet

Late-Wisconsin glaciation probably played an important role in the colonization of sockeye salmon in the major Cook Inlet drainages. It seems probable that the Kenai and Kasilof Rivers were open for colonization before many of the other drainages in Cook Inlet were free of glacial ice (Reger and Pinney *In press*). While the upper Kenai and Kasilof Rivers were still blocked with glacial ice, suitable habitat for spawning sockeye salmon (in the form of impounded lakes and their resulting outwash) existed near the outlets of both rivers.

Mitochondrial DNA is useful in examining past colonization events because of its strict maternal inheritance and haploid nature, which reduces the effective breeding population size to one fourth that of nuclear genes (Avise et al. 1987). The reduced effective population size can greatly influence the frequencies of haplotypes due to greater pressures of genetic drift. Therefore, low haplotype diversity within a population could indicate the population went through some sort of bottleneck (i.e., the populations may have been founded by a small number of females or the number of breeding individuals was drastically reduced at some

point).

If we examine haplotype frequencies from the Kenai River drainage, one population fits this scenario. The upper Russian River populations (early and late run) have an almost complete lack of variation (haplotype I = 97%). The Russian River valley was probably one of the last to become free of glacial ice, which would mean it was probably colonized most recently. In addition, the presence of an imposing water fall two miles from its confluence with the mainstem of the Kenai River probably also played a role in limiting the number of founders in the first few generations.

Other populations with a similar lack of variation are Daniels Lake outlet (haplotype II = 100%) and Packers Lake (haplotype I = 95%), which indicates these populations probably underwent colonizations with small number of founders. Many of the other populations examined from Cook Inlet had greater haplotype diversity.

Mixed-stock analyses (MSA)

In addition to describing the genetic diversity present in Cook Inlet, a primary goal of this study was to evaluate and utilize the genetic data for MSA to aid in the restoration of injured Kenai River populations. Of the 68 allozyme loci detected in this study, a set of 27 were used in the majority of the admixture analyses. This represents a large increase from the earlier study where Grant et al. (1980) successfully discriminated Kasilof and Susitna populations of sockeye salmon with only three informative loci.

A basic requirement of MSA using genetic data is that all major contributing populations are represented in the baseline. To a large extent, this assumption can be met by the extensive genetic information collected by this study. However, unlike some other species of Pacific salmon such as chinook salmon (Utter et al. 1993), there is little relationship between genetic distance and geographic distance. Sockeye salmon populations inhabiting the same drainage may be more divergent than populations geographically quite separate. As a result, exhaustive baseline sampling is needed, and some additional baseline sampling is continuing.

Evaluation and refinement of the MSA model was conducted primarily through simulation studies using pure or 100% simulations. Bias in the estimated composition will be greatest at the most extreme compositions (0 or 100%) given the constrained maximum likelihood techniques used (no estimates < 0.00 or > 1.00). A series of 100% simulations, thus, provides a difficult test of the model.

Based on earlier work with sockeye salmon (Wood et al. 1989; 1994), we took a conservative approach to identifying regional reporting units and used the allocate-sum procedure to estimate regional contributions. The performance of the Kenai River was of particular concern. Performance was quite good with a simulation estimate of 92.5% (S.D. 4.7%). Additional indicators of the accuracy of the method are the misallocations to

particular regions. The Kenai River also performed well with misallocations in simulations ranging from 0.5% from the Susitna to 3.2% for West Cook Inlet. The Kasilof, Northeastern Cook Inlet, and Knik Arm regions also performed well. Pooling the Yentna and Susitna regions improved performance for the Susitna populations. The poorest results were obtained for Western Cook Inlet, a very heterogeneous group of populations with genetic affinities to the Yentna and Susitna River populations.

The results for the MLE estimates over the three years varied not only through time, but also across years with the Kenai River estimate varying from 88% to 53%. In all cases, the Kenai River was the largest contributor, however these estimates will vary depending on the relative run strengths, location of sampling, and timing of sampling. The model can be used to accurately track their timing and relative abundance through the Inlet as the injured year-classes return to the Kenai River.

The inriver mixed-stock estimates can be used to monitor individual populations within systems. For example, the Russian River and Hidden Creek populations of the Kenai River can be very accurately and precisely estimated and can potentially serve as indicator stocks for management purposes.

The inriver samples can also provide an indication of the adequacy of the baseline. However, intrinsic in this application is the assumption that very little straying or "nosing in" occurs. Anecdotally, biologists have observed that some fish will temporarily enter a non-natal stream prior to correctly homing. Some general trends appear. The data suggest that the model performs the most poorly early in the season and improves dramatically as the season progresses. This strongly suggests that the baseline is weighted towards mid or later-timing populations. This is likely an acceptable bias as many of the early-timing populations may be very low in actual abundance (Ken Tarbox, ADF&G, Soldotna, personal communication).

Utility of mtDNA in mixed-stock analyses

Mixed-stock analysis using mtDNA restriction-sites data has been used only recently for genetic stock identification (Wirgin et al. 1993; Xu et al. 1994; Seeb et al. 1995). Since the mtDNA molecule accumulates mutations fairly rapidly and the effective population size for mtDNA is much smaller (Birky et al. 1989), one expects levels of geographic differentiation in haplotype frequencies to be higher than its relatively slowly evolving nuclear counterpart (Avise et al. 1987). However, this has not always been the case with Pacific salmon (Park et al. 1993 and references therein). For instance, a single variant at *ND5/ND6* has more discriminatory power than any single allozyme locus in separating chum salmon from Japan from the rest of the Pacific rim (Park et al. 1993), but cannot identify any other region. Conversely, Seeb et al. (1995) used allozyme data to allocate chum salmon mixtures to seven regions around the Pacific Rim.

Mitochondrial DNA data do provide a valuable addition to the allozyme database for

Cook Inlet sockeye salmon. The magnitude of variation in haplotype frequencies exceeds that of any single allozyme locus examined in this study. With allozymes, the largest difference detected among Cook Inlet sockeye populations is found at *PGM-2** (i.e., between Hidden Creek '92 and Daniels Lake, outlet '92) with a maximum frequency change of 0.770; compared to fixed differences in mtDNA *ND5/ND6* with no shared haplotypes between Russian River above-the-falls/late-run and Daniels Lake, outlet (Table 9). The degree of mtDNA differentiation among sockeye salmon populations from Cook Inlet is quite high (i.e., $F_{ST} = 0.33$) versus a lower estimate for allozyme data ($G_{st} = 0.12$). We only examined a small proportion (*ND5/ND6* region = 2400 bp or ~ 15%) of the mitochondrial genome, but similar studies (cyt-*b*/D-loop region, Appendix H) have shown that other regions of this molecule are just as variable and capable of distinguishing sockeye populations.

Table 13 shows that mtDNA data can improve stock estimates. This is expected because we are adding a new, highly variable locus to the genetic model and the accuracy of allocation is dependent on the degree of divergence among stocks (Pella and Milner 1987). On its own, however, mtDNA does not fair well. This is due, in part, to the limited number of haplotype differences (which relates to the number of nucleotides surveyed) detected among the populations. A greater number of nucleotides and probably more populations will need to be sampled in order to detect new haplotypes that are informative at the population or regional levels (Lynch and Crease 1990). However, Smouse et al. (1994) argued that an increase in the number of haplotypes observed may not improve mixture model performance because biallelic loci with frequencies ranging from 0.2 to 0.8 provide the greatest resolving power.

CONCLUSIONS

The allozyme and mtDNA data both reveal a substantial amount of genetic diversity among populations of Cook Inlet sockeye salmon. This diversity is distributed both within and among major drainages. In general, the data support a model of population structure based on the nursery lake, however we did detect significant divergence among both temporal and geographic components within nursery lakes. This diversity likely arises from isolation and genetic drift among nursery lakes combined with a tendency of sockeye salmon to home with great fidelity.

The results of the MSA indicate that Kenai River populations can be identified in mixtures of Cook Inlet sockeye salmon at a level of precision and accuracy useful for fisheries management and restoration. The accuracy and precision of the estimates can likely be further improved as additional DNA baseline data become available. The data collected in this study can also be used within drainages to identify specific population components. These applications are currently underway on the Kenai River to aid in the restoration of injured populations.

Sockeye salmon from Cook Inlet and throughout their range exhibit a complex

population structure, and this high level of diversity likely indicates significant local adaptation has occurred. Conservation of this diversity should be incorporated into all restoration and management efforts.

ACKNOWLEDGEMENTS

A study of this magnitude could not have been completed without the help and cooperation of a large number of people. Ken Tarbox, Linda Brannian, and Steve Fried of ADF&G Central Region were instrumental in the conception, design, and implementation of this study. Randall Davis, ADF&G Soldotna, and his staff collected the majority of the samples. The study could not have been conducted without their field expertise. Paul Ruesch and Dave Waltmeyer, ADF&G Soldotna, also assisted with important aspects of the study.

An essential component of this study was the expert laboratory effort provided by Lori Wagoner, Chris Schlichten, Bruce Whelan, and Dave Sarafin of the ADF&G Genetics Laboratory, Anchorage. Many others from the Genetics Laboratory contributed, particularly during the inseason analyses including, Judy Berger, Jeanne Skalka, John McMahon, Holly Moore, Robin Reich, Dave Kean, Kristin Denning, Gary Miller, and Jim Fish. Penny Crane and Sue Merkouris, in particular, lent their allozyme expertise to the inseason efforts and helped implement the project during its initial phases. The ADF&G Division of Wildlife Conservation kindly lent us a portion of their laboratory during the first year of the study.

We would also like to thank Paul Aebersold and Charles Guthrie of the National Marine Fisheries Service, Seattle and Auke Bay, and Carl Burger of the National Biological Service, Anchorage, for sharing their sockeye expertise. This study was funded by the *Exxon Valdez* Oil Spill Trustee Council.

LITERATURE CITED

Aebersold, P. B., Winans, G. A., Teel, D. J., Milner, G. B., and Utter, F. M. 1987. Manual for starch gel electrophoresis: A method for the detection of genetic variation. NOAA Technical Report NMFS 61, U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 19 p.

Allendorf, F. W. and Phelps, S. R. 1981. Use of allelic frequencies to describe population structure. Can. J. Fish. Aquat. Sci. 38: 1507-1514.

Avise, J. C., Arnold, J., Ball, R. M., Bermingham, E., Lamb, T., Neigel, J. E., Reeb, C. A., and Saunders, N. C. J. 1987. Intraspecific phylogeography: The mitochondrial DNA bridge between population genetics and systematics. Ann. Rev. Ecol. Syst. 18: 489-522.

Beacham, T. D., Withler, R. E., and Wood, C. C. In Press. Stock identification of sockeye salmon (*Oncorhynchus nerka*) using minisatellite DNA variation. North Ame. J. Fish. Man.

Bickham, J. W., Wood, C. C., and Patton, J. C. 1995 . Biogeographic implications of cytochrome-*b* sequences and allozymes in sockeye (*Oncorhynchus nerka*). J. Hered. 86: 140-144.

Birky, C. W. Jr, Fuerst, P., and Maruyama, T. 1989. Organelle gene diversity under migration, mutation, and drift: equilibrium expectations, approach to equilibrium, effects of heteroplasmic cells, and comparison to nuclear genes. Genetics 121: 613-627.

Boyer, S. H., Fainer, D. C., and Naughton, M. A. 1963. Myoglobin: Inherited structural variation in man. Science 140: 1228-1231.

Burger, C. V., Finn, J. E., and Holland-Bartels, L. 1995. Pattern of shoreline spawning by sockeye salmon in a glacially turbid lake: Evidence for subpopulation differentiation. Trans. Ame. Fish. Soc. 124: 1-15.

Cavalli-Sforza, L. L. and Edwards, A. W. F. 1967. Phylogenetic analysis: models and estimation procedures. Evolution 21: 550-570.

Clayton, G. M. and Tretiak, D. N. 1972. Amine-citrate buffers for pH control in starch gel electrophoresis. J. Fish. Res. Board Can. 29: 1169-1172.

Cronin, M. A., Spearman, W. J., Wilmot, R. L, Patton, J. C., and Bickham, J. W. 1993. Mitochondrial DNA variation in chinook and chum salmon detected by restriction enzyme analysis of polymerase chain reaction (PCR) products. Can. J. Fish. Aquat. Sci. 50: 708-715.

Efron, B. and Tibshirani, R. 1986. Bootstrap methods for standard errors, confidence intervals, and other measures of statistical accuracy. Stat. Sci. 54-77:

Felsenstein, J. 1993. PHYLIP (Phylogeny Inference Package) Version 3.5c. Department of Genetics, University of Washington, Seattle. Distributed by the author.

Fournier, D. A., Beacham, T. D., Riddell, B. E., and Busack C. A. 1984. Estimating stock composition in mixed stock fisheries using morphometric, meristic and electrophoretic characteristics. Can. J. Fish. Aquat. Sci. 41: 400-408.

Gomulkiewicz, R., Brodziak, J. K. T., and Mangel, M. 1990. Ranking loci for genetic stock identification by curvature methods. Can. J. Fish. Aquat. Sci. 47: 611-619.

Grant, W. S., Milner, G. B., Krasnowski, P., and Utter, F. M. 1980. Use of biochemical genetic variants for identification of sockeye salmon (*Oncorhynchus nerka*) stocks in Cook Inlet, Alaska. Can. J. Fish. Aquat. Sci. 37: 1236-1247.

Harris, H. and Hopkinson, D. A. 1976. Handbook of enzyme electrophoresis in human genetics. American Elsevier, New York.

Holmes, R. S. and Masters. C. J. 1970. Epigenetic interconversions of the multiple forms of mouse liver catalase. FEBS Letters 11: 45-48.

Lynch, M. and Crease, T. J. 1990. The analysis of population survey data on DNA sequence variation. Mol. Biol. Evol. 7: 377-394.

Marshall, S., Bernard, D., Conrad, R., Cross, B., McBride, D., McGregor, A., McPherson, S., Oliver, G., Sharr, S., and Van Allen, B. 1987. Application of scale patterns analysis to the management of Alaska's sockeye salmon (*Oncorhynchus nerka*) fisheries, p. 207-326. *In* Smith, H. D., Margolis, L., and Wood, C. C. [ed.] Sockeye salmon (*Oncorhynchus nerka*) population biology and future management. Can. Spec. Publ. Fish. Aquat. Sci. 96.

Masuda, M., Nelson, S., and Pella, J. 1991. The computer programs for computing conditional maximum likelihood estimates of stock composition from discrete characters. USA-DOC-NOAA-NMFS, Auke Bay Laboratory, Auke Bay, Alaska

May, B., Wright, J. E., and Stoneking, M. 1979. Joint segregation of biochemical loci in Salmonidae: Results from experiments with *Salvelinus* and review of the literature on other species. J. Fish. Res. Board Can. 36: 1114-1128.

McElroy, D., Moran, P., Bermingham, E., and Kornfield, I. 1992. REAP - An integrated environment for the manipulation and phylogenetic analysis of restriction data. J. Hered. 83: 157-158.

McPhail, J. D., and C. C. Lindsey. 1970. Freshwater fishes of northwestern Canada and Alaska. Fish. Res. Board Can. Bull. 173.

Millar, R. B. 1990. Comparison of methods for estimating mixed stock fishery composition. Can. J. Fish. Aquat. Sci. 47: 2235-2241.

Millar, R. B. 1987. Maximum likelihood estimation of mixed stock fishery composition. Can. J. Fish. Aquat. Sci. 44: 583-590.

Milner, G. B., Teel, D. J., Utter, F. M, and Burley, C. L. 1981. Columbia River stock identification study: Validation of genetic method. Annual report of research (FY80) NOAA, Northwest and Alaska Fisheries Center, Seattle, Wash.

Mundy, P. R. 1985. Harvest control systems for commercial marine fisheries management; theory and practice, *In* Mundy, P. R., Quinn, T. J., and Deriso, R. B. [ed.] Fisheries Dynamics, Harvest Management and Sampling, Washington Sea Grant Technical Report 85-1. University of Washington, Seattle, Washington.

Mundy, P. R., English, K. K., Gazey, W. J., and Tarbox, K. E. 1992. Evaluation of the harvest management strategies applied to sockeye salmon populations of Upper Cook Inlet, Alaska, using run reconstruction analysis, p. 107-139. *In* Kruse, G., Eggers, D. M, Marasco, F. J., Pautzke, C., and Quinn II, T. J [ed.] Proceedings of the International Symposium on Management Strategies for Exploited Fish Populations. Alaska Sea Grant College Program, Fairbanks, AK.

Nei, M. 1973. Analysis of gene diversity in subdivided populations. Proc. Natl. Acad. Sci. U. S. A. 70: 3321-3323.

Nei, M. and F. Tajima. 1981. DNA polymorphism detectable by restriction endonucleases. Genetics 97: 145-163.

Park, L. K., Brainard, M. A., Dightman, D. A., and Winans, G. A. 1993. Low levels of intraspecific variation in the mitochondrial DNA of chum salmon (*Oncorhynchus keta*). Mol. Mar. Biol. Biotech. 2: 362-370.

Pella, J. J., Masuda, M., and Nelson, S. 1994. Search algorithms for computing stock composition of a mixture from traits of individuals by maximum likelihood. Unpublished manuscript in review, NMFS, Auke Bay, Alaska.

Pella, J. J. and Milner, G. B. 1987. Use of genetic marks in stock composition analysis, p. 247-276. *In* Ryman, N. and Utter, F. [ed.] Population Genetics and Fishery Management. Washington Sea Grant, Univ. of Washington Press, Seattle.

Phelps, S. R., Leclair, L. L., Young, S., and Blankenship, H. L. 1994. Genetic Diversity Patterns of Chum Salmon in the Pacific Northwest. Can. J. Fish. Aquat. Sci. 51: 65-83.

Quinn, T. P. 1985. Homing and the evolution of sockeye salmon (*Oncorhynchus nerka*). Contrib. Mar. Sci. 356-366.

Quinn, T. P., Wood, C. C., Margolis, L., Riddell, B. E., and Hyatt, K. D. 1987. Homing in wild sockeye salmon (*Oncorhynchus nerka*) populations as inferred from differences in parasite prevalence and allozyme allele frequencies. Can. J. Fish. Aquat. Sci. 44: 1963-1971.

Reger, R. D. and Pinney, D. S. In Press. Late Wisconsin glaciation of the Cook Inlet region with emphasis on Kenai lowland and implications for early peopling, *In* Davis, N. Y. and Davis, W. E. [ed.] The Anthropology of Cook Inlet: Proceedings from a Symposium. Cook Inlet Historical Society, Anchorage, AK.

Ridgway, G. J., Sherburne, S. W., and Lewis, R. D. 1970. Polymorphisms in the esterases of Atlantic herring. Trans. Am. Fish. Soc. 99: 147-151.

Roff, D. A. and Bentzen, P. 1989. The statistical analysis of mitochondrial DNA polymorphisms: X^2 and the problem of small samples. Mol. Biol. Evol. 6: 539-545.

Saitou, N. and Nei, M. 1987. The neighbor-joining method: A new method for reconstructing phylogenetic trees. Mol. Biol. Evol. 4: 406-425.

Schmidt, D. and Tarbox, K. 1993. Sockeye salmon overescapement. *Exxon Valdez* Oil Spill State/Federal Natural Resource Damage Assessment Status Report (Fish/Shellfish Study 27), Alaska Department of Fish and Game, Soldotna, Alaska.

Seeb, J. E., Seeb, L. W., and Utter, F. M. 1986. Use of genetic marks to assess stock dynamics and management programs for chum salmon. Trans. Ame. Fish. Soc. 115: 448-454.

Seeb, L. W., Crane, P. A., and Gates, R. B. 1995. Progress report of genetic studies of Pacific Rim chum salmon and preliminary analysis of the 1993 and 1994 South Unimak June Fisheries. Regional Information Report No. 5J95-07, Alaska Department of Fish and Game, 333 Raspberry Road, Anchorage, AK, 97 pp.

Seeb, L. W., Seeb, J. E., and Gharrett, A. J. 1990. Genetic marking of fish populations, p. 223-239. *In* Whitmore, D. H. [ed.] Electrophoretic and isoelectric focusing techniques in fisheries management. CRC Press, Boca Raton, FL.

Selander, R. K., Smith, M. H., Yang, S. Y., Johnson, W. E., and Gentry, J. B. 1971. Biochemical polymorphism and systematics in the genus *Peromyscus*. I. Variation in the old field mouse (*Peromyscus polionotus*). Studies in Genetics VI. University of Texas Publication 7103: 49-90.

Shaklee, J. B., Allendorf, F. W., Morizot, D. C., and Whitt, G. S. 1990. Gene nomenclature for protein-coding loci in fish. Trans. Am. Fish. Soc. 119: 2-15.

Shaklee, J. B. and Phelps, S. R. 1990. Operation of a large-scale, multiagency program for genetic stock identification. Trans. Amer. Fish. Soc. 7: 817-830.

Smouse, P. E., Kobak, C. J., and Xu, Shizhong. 1994. Some thoughts on information content in allozyme and DNA markers in genetic stock identification, p. 121-126. *In* Park, L. K., Moran, P., and Waples, R. S. [ed.] Application of DNA technology to the management of Pacific salmon: Proceedings of the workshop. US. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-17.

Smouse, P. E., Waples, R. S., and Tworek, J. A. 1990. A genetic mixture analysis for use with incomplete source population data. Can. J. Fish. Aquat. Sci. 47: 620-634.

Sneath, P. H. and Sokal, R. R. 1973. Numerical taxonomy. W. H. Freeman and Co., San Francisco.

Swofford, D. L and Selander, R. G. 1981. BIOSYS-1--a FORTRAN program for the comprehensive analysis of electrophoretic data in population genetics and systematics. J. Hered. 72: 281-283.

Utter, F. M., Aebersold, P., Helle, J., and Winans, G. 1984. Genetic characterization of populations in the southeastern range of sockeye salmon, p. 17-31. *In* Walton, J. M and Houston, D. B. [ed.] Proceedings of the Olympic Wild Fish Conference.

Utter, F. M., Campton, D., Grant, S., Milner, G., Seeb, J., and Wishard, L. 1980. Population structures of indigenous salmonid species of the Pacific Northwest, p. 285-304. *In* McNeil, W. J. and Himsworth, D. C. [ed.] Salmonid ecosystems of the North Pacific.

Utter, F. M, Seeb, J. E., and Seeb, L. W. 1993. Complementary uses of ecological and biochemical genetic data in identifying and conserving salmon populations. Fish. Res. 18: 59-76.

Varnavskaya, N. V., Wood, C. C., and Everett, R. J. 1994b. Genetic variation in sockeye salmon (*Oncorhynchus nerka*) populations of Asia and North America. Can. J. Fish. Aquat. Sci. 51: 132-146.

Varnavskaya, N. V., Wood, C. C., Everett, R. J., Wilmot, R. L., Varnavsky, V. S., Midanaya, V. V., and Quinn, T. P. 1994a. Genetic differentiation of subpopulations of sockeye salmon (*Oncorhynchus nerka*) within lakes of Alaska, British Columbia, and Kamchatka, Russia. Can. J. Fish. Aquat. Sci. 51: 147-157.

Walters, C. J. 1975. Optimal harvest strategies for salmon in relation to environmental variability and uncertain production parameters. Can. J. Fish. Aquat Sci. 32: 1777-1784.

Waples, R. S. 1991. Genetic interactions between hatchery and wild salmonids - Lessons from the Pacific Northwest. Can. J. Fish. Aquat. Sci. 48: 124-133.

Waples, R. S. 1990. Temporal changes of allele frequency in Pacific salmon - Implications for mixed-stock fishery analysis. Can. J. Fish. Aquat. Sci. 47: 968-976.

Weir, B. S. 1990. Genetic data analysis. Sinauer, Sunderland, MA. 377 p.

White, B. A. and Shaklee, J. B. 1991. Need for replicated electrophoretic analyses in multiagency genetic stock identification (GSI) programs: examples from a pink salmon (*Oncorhynchus gorbuscha*) GSI fisheries study. Can. J. Fish. Aquat. Sci. 48: 1396-1407.

Wilmot, R. L. and Burger, C. V. 1985. Genetic differences among populations of Alaskan sockeye salmon. Trans. Amer. Fish. Soc. 114: 236-243.

Winans, G. A., Aebersold, P. B., Urawa, S., and Varnavskaya, N. V. 1994. Determining continent of origin of chum salmon (*Oncorhynchus keta*) using genetic stock identification techniques - Status of allozyme baseline in Asia. Can. J. Fish. Aquat. Sci. 51: 95-113.

Wirgin, I. I., Ong, T. L., and Maceda, L. 1993. Mitochondrial DNA Variation in Striped Bass (*Morone saxatilis*) from Canadian Rivers. Can. J. Fish. Aquat. Sci. 50: 80-87.

Wood, C. C., McKinnell, S., Mulligan, T. J., and Fournier, D. A. 1987. Stock identification with the maximum-likelihood mixture model: sensitivity analysis and application to complex problems. Can. J. Fish. Aquat. Sci. 44: 866-881.

Wood, C. C., Riddell, B. E., Rutherford, D. T., and Withler, R. E. 1994. Biochemical genetic survey of sockeye salmon (*Oncorhynchus nerka*) in Canada. Can. J. Fish.Aquat. Sci. 51: 114-131.

Wood, C. C., Rutherford, D. T., and Mckinnell, S. 1989. Identification of sockeye salmon (*Oncorhynchus nerka*) stocks in mixed-stock fisheries in British Columbia and Southeast Alaska using biological markers. Can. J. Fish. Aquat. Sci. 46: 2108-2120.

Xu, S., Kobak, C. J., and Smouse, P. E. 1993. Constrained least squares estimation of mixed population stock composition from mtDNA haplotype frequency data. Can. J. Fish. Aquat. Sci. 51: 417-425.

Table 1. Sockeye salmon populations sampled for genetic studies. All populations originate from Upper Cook Inlet, 1992-1994.

	Location	Sample Date	N
	Kenai River Drainage		
1	Russian River (above falls, early)	7/01/92	100
	Russian River (above falls, late)	8/06/92	100
		7/26/93	100
	Russian River (below falls, late)	8/17/93	100
2	Ptarmigan Creek	8/31/92	100
		8/05/93	98
3	Tern Lake	9/01/92	50
		8/24/93	100
4	Quartz Creek	8/13/92	100
		7/27/93	100
5	Between Kenai/Skilak Lake (early)		
	River mile 69.8 (Site 6)	8/18/92	100
	River mile 69.8 (Site 6)	8/13/93	99
	River mile 79.8 (Site 1)	8/11/94	50
	River mile 76.6 (Site 2)	8/12/94	50
	River mile 70.5 (Site 3)	8/12/94	100
	Between Kenai/Skilak Lake (late)		
	River mile 69.8 (Site 6)	8/27/93	100
	River mile 79.8 (Site 1)	8/22/94	50
	River mile 76.6 (Site 2)	8/23/94	50
	River mile 70.5 (Site 3)	8/23/94	50
	River mile 72.5 (Site 4)	8/23/94	50
	River mile 65.3 (Site 5)	9/09/94	100
6	Hidden Creek	8/03/92	100
		8/04/93	100

	Location	Sample Date	N
7	Skilak Lake outlet (early)		
	River mile 49.6 (north bank, Site 1)	8/19/92	100
	River mile 47.6 (south bank, Site 2)	8/13/93	100
	River mile 47.6 (south bank, Site 2)	8/20/94	200
	Skilak Lake outlet (late)		
	River mile 47.6 (south bank, Site 2)	8/27/93	100
	River mile 47.6 (south bank, Site 2)	8/30/94	200
8	Moose Creek	7/27/93	100
		7/13/94	100
	Susitna River (Yentna Drainages)		
9	Chelatna Lake	8/20/92	100
		8/02/93	100
10	Yentna River West Fork (Unnamed slough)	9/08/92	100
		9/08/93	100
11	Hewitt Lake	8/24/92	50
12	Whiskey Lake	9/03/93	50
13	Shell Lake (Skwentna R.)	8/26/92	100
		9/01/93	100
14	Trinity Lake	8/25/92	100
		9/03/93	100
15	Judd Lake (Talachulitna R.)	8/24/92	100
		8/24/93	100
	Susitna River (Mainstem Drainages)		
16	Byers Lake	8/23/93	100

Table 1. Continued.

	Location	Sample Date	N
17	Stephan Lake (Talkeetna R.)		
	Site 1 (outlet Prairie Creek)	8/19/94	25
	Site 2 (lake spawners)	9/08/93	100
	Site 2 (lake spawners)	8/19/94	25
18	Larson Lake (Talkeetna R.)	8/20/92	100
		8/31/93	100
19	Birch Creek	8/19/93	67
20	Red Shirt Lake	9/15/93	34
21	Coal Creek West Fork (Beluga R. Drainage)	9/01/92	100
		8/25/93	100
22	Chilligan R. (Chakachatna R. Drainage)	9/08/92	100
		9/13/94	50
23	McArthur R. Stream 12.4 (Chakachatna R.)	8/18/93	100
24	Wolverine Creek (Big R. Drainage)	7/03/93	100
25	Crescent Drainage		
	Crescent River Weir (River mile 2)	7/06-7/31/92	100
		7/08/93	100
	Crescent Lake Site 1 (South Shore)	8/14/94	50
	Crescent Lake Site 2 (near outlet)	8/14/94	50
26	Packers Lake (Kalgin Island)	7/16/92	100
		7/26/93	100
	Kasilof River Drainage		
27	Bear Creek	8/12/92	100
		8/03/93	100

Table 1. Continued.

	Location	Sample Date	N
28	Moose Creek	8/10/92	100
		8/03/93	100
29	Glacier Flat Creek	8/11/92	100
		8/02/93	100
		8/04/94	100
30	Nikolai Creek	7/29/92	100
		7/27/93	100
31	Tustumena Lake (lake spawners)		
	Site 1 (between Glacier Flat and Crystal Ck)	8/31/94	50
	Site 2 (mouth of Crystal Creek)	9/01/94	50
32	Seepage Creek	8/25/94	100
	Northeastern Cook Inlet Drainages		
33	Bishop Creek (Stream 602)	8/23/93	100
34	Daniels Lake (Bishop Ck. Drainage) (Strm. 601)	9/02/92	100
		8/20/93	100
	Knik Arm (Little Susitna River Drainages)		
35	Nancy Lake (Little Susitna R.)	8/26/93	100
36	Cottonwood Lake (Knik Arm)	8/18/93	100
37	Fish Creek	8/01/92	100
		8/16/93	100
		8/15/94	100

Table 1. Continued.

Location	Sample Date	N
Inriver Composite Samples		
Kenai River (fish wheel site, river mile 19)		
1992-1	7/13/92	200
1994-1	7/08-7/14/94	88
1994-2	7/17-7/18/94	200
1994-3	7/31-8/01/94	200
1994-4	8/09-8/11/94	200
Kasilof River (fish wheel site, river mile 7)		
1992-1	7/02-7/03/92	200
1992-2	7/22-7/23/92	200
1994-1	7/08-7/10/94	200
1994-2	7/17/94	200
1994-3	8/01-8/03/94	98
Susitna River Mainstem (Sunshine Station fish wheel, River mile 80)	7/26/92	200
	8/04/92	114
Yentna River (fish wheel site, river mile 4)		
1992-1	7/16/92	200
1992-2	7/24/92	200
1994	7/25-26/94	200
Commercial Sampling		
Drift gill net fishery 1992	7/13/92	200
	7/20/92	200
Drift gill net fishery 1993	7/12/93	400
	7/16/93	283
Drift gill net fishery 1994	7/08/94	350

Table 2. Enzymes or proteins screened in Cook Inlet sockeye salmon. Enzyme nomenclature follows Shaklee et al. (1990), and locus abbreviations are given. Buffer abbreviations are as described in the text.

Enzyme or Protein	Enzyme Number	Locus	Tissue	Buffer
Aspartate aminotransferase	2.6.1.1	*sAAT-1,2**	Heart	ACE 7.2
		*sAAT-3**	Eye	TBCL
		*mAAT-1**	Heart	ACE 7.2
		*mAAT-2**	Liver	ACE 7.0
Adenosine deaminase	3.5.4.4	*ADA-1**	Muscle	KG
Aconitate hydratase	4.2.1.3	*mAH-1,2**	Heart	ACE 7.2
		*mAH-3**	Heart	ACE 7.2
		*mAH-4**	Heart	ACE 7.2
		*sAH**	Liver	ACE 7.0
Alanine aminotransferase	2.6.1.2	*ALAT**	Muscle	KG
Creatine kinase	2.7.3.2	*CK-A1**	Muscle	TBCLE
		*CK-A2**	Muscle	TBCLE
		*CK-B**	Eye	ACE 7.0
		*CK-C1**	Eye	ACE 7.0
		*CK-C2**	Eye	ACE 7.0
Esterase-D	3.1.-.-	*ESTD**	Muscle	TBCLE
Fructose-biphosphate aldolase	4.1.2.13	*FBALD-4**	Eye	ACE 7.0
Formaldehyde dehydrogenase[1] (Hydroxyacylglutathione hydrolase)	1.2.1.1	*FDH ** *(HAGH*)*	Liver	TBE
Fumarate hydratase	4.2.1.2	*FH**	Muscle	ACN 7.0
β-N-Acetylgalactosaminidase	3.2.1.53	*βGALA**	Liver	ACE 7.0
Glyceraldehyde-3-phosphate dehydrogenase	1.2.1.12	*GAPDH-2**	Heart	ACN 7.0
		*GAPDH-3**	Heart	ACN 7.0

Table 2. Continued.

Enzyme or Protein	Enzyme Number	Locus	Tissue	Buffer
		*GAPDH-4**	Eye	ACE 7.0
		*GAPDH-5**	Eye	ACE 7.0
Glycerol-3-phosphate dehydrogenase	1.1.1.8	*G3PDH-1,2**	Muscle	ACN 7.0
		*G3PDH-3**	Heart	ACN 7.0
		*G3PDH-4**	Heart	ACN 7.0
N-Acetyl-β-glucosaminidase	3.2.1.30	*βGLUA* *	Liver	TC4
Glucose-6-phosphate isomerase	5.3.1.9	*GPI-B1,2**	Muscle	TBCLE
		*GPI-A**	Muscle	TBCLE
Glutathione reductase	1.6.4.2	*GR**	Eye	TBCL
Isocitrate dehydrogenase (NADP+)	1.1.1.42	*mIDHP-1**	Heart	ACN 7.0
		*mIDHP-2**	Heart	ACN 7.0
		*sIDHP-1**	Liver	ACE 7.0
		*sIDHP-2**	Liver	ACE 7.0
L-Lactate dehydrogenase	1.1.1.27	*LDH-A1**	Muscle	ACN 7.0
		*LDH-A2**	Muscle	ACN 7.0
		*LDH-B1**	Muscle	TBCLE
		*LDH-B2**	Liver	TBE
		*LDH-C**	Eye	KG
αMannosidase	3.2.1.24	*αMAN**	Liver	TC4
Malate dehydrogenase	1.1.1.37	*sMDH-A1,2**	Heart	ACN 7.0
		*sMDH-B1,2**	Heart	ACN 7.0
		*mMDH-1**	Heart	ACN 7.0
		*mMDH-2**	Muscle	ACN 7.0
		*mMDH-3**	Muscle	ACN 7.0

Table 2. Continued.

Enzyme or Protein	Enzyme Number	Locus	Tissue	Buffer
Malic enzyme (NADP+)	1.1.1.40	*sMEP-1**	Liver	TC4
		*mMEP-1**	Muscle	ACN 7.0
Mannose-6-phosphate isomerase	5.3.1.8	*MPI**	Liver	TBE
Dipeptidase	3.4.-.-	*PEPA**	Muscle	TBCLE
Tripeptide aminopeptidase	3.4.-.-	*PEPB-1**	Heart	TBE
Peptidase-C	3.4.-.-	*PEPC**	Eye	KG
Proline dipeptidase	3.4.13.9	*PEPD-1**	Heart	TBE
Peptidase-LT	3.4.-.-	*PEPLT**	Muscle	TBCLE
Phosphogluconate dehydrogenase	1.1.1.44	*PGDH**	Liver	ACE 7.0
Phosphoglucomutase	5.4.2.2	*PGM-1**	Heart	ACE 7.2
		*PGM-2**	Muscle	TBCLE
Superoxide dismutase	1.15.1.1	*sSOD-1**	Liver	TBE
Triose-phosphate isomerase	5.3.1.1	*TPI-1,2**	Eye	KG
		*TPI-3**	Eye	KG
		*TPI-4**	Eye	KG

[1]*HAGH* (E.C. 3.1.2.6) and *FDH* (Formaldehyde dehydrogenase, E.C. 1.2.1.1) appear to be the same locus.

Table 3. Hierarchical G-statistic log-likelihood analysis for Cook Inlet.

Populations	DF	*sAAT-1,2*	DF	*sAAT-3*	DF	*mAAT-1*	DF	*mAAT-2*	DF	*mAH-1,2*	DF	*mAH-4*	DF	*sAH*	DF	*ALAT*
Among regions	12	31.75	6	9.94	6	479.40	6	403.58	6	202.70	6	11.43	18	899.59	18	821.29
Within regions	132	21.69	66	21.08	66	460.17	66	595.05	66	340.86	66	34.73	198	1980.78	198	1341.77
Kenai River[1]	44	0.00	22	0.00	22	100.54	22	577.87	22	89.04	22	20.03	66	1932.11	66	572.39
Among streams	26	0.00	13	0.00	13	92.56	13	566.80	13	70.42	13	17.59	39	1923.00	39	546.40
Between years	18	0.00	9	0.00	9	7.98	9	11.07	9	18.62	9	2.44	27	9.11	27	25.99
Russian River, above[2]	2	0.00	1	0.00	1	2.53	1	0.96	1	13.79	1	0.00	3	0.60	3	1.82
Ptarmigan Creek	2	0.00	1	0.00	1	0.97	1	0.00	1	0.41	1	0.00	3	1.09	3	0.30
Tern Lake	2	0.00	1	0.00	1	0.55	1	3.27	1	2.35	1	2.44	3	2.20	3	0.35
Quartz Creek	2	0.00	1	0.00	1	0.48	1	2.86	1	1.57	1	0.00	3	0.00	3	5.36
Btwn Ken/Ski, 92/93	2	0.00	1	0.00	1	0.24	1	0.00	1	0.17	1	0.00	3	2.52	3	2.08
Hidden Creek	2	0.00	1	0.00	1	0.41	1	0.25	1	0.02	1	0.00	3	0.00	3	3.05
Skilak Lake, outlet	4	0.00	2	0.00	2	2.44	2	1.84	2	0.20	2	0.00	6	2.21	6	10.71
Moose Creek, Kenai	2	0.00	1	0.00	1	0.36	1	1.89	1	0.11	1	0.00	3	0.49	3	2.32
Yentna River	22	0.00	11	6.18	11	151.45	11	0.00	11	34.80	11	14.70	33	6.82	33	208.02
Among streams	10	0.00	5	4.81	5	143.40	5	0.00	5	23.64	5	9.16	15	6.82	15	200.50
Between years	12	0.00	6	1.37	6	8.05	6	0.00	6	11.16	6	5.54	18	0.00	18	7.52
Chelatna Lake	2	0.00	1	0.00	1	0.01	1	0.00	1	0.00	1	4.15	3	0.00	3	1.68
Yentna River, west fork	2	0.00	1	0.00	1	0.00	1	0.00	1	0.05	1	0.00	3	0.00	3	0.45
Hewitt/Whiskey Lakes	2	0.00	1	1.37	1	2.02	1	0.00	1	5.15	1	0.00	3	0.00	3	0.75
Shell Lake	2	0.00	1	0.00	1	5.52	1	0.00	1	0.21	1	0.00	3	0.00	3	1.03
Trinity/Movie Lakes	2	0.00	1	0.00	1	0.02	1	0.00	1	0.00	1	0.00	3	0.00	3	1.42
Judd Lake	2	0.00	1	0.00	1	0.48	1	0.00	1	5.75	1	1.39	3	0.00	3	2.19
Susitna River	12	21.69	6	0.00	6	83.18	6	0.00	6	35.05	6	0.00	18	13.34	18	103.01
Among streams[3]	8	19.45	4	0.00	4	80.49	4	0.00	4	28.82	4	0.00	12	11.54	12	96.54
Between years	4	2.24	2	0.00	2	2.69	2	0.00	2	6.23	2	0.00	6	1.80	6	6.47
Stephan Lake	2	2.24	1	0.00	1	0.40	1	0.00	1	2.24	1	0.00	3	1.80	3	4.85
Larson Lake	2	0.00	1	0.00	1	2.29	1	0.00	1	3.99	1	0.00	3	0.00	3	1.62

Table 3. Continued.

Populations	DF	*sAAT-1,2*	DF	*sAAT-3*	DF	*mAAT-1*	DF	*mAAT-2*	DF	*mAH-1,2*	DF	*mAH-4*	DF	*sAH*	DF	*ALAT*
Western Cook Inlet	20	0.00	10	10.15	10	46.36	10	10.19	10	129.09	10	0.00	30	9.06	30	358.66
Among streams[4]	14	0.00	7	7.37	7	43.28	7	10.19	7	123.80	7	0.00	21	9.06	21	350.00
Between years	6	0.00	3	2.78	3	3.08	3	0.00	3	5.29	3	0.00	9	0.00	9	8.66
Coal Creek	2	0.00	1	2.78	1	0.39	1	0.00	1	1.92	1	0.00	3	0.00	3	7.26
Chilligan River	2	0.00	1	0.00	1	0.97	1	0.00	1	0.23	1	0.00	3	0.00	3	0.55
Crescent River	2	0.00	1	0.00	1	1.72	1	0.00	1	3.14	1	0.00	3	0.00	3	0.85
Kasilof River	22	0.00	11	4.75	11	14.61	11	4.82	11	15.74	11	0.00	33	8.20	33	18.27
Among streams[5]	12	0.00	6	2.53	6	9.18	6	2.60	6	10.46	6	0.00	18	6.02	18	8.65
Between years	10	0.00	5	2.22	5	5.43	5	2.22	5	5.28	5	0.00	15	2.18	15	9.62
Bear Creek	2	0.00	1	0.00	1	2.32	1	0.00	1	0.00	1	0.00	3	0.00	3	1.75
Moose Creek, Tustumena	2	0.00	1	0.00	1	0.14	1	0.00	1	0.37	1	0.00	3	0.00	3	0.51
Glacier Flat Creek	4	0.00	2	2.22	2	1.26	2	2.22	2	3.90	2	0.00	6	2.18	6	5.53
Nikolai Creek	2	0.00	1	0.00	1	1.71	1	0.00	1	1.01	1	0.00	3	0.00	3	1.83
Northeastern Cook Inlet	4	0.00	2	0.00	2	47.09	2	2.17	2	4.39	2	0.00	6	11.25	6	37.87
Among streams[6]	2	0.00	1	0.00	1	44.10	1	0.79	1	1.62	1	0.00	3	9.85	3	33.85
Between years	2	0.00	1	0.00	1	2.99	1	1.38	1	2.77	1	0.00	3	1.40	3	4.02
Daniels Lake, outlet	2	0.00	1	0.00	1	2.99	1	1.38	1	2.77	1	0.00	3	1.40	3	4.02
Knik Arm	8	0.00	4	0.00	4	16.94	4	0.00	4	32.75	4	0.00	12	0.00	12	43.55
Among streams[7]	4	0.00	2	0.00	2	8.44	2	0.00	2	28.52	2	0.00	6	0.00	6	32.60
Between years	4	0.00	2	0.00	2	8.50	2	0.00	2	4.23	2	0.00	6	0.00	6	10.95
Fish Creek	4	0.00	2	0.00	2	8.50	2	0.00	2	4.23	2	0.00	6	0.00	6	10.95

Table 3. Continued.

Populations	DF	*CK-A2*	DF	*CK-B*	DF	*FDH*	DF	*GAPDH-2*	DF	*G3PDH-1,2*	DF	*G3PDH-4*	DF	*GPI-B1,2*	DF	*GPI-A*
Among regions	6	11.05	6	8.89	6	3.82	12	70.62	18	20.25	6	77.14	12	364.05	12	49.51
Within regions	66	39.25	66	17.22	66	9.17	132	128.17	198	35.45	66	17.80	132	87.23	132	64.59
Kenai River	22	34.51	22	6.69	22	9.17	44	83.53	66	35.45	22	0.00	44	31.73	44	46.86
Among streams	13	30.70	13	4.49	13	7.01	26	71.33	39	29.44	13	0.00	26	27.28	26	45.84
Between years	9	3.81	9	2.20	9	2.16	18	12.20	27	6.01	9	0.00	18	4.45	18	1.02
Russian River, above	1	0.00	1	2.20	1	0.00	2	2.22	3	0.00	1	0.00	2	0.00	2	0.00
Ptarmigan Creek	1	0.00	1	0.00	1	1.34	2	0.00	3	0.00	1	0.00	2	0.00	2	0.00
Tern Lake	1	0.00	1	0.00	1	0.00	2	0.00	3	0.81	1	0.00	2	0.00	2	0.00
Quartz Creek	1	2.99	1	0.00	1	0.00	2	0.00	3	0.00	1	0.00	2	0.21	2	0.00
Btwn Ken/Ski, 92/93	1	0.82	1	0.00	1	0.82	2	4.95	3	2.99	1	0.00	2	0.00	2	0.82
Hidden Creek	1	0.00	1	0.00	1	0.00	2	1.35	3	0.00	1	0.00	2	0.34	2	0.20
Skilak Lake, outlet	2	0.00	2	0.00	2	0.00	4	3.68	6	2.21	2	0.00	4	2.50	4	0.00
Moose Creek, Kenai	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	1	0.00	2	1.40	2	0.00
Yentna River	11	0.00	11	0.00	11	0.00	22	0.00	33	0.00	11	0.00	22	0.00	22	0.00
Among streams	5	0.00	5	0.00	5	0.00	10	0.00	15	0.00	5	0.00	10	0.00	10	0.00
Between years	6	0.00	6	0.00	6	0.00	12	0.00	18	0.00	6	0.00	12	0.00	12	0.00
Chelatna Lake	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	1	0.00	2	0.00	2	0.00
Yentna River, west fork	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	1	0.00	2	0.00	2	0.00
Hewitt/Whiskey Lakes	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	1	0.00	2	0.00	2	0.00
Shell Lake	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	1	0.00	2	0.00	2	0.00
Trinity/Movie Lakes	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	1	0.00	2	0.00	2	0.00
Judd Lake	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	1	0.00	2	0.00	2	0.00
Susitna River	6	0.00	6	0.00	6	0.00	12	35.21	18	0.00	6	0.00	12	6.64	12	0.00
Among streams	4	0.00	4	0.00	4	0.00	8	35.04	12	0.00	4	0.00	8	5.25	8	0.00
Between years	2	0.00	2	0.00	2	0.00	4	0.17	6	0.00	2	0.00	4	1.39	4	0.00
Stephan Lake	1	0.00	1	0.00	1	0.00	2	0.17	3	0.00	1	0.00	2	0.00	2	0.00
Larson Lake	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	1	0.00	2	1.39	2	0.00

Table 3. Continued.

Populations	DF	*CK-A2*	DF	*CK-B*	DF	*FDH*	DF	*GAPDH-2*	DF	*G3PDH-1,2*	DF	*G3PDH-4*	DF	*GPI-B1,2*	DF	*GPI-A*
Western Cook Inlet	10	0.00	10	0.00	10	0.00	20	4.65	30	0.00	10	0.00	20	4.69	20	0.00
Among streams	7	0.00	7	0.00	7	0.00	14	3.27	21	0.00	7	0.00	14	4.69	14	0.00
Between years	3	0.00	3	0.00	3	0.00	6	1.38	9	0.00	3	0.00	6	0.00	6	0.00
Coal Creek	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	1	0.00	2	0.00	2	0.00
Chilligan River	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	1	0.00	2	0.00	2	0.00
Crescent River	1	0.00	1	0.00	1	0.00	2	1.38	3	0.00	1	0.00	2	0.00	2	0.00
Kasilof River	11	4.74	11	10.53	11	0.00	22	4.78	33	0.00	11	11.40	22	40.97	22	0.00
Among streams	6	2.58	6	10.19	6	0.00	12	2.62	18	0.00	6	10.87	12	25.34	12	0.00
Between years	5	2.16	5	0.34	5	0.00	10	2.16	15	0.00	5	0.53	10	15.63	10	0.00
Bear Creek	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	1	0.34	2	0.40	2	0.00
Moose Creek,	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	1	0.00	2	0.00	2	0.00
Glacier Flat Creek	2	2.16	2	0.00	2	0.00	4	2.16	6	0.00	2	0.19	4	11.82	4	0.00
Nikolai Creek	1	0.00	1	0.34	1	0.00	2	0.00	3	0.00	1	0.00	2	3.41	2	0.00
Northeastern Cook Inlet	2	0.00	2	0.00	2	0.00	4	0.00	6	0.00	2	0.00	4	0.00	4	17.73
Among streams	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	1	0.00	2	0.00	2	6.48
Between years	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	1	0.00	2	0.00	2	11.25
Daniels Lake, outlet	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	1	0.00	2	0.00	2	11.25
Knik Arm	4	0.00	4	0.00	4	0.00	8	0.00	12	0.00	4	6.40	8	3.20	8	0.00
Among streams	2	0.00	2	0.00	2	0.00	4	0.00	6	0.00	2	2.06	4	1.01	4	0.00
Between years	2	0.00	2	0.00	2	0.00	4	0.00	6	0.00	2	4.34	4	2.19	4	0.00
Fish Creek	2	0.00	2	0.00	2	0.00	4	0.00	6	0.00	2	4.34	4	2.19	4	0.00

Table 3. Continued.

Populations	DF	*mIDHP-1*	DF	*sIDHP-1*	DF	*sIDHP-2*	DF	*LDH-A2*	DF	*LDH-B2*	DF	*sMDH-A1,2*	DF	*sMDH-B1,2*	DF	*mMEP-1*
Among regions	12	62.71	24	230.38	12	324.94	6	11.04	12	361.98	12	116.65	18	177.80	12	64.85
Within regions	132	40.11	264	203.81	132	601.83	66	34.47	132	669.83	132	125.80	198	192.70	132	68.59
Kenai River	44	3.91	88	70.05	44	601.83	22	5.36	44	345.91	44	91.03	66	22.60	44	3.87
Among streams	26	2.80	52	51.19	26	575.90	13	4.53	26	327.00	26	82.74	39	15.44	26	2.91
Between years	18	1.11	36	18.86	18	25.93	9	0.83	18	18.91	18	8.29	27	7.16	18	0.96
Russian River, above	2	0.00	4	0.00	2	0.00	1	0.00	2	11.99	2	0.00	3	0.23	2	0.00
Ptarmigan Creek	2	0.00	4	1.09	2	0.00	1	0.00	2	0.15	2	0.72	3	0.00	2	0.00
Tern Lake	2	0.00	4	0.00	2	0.00	1	0.00	2	0.30	2	0.00	3	0.00	2	0.00
Quartz Creek	2	0.00	4	2.77	2	20.51	1	0.00	2	3.05	2	1.03	3	0.00	2	0.00
Btwn Ken/Ski, 92/93	2	0.00	4	3.81	2	0.00	1	0.83	2	0.60	2	2.88	3	0.00	2	0.00
Hidden Creek	2	0.00	4	0.00	2	0.96	1	0.00	2	0.85	2	0.00	3	0.00	2	0.00
Skilak Lake, outlet	4	1.11	8	8.42	4	0.00	2	0.00	4	1.85	4	3.66	6	6.93	4	0.96
Moose Creek, Kenai	2	0.00	4	2.77	2	4.46	1	0.00	2	0.12	2	0.00	3	0.00	2	0.00
Yentna River	22	0.00	44	0.00	22	0.00	11	0.00	22	99.25	22	0.00	33	0.00	22	0.00
Among streams	10	0.00	20	0.00	10	0.00	5	0.00	10	88.95	10	0.00	15	0.00	10	0.00
Between years	12	0.00	24	0.00	12	0.00	6	0.00	12	10.30	12	0.00	18	0.00	12	0.00
Chelatna Lake	2	0.00	4	0.00	2	0.00	1	0.00	2	0.38	2	0.00	3	0.00	2	0.00
Yentna River, west fork	2	0.00	4	0.00	2	0.00	1	0.00	2	0.68	2	0.00	3	0.00	2	0.00
Hewitt/Whiskey Lakes	2	0.00	4	0.00	2	0.00	1	0.00	2	2.83	2	0.00	3	0.00	2	0.00
Shell Lake	2	0.00	4	0.00	2	0.00	1	0.00	2	0.00	2	0.00	3	0.00	2	0.00
Trinity/Movie Lakes	2	0.00	4	0.00	2	0.00	1	0.00	2	4.93	2	0.00	3	0.00	2	0.00
Judd Lake	2	0.00	4	0.00	2	0.00	1	0.00	2	1.48	2	0.00	3	0.00	2	0.00
Susitna River	12	0.00	24	91.46	12	0.00	6	0.00	12	24.80	12	0.00	18	0.00	12	0.00
Among streams	8	0.00	16	91.44	8	0.00	4	0.00	8	20.24	8	0.00	12	0.00	8	0.00
Between years	4	0.00	8	0.02	4	0.00	2	0.00	4	4.56	4	0.00	6	0.00	4	0.00
Stephan Lake	2	0.00	4	0.02	2	0.00	1	0.00	2	4.37	2	0.00	3	0.00	2	0.00
Larson Lake	2	0.00	4	0.00	2	0.00	1	0.00	2	0.19	2	0.00	3	0.00	2	0.00

Table 3. Continued.

Populations	DF	*mIDHP-1*	DF	*sIDHP-1*	DF	*sIDHP-2*	DF	*LDH-A2*	DF	*LDH-B2*	DF	*sMDH-A1,2*	DF	*sMDH-B1,2*	DF	*mMEP-1*
Western Cook Inlet	20	10.23	40	20.08	20	0.00	10	24.33	20	102.13	20	0.00	30	163.29	20	59.94
Among streams	14	7.47	28	20.08	14	0.00	7	15.44	14	93.97	14	0.00	21	162.30	14	59.94
Between years	6	2.76	12	0.00	6	0.00	3	8.89	6	8.16	6	0.00	9	0.99	6	0.00
Coal Creek	2	2.76	4	0.00	2	0.00	1	0.00	2	3.00	2	0.00	3	0.99	2	0.00
Chilligan River	2	0.00	4	0.00	2	0.00	1	8.89	2	2.46	2	0.00	3	0.00	2	0.00
Crescent River	2	0.00	4	0.00	2	0.00	1	0.00	2	2.70	2	0.00	3	0.00	2	0.00
Kasilof River	22	25.97	44	9.17	22	0.00	11	4.78	22	11.91	22	12.15	33	6.81	22	4.78
Among streams	12	14.32	24	7.79	12	0.00	6	3.40	12	9.56	12	6.17	18	5.19	12	3.40
Between years	10	11.65	20	1.38	10	0.00	5	1.38	10	2.35	10	5.98	15	1.62	10	1.38
Bear Creek	2	0.00	4	0.00	2	0.00	1	0.00	2	0.35	2	1.38	3	0.00	2	1.38
Moose Creek, Tustumena	2	2.78	4	0.00	2	0.00	1	0.00	2	0.35	2	0.00	3	0.00	2	0.00
Glacier Flat Creek	4	7.48	8	0.00	4	0.00	2	0.00	4	0.47	4	4.40	6	1.62	4	0.00
Nikolai Creek	2	1.39	4	1.38	2	0.00	1	1.38	2	1.18	2	0.20	3	0.00	2	0.00
Northeastern Cook Inlet	4	0.00	8	0.00	4	0.00	2	0.00	4	0.00	4	0.00	6	0.00	4	0.00
Among streams	2	0.00	4	0.00	2	0.00	1	0.00	2	0.00	2	0.00	3	0.00	2	0.00
Between years	2	0.00	4	0.00	2	0.00	1	0.00	2	0.00	2	0.00	3	0.00	2	0.00
Daniels Lake, outlet	2	0.00	4	0.00	2	0.00	1	0.00	2	0.00	2	0.00	3	0.00	2	0.00
Knik Arm	8	0.00	16	13.05	8	0.00	4	0.00	8	85.83	8	22.62	12	0.00	8	0.00
Among streams	4	0.00	8	12.47	4	0.00	2	0.00	4	74.76	4	7.16	6	0.00	4	0.00
Between years	4	0.00	8	0.58	4	0.00	2	0.00	4	11.07	4	15.46	6	0.00	4	0.00
Fish Creek	4	0.00	8	0.58	4	0.00	2	0.00	4	11.07	4	15.46	6	0.00	4	0.00

Table 3. Continued.

Populations	DF	*MPI*	DF	*PEPA*	DF	*PEPB-1*	DF	*PEPC*	DF	*PEPD-1*	DF	*PEPLT*	DF	*PGDH*	DF	*PGM-1*
Among regions	6	28.77	12	91.54	12	178.91	6	454.20	12	55.89	12	1043.90	6	7.88	12	499.13
Within regions	66	30.74	132	98.14	132	312.48	66	672.88	132	85.49	132	365.46	66	6.95	132	1494.29
Kenai River	22	30.74	44	82.51	44	96.30	22	36.78	44	60.23	44	220.61	22	0.00	44	641.20
Among streams	13	23.14	26	72.12	26	93.42	13	17.21	26	54.78	26	196.50	13	0.00	26	613.30
Between years	9	7.60	18	10.39	18	2.88	9	19.57	18	5.45	18	24.11	9	0.00	18	27.90
Russian River, above	1	0.00	2	0.00	2	0.00	1	0.00	2	0.00	2	0.00	1	0.00	2	0.23
Ptarmigan Creek	1	1.40	2	2.82	2	0.64	1	1.36	2	0.00	2	8.27	1	0.00	2	2.48
Tern Lake	1	0.00	2	0.81	2	0.92	1	2.19	2	0.00	2	5.80	1	0.00	2	1.92
Quartz Creek	1	2.76	2	2.99	2	0.00	1	1.38	2	0.00	2	3.13	1	0.00	2	8.24
Btwn Ken/Ski, 92/93	1	0.00	2	0.90	2	0.00	1	2.16	2	0.82	2	2.91	1	0.00	2	1.96
Hidden Creek	1	0.00	2	0.00	2	0.00	1	0.00	2	0.00	2	0.71	1	0.00	2	0.94
Skilak Lake, outlet	2	3.44	4	2.87	4	0.00	2	8.24	4	4.63	4	1.95	2	0.00	4	10.07
Moose Creek, Kenai	1	0.00	2	0.00	2	1.32	1	4.24	2	0.00	2	1.34	1	0.00	2	2.06
Yentna River	11	0.00	22	0.00	22	216.18	11	398.64	22	9.60	22	35.85	11	0.00	22	233.80
Among streams	5	0.00	10	0.00	10	215.70	5	385.50	10	6.82	10	33.38	5	0.00	10	228.90
Between years	6	0.00	12	0.00	12	0.48	6	13.14	12	2.78	12	2.47	6	0.00	12	4.90
Chelatna Lake	1	0.00	2	0.00	2	0.00	1	0.00	2	0.00	2	0.00	1	0.00	2	0.66
Yentna River, west fork	1	0.00	2	0.00	2	0.00	1	2.76	2	2.78	2	2.47	1	0.00	2	0.01
Hewitt/Whiskey Lakes	1	0.00	2	0.00	2	0.00	1	0.48	2	0.00	2	0.00	1	0.00	2	0.90
Shell Lake	1	0.00	2	0.00	2	0.00	1	0.00	2	0.00	2	0.00	1	0.00	2	2.85
Trinity/Movie Lakes	1	0.00	2	0.00	2	0.48	1	9.90	2	0.00	2	0.00	1	0.00	2	0.06
Judd Lake	1	0.00	2	0.00	2	0.00	1	0.00	2	0.00	2	0.00	1	0.00	2	0.42
Susitna River	6	0.00	12	0.00	12	0.00	6	99.28	12	0.00	12	12.37	6	0.00	12	216.11
Among streams	4	0.00	8	0.00	8	0.00	4	97.85	8	0.00	8	12.37	4	0.00	8	210.50
Between years	2	0.00	4	0.00	4	0.00	2	1.43	4	0.00	4	0.00	2	0.00	4	5.61
Stephan Lake	1	0.00	2	0.00	2	0.00	1	0.05	2	0.00	2	0.00	1	0.00	2	0.00
Larson Lake	1	0.00	2	0.00	2	0.00	1	1.38	2	0.00	2	0.00	1	0.00	2	5.61

Table 3. Continued.

Populations	DF	*MPI*	DF	*PEPA*	DF	*PEPB-1*	DF	*PEPC*	DF	*PEPD-1*	DF	*PEPLT*	DF	*PGDH*	DF	*PGM-1*
Western Cook Inlet	10	0.00	20	4.67	20	0.00	10	77.30	20	4.66	20	4.62	10	6.95	20	348.04
Among streams	7	0.00	14	4.67	14	0.00	7	70.41	14	3.29	14	3.24	7	6.95	14	340.60
Between years	3	0.00	6	0.00	6	0.00	3	6.89	6	1.37	6	1.38	3	0.00	6	7.44
Coal Creek	1	0.00	2	0.00	2	0.00	1	0.00	2	1.37	2	1.38	1	0.00	2	3.49
Chilligan River	1	0.00	2	0.00	2	0.00	1	6.61	2	0.00	2	0.00	1	0.00	2	3.69
Crescent River	1	0.00	2	0.00	2	0.00	1	0.28	2	0.00	2	0.00	1	0.00	2	0.26
Kasilof River	11	0.00	22	10.96	22	0.00	11	41.75	22	7.80	22	0.00	11	0.00	22	11.60
Among streams	6	0.00	12	9.58	12	0.00	6	32.01	12	5.60	12	0.00	6	0.00	12	4.28
Between years	5	0.00	10	1.38	10	0.00	5	9.74	10	2.20	10	0.00	5	0.00	10	7.32
Bear Creek	1	0.00	2	0.00	2	0.00	1	2.78	2	0.00	2	0.00	1	0.00	2	0.27
Moose Creek, Tustumena	1	0.00	2	0.00	2	0.00	1	0.00	2	0.00	2	0.00	1	0.00	2	1.12
Glacier Flat Creek	2	0.00	4	0.00	4	0.00	2	4.93	4	2.20	4	0.00	2	0.00	4	5.34
Nikolai Creek	1	0.00	2	1.38	2	0.00	1	2.03	2	0.00	2	0.00	1	0.00	2	0.59
Northeastern Cook Inlet	2	0.00	4	0.00	4	0.00	2	0.00	4	0.00	4	2.34	2	0.00	4	0.99
Among streams	1	0.00	2	0.00	2	0.00	1	0.00	2	0.00	2	2.29	1	0.00	2	0.13
Between years	1	0.00	2	0.00	2	0.00	1	0.00	2	0.00	2	0.05	1	0.00	2	0.86
Daniels Lake, outlet	1	0.00	2	0.00	2	0.00	1	0.00	2	0.00	2	0.05	1	0.00	2	0.86
Knik Arm	4	0.00	8	0.00	8	0.00	4	19.13	8	3.20	8	89.67	4	0.00	8	42.55
Among streams	2	0.00	4	0.00	4	0.00	2	13.02	4	1.02	4	89.21	2	0.00	4	40.58
Between years	2	0.00	4	0.00	4	0.00	2	6.11	4	2.18	4	0.46	2	0.00	4	1.97
Fish Creek	2	0.00	4	0.00	4	0.00	2	6.11	4	2.18	4	0.46	2	0.00	4	1.97

Table 3. Continued.

Populations	DF	*PGM-2*	DF	*sSOD-1*	DF	*TPI-1,2*	DF	*TPI-3*	DF	*TPI-4*	DF	Overall
Among regions	12	935.35	6	3.93	12	31.28	6	56.96	12	11.57	390	8214.80
Within regions	132	1219.68	66	4.65	132	29.13	66	77.25	132	26.06	4290	11556.26
Kenai River	44	264.65	22	0.00	44	0.00	22	10.75	44	21.26	1430	6149.85
Among streams	26	246.30	13	0.00	26	0.00	13	8.24	26	16.88	845	5837.00
Between years	18	18.35	9	0.00	18	0.00	9	2.51	18	4.38	585	312.85
Russian River, above	2	2.40	1	0.00	2	0.00	1	0.00	2	0.00	65	39.02
Ptarmigan Creek	2	1.19	1	0.00	2	0.00	1	0.00	2	0.00	65	24.32
Tern Lake	2	0.91	1	0.00	2	0.00	1	0.00	2	1.60	65	26.47
Quartz Creek	2	0.67	1	0.00	2	0.00	1	1.38	2	0.00	65	61.46
Btwn Ken/Ski, 92/93	2	0.02	1	0.00	2	0.00	1	0.00	2	0.00	65	32.41
Hidden Creek	2	4.18	1	0.00	2	0.00	1	0.00	2	0.00	65	13.31
Skilak Lake, outlet	4	7.11	2	0.00	4	0.00	2	1.13	4	0.00	130	88.26
Moose Creek, Kenai	2	1.87	1	0.00	2	0.00	1	0.00	2	2.78	65	27.60
Yentna River	22	714.02	11	0.00	22	0.00	11	0.00	22	0.00	715	2129.20
Among streams	10	705.70	5	0.00	10	0.00	5	0.00	10	0.00	325	2053.00
Between years	12	8.32	6	0.00	12	0.00	6	0.00	12	0.00	390	76.20
Chelatna Lake	2	2.22	1	0.00	2	0.00	1	0.00	2	0.00	65	9.13
Yentna River, west fork	2	0.05	1	0.00	2	0.00	1	0.00	2	0.00	65	9.27
Hewitt/Whiskey Lakes	2	0.02	1	0.00	2	0.00	1	0.00	2	0.00	65	13.56
Shell Lake	2	0.85	1	0.00	2	0.00	1	0.00	2	0.00	65	10.48
Trinity/Movie Lakes	2	0.11	1	0.00	2	0.00	1	0.00	2	0.00	65	16.95
Judd Lake	2	5.07	1	0.00	2	0.00	1	0.00	2	0.00	65	16.81
Susitna River	12	24.56	6	0.00	12	0.00	6	0.00	12	0.00	390	766.80
Among streams	8	24.34	4	0.00	8	0.00	4	0.00	8	0.00	260	733.90
Between years	4	0.22	2	0.00	4	0.00	2	0.00	4	0.00	130	32.90
Stephan Lake	2	0.18	1	0.00	2	0.00	1	0.00	2	0.00	65	16.36
Larson Lake	2	0.04	1	0.00	2	0.00	1	0.00	2	0.00	65	16.54

Table 3. Continued.

Populations	DF	*PGM-2*	DF	*sSOD-1*	DF	*TPI-1,2*	DF	*TPI-3*	DF	*TPI-4*	DF	Overall
Western Cook Inlet	20	156.95	10	4.65	20	24.36	10	58.24	20	4.80	650	1648.27
Among streams	14	151.80	7	4.65	14	23.02	7	58.13	14	3.34	455	1581.00
Between years	6	5.15	3	0.00	6	1.34	3	0.11	6	1.46	195	67.27
Coal Creek	2	2.48	1	0.00	2	1.34	1	0.00	2	1.46	65	30.68
Chilligan River	2	0.40	1	0.00	2	0.00	1	0.00	2	0.00	65	23.82
Crescent River	2	2.27	1	0.00	2	0.00	1	0.11	2	0.00	65	12.77
Kasilof River	22	10.60	11	0.00	22	4.77	11	8.26	22	0.00	715	310.36
Among streams	12	2.69	6	0.00	12	3.39	6	8.26	12	0.00	390	206.70
Between years	10	7.91	5	0.00	10	1.38	5	0.00	10	0.00	325	103.66
Bear Creek	2	1.36	1	0.00	2	1.38	1	0.00	2	0.00	65	13.76
Moose Creek, Tustumena	2	0.18	1	0.00	2	0.00	1	0.00	2	0.00	65	5.47
Glacier Flat Creek	4	6.08	2	0.00	4	0.00	2	0.00	4	0.00	130	66.23
Nikolai Creek	2	0.29	1	0.00	2	0.00	1	0.00	2	0.00	65	18.20
Northeastern Cook Inlet	4	4.65	2	0.00	4	0.00	2	0.00	4	0.00	130	128.54
Among streams	2	1.78	1	0.00	2	0.00	1	0.00	2	0.00	65	100.90
Between years	2	2.87	1	0.00	2	0.00	1	0.00	2	0.00	65	27.64
Daniels Lake, outlet	2	2.87	1	0.00	2	0.00	1	0.00	2	0.00	65	27.64
Knik Arm	8	44.25	4	0.00	8	0.00	4	0.00	8	0.00	260	423.24
Among streams	4	34.19	2	0.00	4	0.00	2	0.00	4	0.00	130	345.10
Between years	4	10.06	2	0.00	4	0.00	2	0.00	4	0.00	130	78.14
Fish Creek	4	10.06	2	0.00	4	0.00	2	0.00	4	0.00	130	78.14

[1] Includes Russian River, below; between Kenai and Skilak Lakes, sites 1-3 early & late; between Kenai and Skilak Lakes, sites 4 & 5.
[2] Includes Russian River, above 1992 and 1993, early and late.
[3] Includes Byers Lake, Birch Creek, and Red Shirt Lake.
[4] Includes McArthur River; Wolverine Lake; Crescent Lake, sites 1 & 2; and Packers Lake.
[5] Includes Tustumena Lake, sites 1 & 2; and Seepage Creek.
[6] Includes Bishop Creek.
[7] Includes Nancy Lake and Cottonwood Creek.

Table 4. Gene diversity analysis of Cook Inlet sockeye salmon.

Locus	Absolute gene diversity		Relative gene diversity			
	Total	Within collections	Within collections	Among collections within sites	Among sites within regions	Among regions
*sAAT-3**	0.0008	0.0007	0.9920	0.0039	0.0034	0.0007
*mAAT-1**	0.1697	0.1574	0.9273	0.0025	0.0414	0.0288
*mAAT-2**	0.0299	0.0250	0.8359	0.0012	0.1389	0.0240
*mAH-4**	0.0009	0.0009	0.9869	0.0068	0.0056	0.0007
*sAH**	0.0670	0.0303	0.4527	0.0006	0.4950	0.0517
*ALAT**	0.5243	0.4842	0.9236	0.0027	0.0500	0.0236
*CK-A2**	0.0010	0.0010	0.9828	0.0059	0.0107	0.0006
*CK-B**	0.0005	0.0005	0.9927	0.0013	0.0053	0.0007
*FDH**	0.0003	0.0002	0.9951	0.0029	0.0018	0.0002
*GAPDH-2**	0.0071	0.0070	0.9739	0.0028	0.0180	0.0053
*G3PDH-4**	0.0030	0.0030	0.9881	0.0012	0.0036	0.0071
*GPI-A**	0.0021	0.0021	0.9753	0.0097	0.0090	0.0060
*mIDHP-1**	0.0022	0.0022	0.9851	0.0053	0.0055	0.0040
*sIDHP-1**	0.0129	0.0121	0.9377	0.0011	0.0459	0.0154
*LDH-A2**	0.0013	0.0012	0.9677	0.0165	0.0134	0.0023
*LDH-B2**	0.1718	0.1588	0.9243	0.0037	0.0505	0.0215
*mMEP-1**	0.0014	0.0013	0.9591	0.0003	0.0375	0.0031
*MPI**	0.0024	0.0023	0.9840	0.0085	0.0056	0.0020
*PEPA**	0.0072	0.0072	0.9865	0.0024	0.0070	0.0041
*PEPB-1**	0.0117	0.0105	0.8934	0.0014	0.0926	0.0126
*PEPC**	0.0595	0.0521	0.8746	0.0025	0.0891	0.0338
*PEPD-1**	0.0064	0.0063	0.9847	0.0025	0.0094	0.0034
*PEPLT**	0.0501	0.0429	0.8558	0.0018	0.0252	0.1172
*PGDH**	0.0001	0.0001	0.9946	0.0000	0.0050	0.0004
*PGM-2**	0.4048	0.3488	0.8615	0.0034	0.0724	0.0628
*sSOD-1**	0.0001	0.0001	0.9951	0.0000	0.0045	0.0004
*TPI-3**	0.0044	0.0042	0.9487	0.0007	0.0418	0.0087
*TPI-4**	0.0006	0.0006	0.9912	0.0045	0.0039	0.0004
Overall	0.0551	0.0487	0.8830	0.0028	0.0760	0.0382

Table 5. Results of simulated mixtures of Cook Inlet sockeye salmon with 100 bootstrap resamplings and a simulated sample size of 400. Standard deviations are given in parentheses.

Region	Regional Allocation							
	Kenai	Kasilof	Yentna	Susitna	West Cook Inlet	NE Cook Inlet	Knik Arm	Unknown
Kenai	**0.925 (0.047)**	0.008 (0.014)	0.016 (0.020)	0.017 (0.023)	0.023 (0.031)	0.002 (0.004)	0.008 (0.013)	0.001
Kasilof	0.022 (0.022)	**0.914 (0.047)**	0.017 (0.025)	0.014 (0.021)	0.027 (0.030)	0.000 (0.000)	0.006 (0.011)	0.000
Yentna	0.010 (0.014)	0.001 (0.005)	**0.892 (0.061)**	0.050 (0.052)	0.029 (0.031)	0.002 (0.005)	0.015 (0.021)	0.001
Susitna	0.005 (0.010)	0.006 (0.012)	0.061 (0.052)	**0.804 (0.094)**	0.102 (0.076)	0.002 (0.004)	0.019 (0.033)	0.000
Yentna/Susitna	0.010 (0.015)	0.007 (0.015)	**0.879 (0.063)**		0.072 (0.054)	0.002 (0.004)	0.029 (0.040)	0.001
West Cook Inlet	0.032 (0.030)	0.013 (0.026)	0.027 (0.031)	0.067 (0.069)	**0.834 (0.089)**	0.000 (0.000)	0.027 (0.046)	0.000
Northeastern Cook Inlet	0.003 (0.005)	0.000 (0.002)	0.000 (0.002)	0.003 (0.005)	0.002 (0.004)	**0.990 (0.008)**	0.001 (0.003)	0.000
Knik Arm	0.010 (0.020)	0.003 (0.007)	0.020 (0.023)	0.035 (0.035)	0.034 (0.033)	0.003 (0.006)	**0.895 (0.052)**	0.000

Table 6. Results of Cook Inlet Central District drift fishery mixed-stock analysis, 1992-1994.

Date	N	Kenai		Kasilof		Susitna/Yentna		Western Cook Inlet		NE Cook Inlet		Knik Arm		Unknown	Total
		Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD		
1992															
July 13, 1992	150	0.8819	0.0772	0.0000	0.0000	0.0964	0.0654	0.0217	0.0459	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
July 20, 1992	200	0.5601	0.0931	0.1057	0.0663	0.2117	0.0796	0.0684	0.0428	0.0124	0.0177	0.0416	0.0626	0.0000	0.9999
1993															
July 12, 1993	337	0.5270	0.0683	0.0278	0.0284	0.1543	0.0604	0.1402	0.0507	0.0000	0.0000	0.1333	0.0403	0.0178	1.0004
July 16, 1993	278	0.8323	0.0736	0.0000	0.0000	0.0965	0.0675	0.0238	0.0201	0.0000	0.0000	0.0367	0.0275	0.0108	1.0001
1994															
July 15, 1994	344	0.5284	0.0636	0.0342	0.0616	0.2018	0.0647	0.1073	0.0922	0.0142	0.0150	0.1141	0.0360	0.0000	1.0000

Table 7. Results of inriver mixed-stock analyses for Cook Inlet, 1992-1994.

Drainage and Date		Kenai		Kasilof		Susitna/ Yentna		W.Cook Inlet		NE Cook Inlet		Knik Arm		Unknown
	N	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	Estimate	SD	
Kenai														
July 13, 1992	199	0.8307	0.0608	0.0000	0.0000	0.0205	0.0361	0.1350	0.0520	0.0000	0.0000	0.0087	0.0120	0.0050
July 10, 1994	87	0.6483	0.1900	0.0440	0.1286	0.1556	0.1818	0.1518	0.1371	0.0000	0.0000	0.0003	0.0070	0.0000
July 22, 1994	197	0.9191	0.0632	0.0000	0.0000	0.0637	0.0642	0.0000	0.0000	0.0000	0.0000	0.0121	0.0273	0.0051
July 31, 1994	155	0.8345	0.0755	0.0000	0.0000	0.1571	0.0744	0.0000	0.0000	0.0076	0.0127	0.0009	0.0197	0.0000
August 9, 1994	192	0.9312	0.0674	0.0025	0.0263	0.0285	0.0581	0.0325	0.0398	0.0000	0.0000	0.0053	0.0158	0.0000
Susitna/Mainstem														
July [illegible], 1992	199	0.1283	0.0729	0.0000	0.0000	0.7514	0.1168	0.1149	0.1040	0.0000	0.0000	0.0003	0.0049	0.0050
August 4, 1992	113	0.0361	0.0607	0.0000	0.0000	0.9220	0.0678	0.0102	0.0195	0.0000	0.0000	0.0052	0.0308	0.0265
Susitna/Yentna														
July 15, 1992	196	0.0767	0.0427	0.0013	0.0168	0.7985	0.0643	0.0000	0.0000	0.0343	0.0244	0.0739	0.0397	0.0153
July 24, 1992	200	0.0000	0.0000	0.0001	0.0002	0.9641	0.0304	0.0000	0.0000	0.0205	0.0203	0.0103	0.0216	0.0050
July 25-26, 1994	199	0.0000	0.0000	0.0000	0.0000	0.9823	0.0274	0.0001	0.0003	0.0000	0.0000	0.0175	0.0274	0.0000
Kasilof														
July 2, 1992	196	0.0066	0.0089	0.9167	0.0720	0.0320	0.0424	0.0447	0.0626	0.0000	0.0000	0.0000	0.0000	0.0000
July 22, 1992	199	0.0000	0.0000	0.8437	0.0622	0.0188	0.0222	0.1362	0.0624	0.0000	0.0000	0.0013	0.0191	0.0000
July 8-10, 1994	197	0.1032	0.0652	0.5462	0.1355	0.1144	0.0574	0.2272	0.1468	0.0000	0.0000	0.0091	0.0282	0.0000
July 17, 1994	180	0.0165	0.0709	0.8291	0.0803	0.1054	0.0711	0.0490	0.0447	0.0000	0.0000	0.0000	0.0000	0.0000
August 1-3, 1994	96	0.0462	0.0583	0.8017	0.1061	0.0702	0.0732	0.0005	0.0007	0.0000	0.0000	0.0814	0.0555	0.0000

Table 8. Russian River contribution to mixture samples collected at the Kenai River fish wheel site. The Russian River results include contributions from both the early- and late-run populations.

Sampling Date	N	Russian River (Early and Late Combined)	
		Estimate	SD
July 13, 1992	199	0.020	0.011
July 10, 1994	87	0.105	0.042
July 22, 1994	197	0.040	0.017
July 31, 1994	155	0.182	0.034
August 9, 1994	192	0.301	0.036

Table 9. Sample sizes, composite mtDNA haplotype counts, and nucleotide diversity for sockeye salmon populations sampled from Cook Inlet. Map #'s refer to locations on Figure 1.

Map #	Population	N	ND5/ND6 I	II	III	IV	V	VI	VII	VIII	IX	X	Nucleotide Diversity[b]
1	Russian River, above falls-early 1992	40	38	-	-	-	2	-	-	-	-	-	0.00043
1	Russian River, above falls-late 1992	50	49	-	-	-	1	-	-	-	-	-	0.00018
1	Russian River, below falls 1993	40	16	8	-	10	6	-	-	-	-	-	0.00531
2	Ptarmigan Creek, 1992	40	11	12	-	-	12	-	-	-	-	5	0.00491
5	Between Kenai & Skilak, 1992	40	22	11	-	1	4	2	-	-	-	-	0.00377
6	Hidden Creek, 1992	40	13	2	-	-	25	-	-	-	-	-	0.00257
7	Skilak Lake, outlet 1992	50	26	13	-	-	7	4	-	-	-	-	0.00394
8	Moose Creek, (Kenai) 1993	40	16	5	-	-	19	-	-	-	-	-	0.00326
	Kenai River Totals	**340**	**191**	**51**	**0**	**11**	**76**	**6**	**0**	**0**	**0**	**5**	**0.00305**
27	Bear Creek, (Tustumena) 1992	40	13	3	-	-	17	5	2	-	-	-	0.00463
28	Moose Creek, (Tustumena) 1992	50	14	7	-	-	23	4	2	-	-	-	0.00456
	Kasilof River Totals	**90**	**27**	**10**	**0**	**0**	**40**	**9**	**4**	**0**	**0**	**0**	**0.00459**
34	Daniels Lake, outlet 1992	40	-	40	-	-	-	-	-	-	-	-	0.00000
	Northeastern Cook Inlet Totals	**40**	**0**	**40**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.00000**
10	Yentna River, west fork 1992	50	17	30	-	-	2	-	-	1	-	-	0.00267
13	Shell Lake, 1992	40	29	11	-	-	-	-	-	-	-	-	0.00183
15	Judd Lake, 1992	40	7	31	2	-	-	-	-	-	-	-	0.00205
	Yentna River Totals	**130**	**53**	**72**	**2**	**0**	**2**	**0**	**0**	**1**	**0**	**0**	**0.00218**

Map #	Population	N	*ND5/ND6* I	II	III	IV	V	VI	VII	VIII	IX	X	Nucleotide Diversity[b]
17	Stephan Lake, 1992	40	-	24	-	-	16	-	-	-	-	-	0.00431
18	Larson Lake, 1992	40	18	22	-	-	-	-	-	-	-	-	0.00228
	Susitna River Totals	**80**	**18**	**46**	**0**	**0**	**16**	**0**	**0**	**0**	**0**	**0**	**0.00329**
37	Fish Creek, 1992	40	3	26	-	-	1	1	-	-	9	-	0.00491
37	Fish Creek, 1993	40	4	20	-	-	6	1	-	-	9	-	0.00664
	Knik Arm Totals	**80**	**7**	**46**	**0**	**0**	**7**	**2**	**0**	**0**	**18**	**0**	**0.00578**
23	McArthur River, 1993	40	9	29	-	-	-	2	-	-	-	-	0.00267
25	Crescent River, 1992	40	2	37	-	-	-	1	-	-	-	-	0.00107
25	Crescent Lake, site 2 1994	40	7	31	-	-	1	1	-	-	-	-	0.00224
26	Packers Lake, 1992	40	38	2	-	-	-	-	-	-	-	-	0.00044
	Western Cook Inlet Totals	**160**	**56**	**99**	**0**	**0**	**1**	**4**	**0**	**0**	**0**	**0**	**0.00161**
	TOTALS	**920**	**352**	**364**	**2**	**11**	**142**	**21**	**4**	**1**	**18**	**5**	**0.00294**

[a] Composite haplotypes were generated from polymorphic restriction enzymes and include *Apa I, Hha I, Hinf I, Kpn I, Stu I, and TaqI,* respectively. Haplotypes are: I=AAAAAA, II=BAAAAA, III=ABAAAA, IV=AACAAB, V=AAAAAB, VI=AAABAB, VII=BAAAAB, VIII=BABAAA, IX=BADAAA, and X=AAAACA.

[b] Nucleotide divergence numbers in bold are averages.

Table 10. Restriction enzymes and fragment sizes detected among Cook Inlet sockeye salmon.

Enzyme	r[1]	Sequence	Haplotype	Fragment sizes (bp)[2]
Apa I	6	GGGCCC	A	1500, 900
			B	900, 800, 700
Ase I	6	ATTAAT	A	1400, 800
Ava II	6	GGWCC	A	1700, 700
BstE II	6	GGTNACC	A	1100, 875, 425
BstU I	4	CGCG	A	1600, 800
EcoR I	6	GAATTC	A	2100, 300
EcoR V	6	GATATC	A	1400, 1000
Hha I	4	GCGC	A	1100, 750, 550
			B	1650, 750
Hinf I	4	GANTC	A	750, 675, 500
			B	800, 750, 500
			C	675, 500
			D	1425, 500
Kpn I	6	GGTACC	A	2400
			B	1200
Sau96 I	4	GGNCC	A	700, 520, 480, 350
Stu I	6	AGGCCT	A	1500, 900
			B	900, 800, 700
			C	2400
Taq I	4	TCGA	A	1000, 575, 250
			B	575, 500, 250

[1]r= the length of the restriction enzyme recognition sequence.
[2]Fragment sizes are approximate.

Table 11. Pairwise nucleotide divergence estimates between populations of sockeye salmon from Cook Inlet[1].

Population	1	2	3	4	5	6	7	8	9	10
1. Russian River, above/early 92	0.000000									
2. Russian River, above/late 92	-0.000003	0.000000								
3. Russian River, below 93	0.000956	0.001060	0.000000							
4. Ptarmigan Creek, 92	0.000691	0.000767	0.000299	0.000000						
5. Btw. Kenai & Skilak Lakes, 92	0.000377	0.000420	0.000364	0.000053	0.000000					
6. Hidden Creek, 92	0.001452	0.001613	0.000490	0.000708	0.001044	0.000000				
7. Skilak Lake, outlet 92	0.000422	0.000476	0.000349	0.000039	-0.000070	0.000869	0.000000			
8. Moose Creek, Kenai 93	0.000838	0.000960	0.000212	0.000234	0.000419	0.000050	0.000313	0.000000		
9. Bear Creek, Tustumena 92	0.001213	0.001356	0.000337	0.000441	0.000649	0.000038	0.000481	0.000005	0.000000	
10. Moose Creek, Tustumena 92	0.001218	0.001358	0.000271	0.000318	0.000548	0.000063	0.000403	-0.000018	-0.000081	0.000000
11. Daniels Lake, outlet 92	0.004477	0.004477	0.003698	0.002595	0.002432	0.005639	0.002628	0.004316	0.004701	0.004212
12. Yentna River, west fork 92	0.001694	0.001702	0.001512	0.000746	0.000548	0.002863	0.000678	0.001837	0.002204	0.001905
13. Shell Lake, 92	0.000319	0.000315	0.000921	0.000393	0.000080	0.001885	0.000181	0.001029	0.001431	0.001298
14. Judd Lake, 92	0.002678	0.002676	0.002331	0.001405	0.001194	0.003969	0.001360	0.002789	0.003180	0.002801
15. Stephan Lake, 92	0.002140	0.002244	0.000847	0.000425	0.000624	0.001472	0.000610	0.000935	0.001060	0.000799
16. Larson Lake, 92	0.001328	0.001325	0.001406	0.000659	0.000404	0.002740	0.000540	0.001707	0.002102	0.001834
17. Fish Creek, 92	0.003906	0.003917	0.003226	0.002251	0.002087	0.004915	0.002242	0.003721	0.004050	0.003632
18. Fish Creek, 93	0.002874	0.002917	0.002082	0.001338	0.001283	0.003325	0.001369	0.002393	0.002641	0.002306
19. McArthur River, 93	0.002326	0.002338	0.001910	0.001075	0.000887	0.003386	0.001014	0.002306	0.002610	0.002279
20. Crescent River, 92	0.003816	0.003822	0.003099	0.002080	0.001918	0.004891	0.002087	0.003650	0.003993	0.003552
21. Crescent Lake, site 2 94	0.002660	0.002672	0.002150	0.001273	0.001107	0.003691	0.001247	0.002579	0.002909	0.002544
22. Packers Lake, 92	0.000011	0.000006	0.001042	0.000692	0.000333	0.001702	0.000404	0.000991	0.001399	0.001375

[1]Calculations were made using the REAP package (McElroy et al., 1991) which estimates nucleotide divergence according to Nei (1987; eqs. 10.19, 10.7, 10.20, and 10.21). Nucleotide divergence (v_A) estimates the number of net restriction-site differences per nucleon between two populations.

Table 11. Continued.

Population	11	12	13	14	15	16	17	18	19	20	21	22
1. Russian River, above/early 92												
2. Russian River, above/late 92												
3. Russian River, below 93												
4. Ptarmigan Creek, 92												
5. Btw. Kenai & Skilak Lakes, 92												
6. Hidden Creek, 92												
7. Skilak Lake, outlet 92												
8. Moose Creek, Kenai 93												
9. Bear Creek, Tustumena 92												
10. Moose Creek, Tustumena 92												
11. Daniels Lake, outlet 92	0.000000											
12. Yentna River, west fork 92	0.000625	0.000000										
13. Shell Lake, 92	0.002332	0.000497	0.000000									
14. Judd Lake, 92	0.000212	0.000075	0.001084	0.000000								
15. Stephan Lake, 92	0.001345	0.000500	0.001134	0.000772	0.000000							
16. Larson Lake, 92	0.000879	-0.000024	0.000288	0.000185	0.000646	0.000000						
17. Fish Creek, 92	0.000467	0.000650	0.002060	0.000458	0.001262	0.000887	0.000000					
18. Fish Creek, 93	0.000809	0.000449	0.001445	0.000505	0.000643	0.000635	0.000022	0.000000				
19. McArthur River, 93	0.000325	0.000002	0.000877	-0.000015	0.000531	0.000099	0.000482	0.000407	0.000000			
20. Crescent River, 92	0.000017	0.000380	0.001865	0.000079	0.001012	0.000595	0.000392	0.000609	0.000137	0.000000		
21. Crescent Lake, site 2 94	0.000211	0.000057	0.001088	-0.000028	0.000592	0.000186	0.000424	0.000415	-0.000047	0.000062	0.000000	
22. Packers Lake, 92	0.004039	0.001439	0.000199	0.002337	0.002051	0.001086	0.003536	0.002625	0.002030	0.003421	0.002342	0.000000

Table 12. Analysis of geographic heterogeneity in mtDNA frequencies using a Monte Carlo simulation (Roff and Bentzen 1989) with 10,000 replicate simulations.

Hierarchical Level	χ^2	P^1
Within Regions		
Kenai	254.70	0.0000
Kasilof	1.56	0.8365
Yentna	34.39	0.0000
Susitna	34.09	0.0000
Western Cook Inlet	91.00	0.0000
Northeast Cook Inlet[2]	-	-
Knik Arm	4.50	0.3591
Among Regions	602.16	0.0000
Among Populations	1294.06	0.0000

[1]Probability of exceeding original Chi-squared by chance.
[2]Chi-squared could not be calculated because only one population represents this region.

Table 13. Results of simulated mixtures of Cook Inlet sockeye salmon using allozyme and mtDNA data sets. Each region comprises 100% of the mixture, simulation sample size is 400, and 100 bootstrap resamplings were conducted. Results from the combined allozyme and mtDNA simulations are given first followed by results from simulations with allozyme data only.

100% Mixture Population	Regional Allocations[1]													
	1	SE	2	SE	3	SE	4	SE	5	SE	6	SE	7	SE
1 Kenai River	**0.9776**	**0.0212**	0.0048	0.0077	0.0034	0.0062	0.0033	0.0065	0.0121	0.0172	0.0006	0.0021	0.0006	0.0016
	0.9547	**0.0312**	0.0035	0.0076	0.0139	0.0191	0.0059	0.0110	0.0182	0.0224	0.0007	0.0018	0.0016	0.0038
2 Kasilof River	0.0166	0.0228	**0.9613**	**0.0283**	0.0035	0.0061	0.0043	0.0078	0.0109	0.0125	0.0000	0.0000	0.0005	0.0016
	0.0071	0.0135	**0.9499**	**0.0342**	0.0096	0.0131	0.0059	0.0114	0.0243	0.0262	0.0000	0.0000	0.0022	0.0057
3 Yentna River	0.0089	0.0124	0.0011	0.0032	**0.9255**	**0.0392**	0.0247	0.0279	0.0306	0.0330	0.0016	0.0032	0.0007	0.0019
	0.0090	0.0141	0.0002	0.0013	**0.9240**	**0.0492**	0.0218	0.0315	0.0396	0.0405	0.0011	0.0026	0.0033	0.0068
4 Susitna River	0.0067	0.0103	0.0033	0.0063	0.0200	0.0263	**0.9491**	**0.0373**	0.0209	0.0208	0.0000	0.0001	0.0000	0.0000
	0.0070	0.0137	0.0053	0.0093	0.0261	0.0292	**0.9477**	**0.0389**	0.0138	0. 0185	0.0000	0.0000	0.0000	0.0000
5 West Cook Inlet	0.0144	0.0159	0.0018	0.0048	0.0119	0.0141	0.0061	0.0099	**0.9651**	**0.0264**	0.0000	0.0000	0.0000	0.0001
	0.0252	0.0317	0.0006	0.0031	0.0208	0.0266	0.0086	0.0123	**0.9445**	**0.0422**	0.0000	0.0004	0.0000	0.0000
6 Northeastern Cook Inlet	0.0016	0.0033	0.0000	0.0000	0.0009	0.0025	0.0000	0.0001	0.0045	0.0056	**0.9923**	**0.0091**	0.0007	0.0024
	0.0058	0.0081	0.0000	0.0004	0.0011	0.0029	0.0005	0.0015	0.0018	0.0046	**0.9898**	**0.0107**	0.0009	0.0027
7 Knik Arm	0.0078	0.0133	0.0088	0.0114	0.0035	0.0062	0.0007	0.0023	0.0123	0.0164	0.0016	0.0036	**0.9645**	**0.0295**
	0.0016	0.0039	0.0049	0.0079	0.0079	0.0123	0.0006	0.0022	0.0088	0.0119	0.0021	0.0052	**0.9739**	**0.0187**

[1]Estimates in bold print along the diagonals should sum to 1.0000.

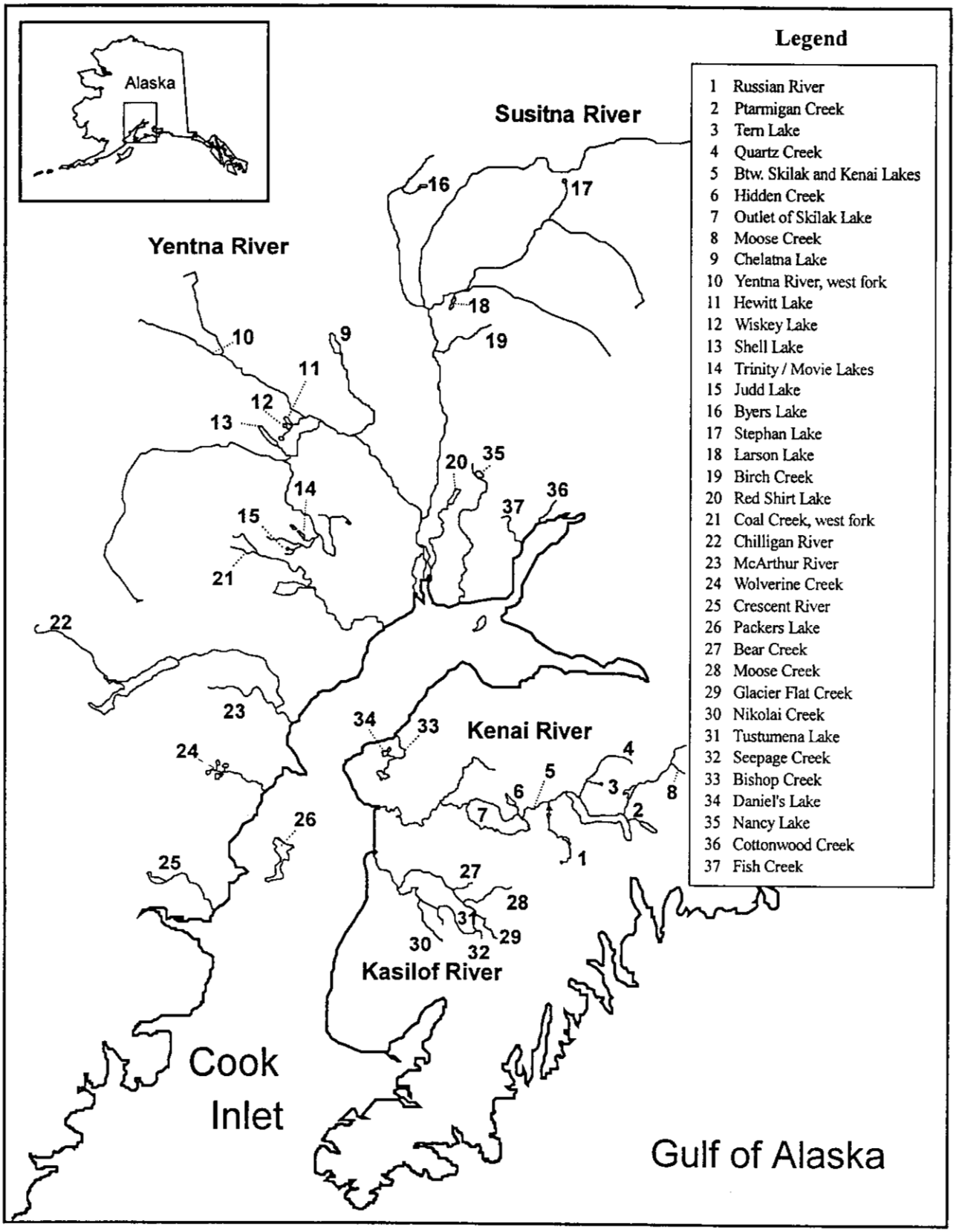


Figure 1. Sockeye salmon genetic samples originating from Upper Cook Inlet, 1992-1994.

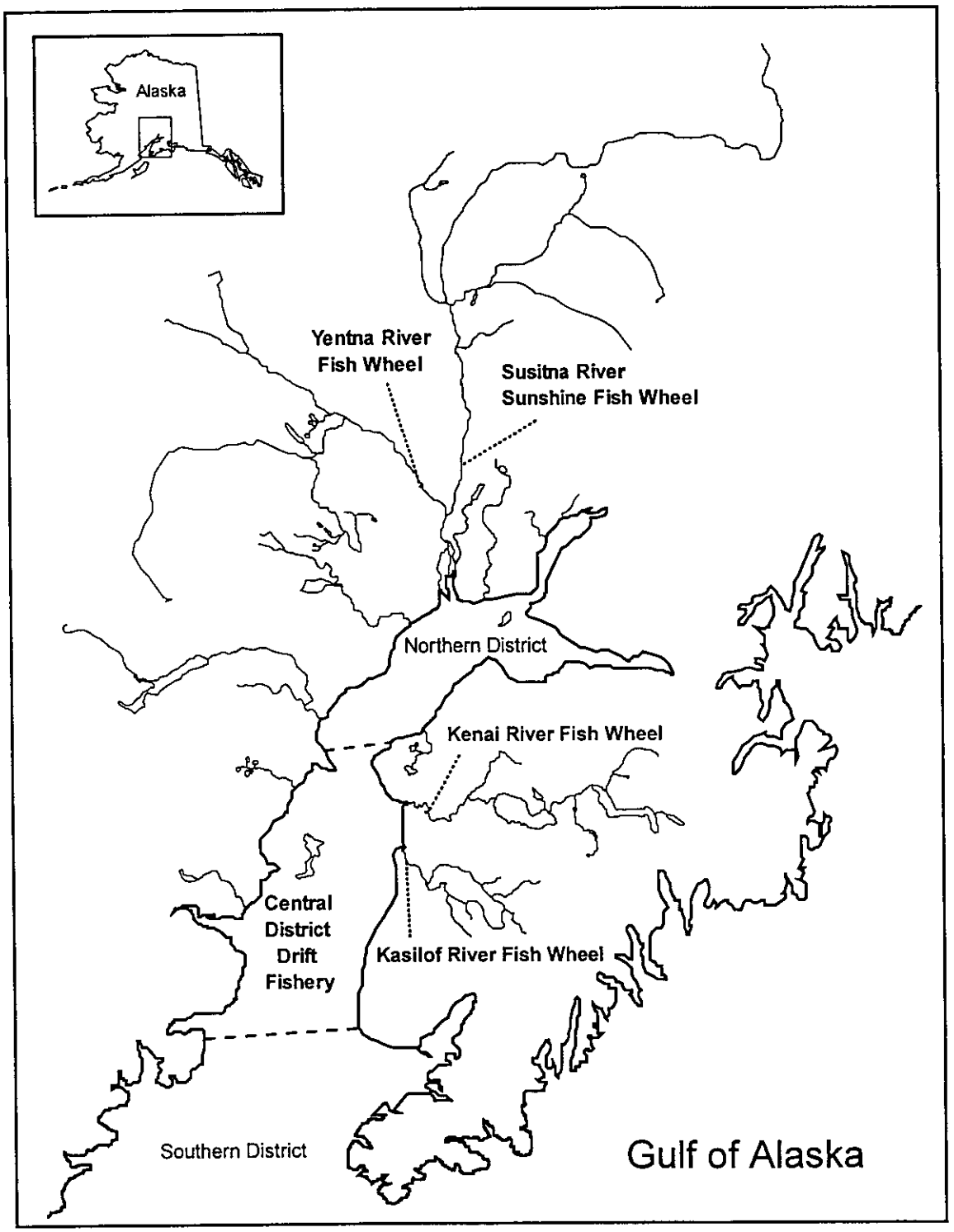


Figure 2. Locations of mixed-stock and inriver samples from Upper Cook Inlet, 1992-1994.

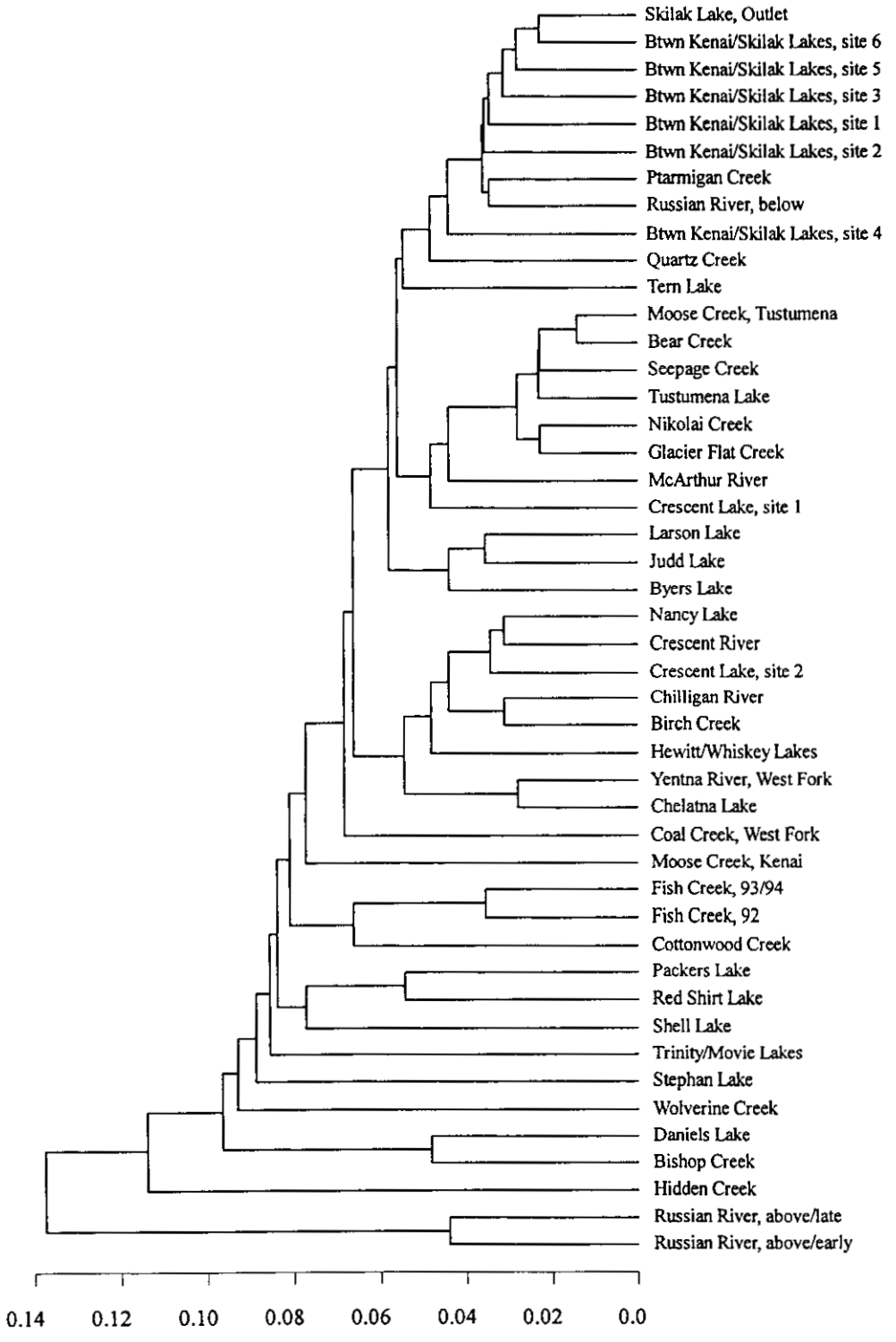


Figure 3. UPGMA phenogram for Cook Inlet sockeye salmon using Cavalli-Sforza and Edwards (1967) chord measure of genetic distance.

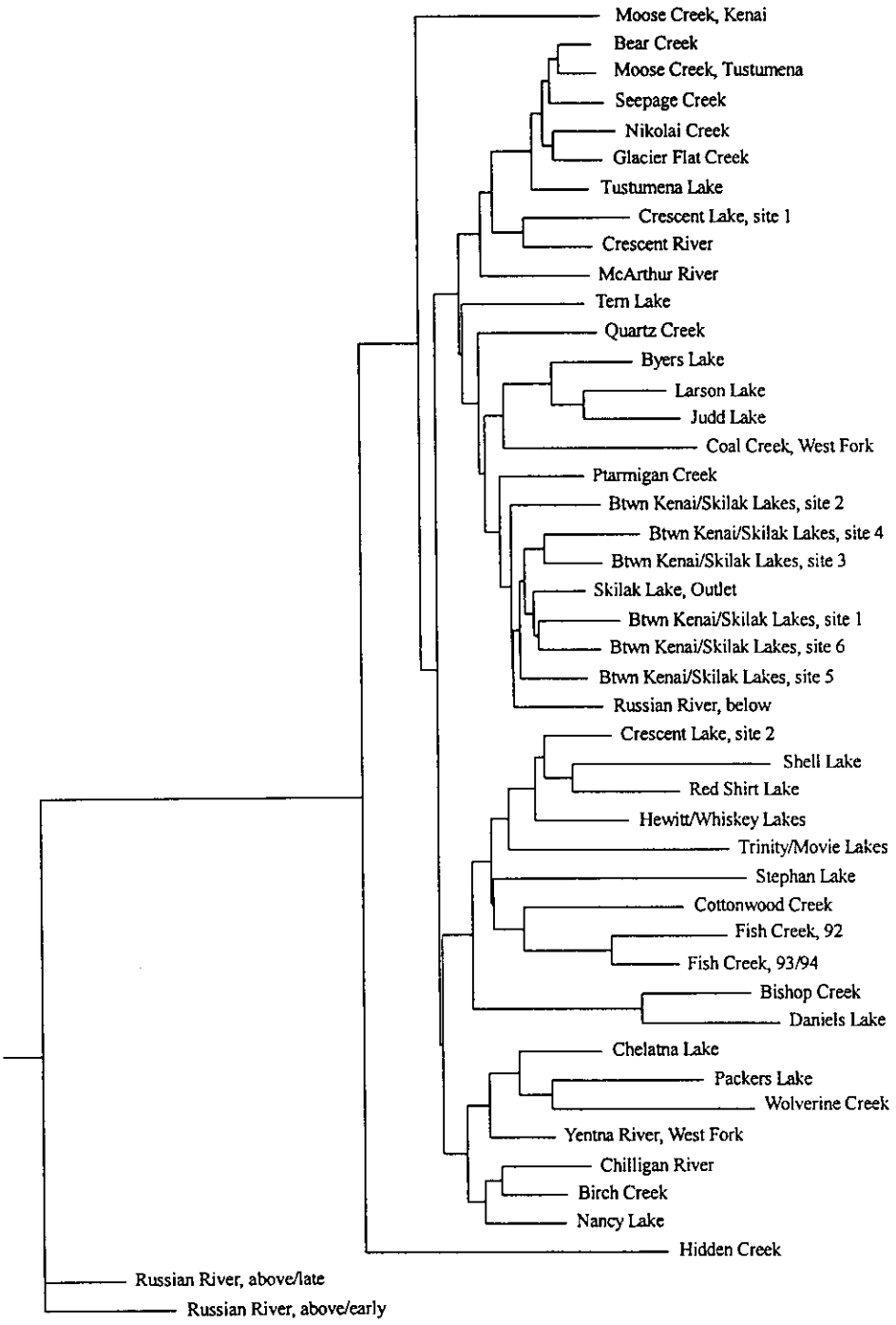


Figure 4. Neighbor-joining tree for Cook Inlet sockeye salmon based on Cavalli-Sforza and Edwards (1967) chord measure of genetic distance.

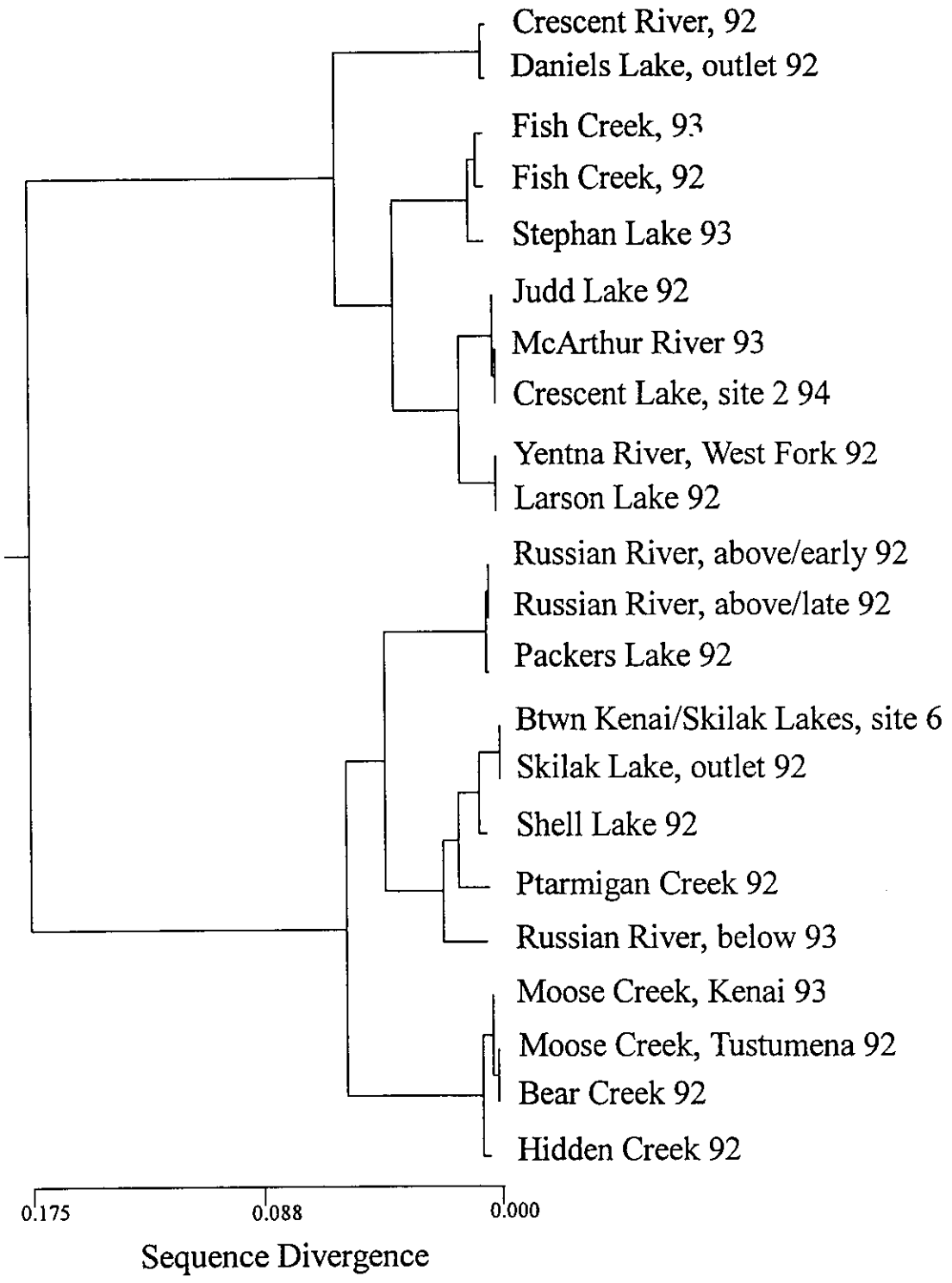


Figure 5. UPGMA phenogram for Cook Inlet sockeye salmon populations examined for mtDNA variation using nucleotide divergence estimates among populations (Nei and Tajima 1981).

Appendix A. Allele frequency estimates for Cook Inlet sockeye salmon.

Population	N	sAAT-1,2* 100	77	122	N	sAAT-3* 100	117	N	mAAT-1* -100	-83
Kenai River Drainage										
Russian River, above/early, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.8050	0.1950
Russian River, above/late, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.9250	0.0750
Russian River, above/late, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	99	0.9091	0.0909
Russian River, above/late pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	199	0.9171	0.0829
Russian River, below, 93	99	1.0000	0.0000	0.0000	100	1.0000	0.0000	99	0.9242	0.0758
Ptarmigan Creek, 92	100	1.0000	0.0000	0.0000	95	1.0000	0.0000	100	0.9500	0.0500
Ptarmigan Creek, 93	98	1.0000	0.0000	0.0000	97	1.0000	0.0000	98	0.9694	0.0306
Ptarmigan Creek pooled	198	1.0000	0.0000	0.0000	192	1.0000	0.0000	198	0.9596	0.0404
Tern Lake, 92	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	50	0.9800	0.0200
Tern Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.9650	0.0350
Tern Lake pooled	150	1.0000	0.0000	0.0000	150	1.0000	0.0000	150	0.9700	0.0300
Quartz Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.9550	0.0450
Quartz Creek, 93	99	1.0000	0.0000	0.0000	99	1.0000	0.0000	99	0.9394	0.0606
Quartz Creek pooled	199	1.0000	0.0000	0.0000	199	1.0000	0.0000	199	0.9472	0.0528
Btwn Kenai/Skilak Lakes, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.9350	0.0650
Btwn Kenai/Skilak Lakes, early, 93	90	1.0000	0.0000	0.0000	97	1.0000	0.0000	97	0.9381	0.0619
Btwn Kenai/Skilak Lakes, late, 93	100	1.0000	0.0000	0.0000	93	1.0000	0.0000	100	0.9100	0.0900
Btwn Ken/Ski Lakes site 6 pooled	290	1.0000	0.0000	0.0000	290	1.0000	0.0000	297	0.9276	0.0724
Btwn Kenai/Skilak Lakes site 1, early, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	50	0.8700	0.1300
Btwn Kenai/Skilak Lakes site 1, late, 94	50	1.0000	0.0000	0.0000	49	1.0000	0.0000	50	0.8900	0.1100
Btwn Ken/Ski Lakes site 1 pooled	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	100	0.8800	0.1200
Btwn Kenai/Skilak Lakes site 2, early, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	50	0.8500	0.1500
Btwn Kenai/Skilak Lakes site 2, late, 94	50	1.0000	0.0000	0.0000	49	1.0000	0.0000	50	0.9100	0.0900
Btwn Ken/Ski Lakes site 2 pooled	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	100	0.8800	0.1200
Btwn Kenai/Skilak Lakes site 3, early, 94	100	1.0000	0.0000	0.0000	97	1.0000	0.0000	100	0.9650	0.0350
Btwn Kenai/Skilak Lakes site 3, late, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	50	0.9400	0.0600
Btwn Ken/Ski Lakes site 3 pooled	150	1.0000	0.0000	0.0000	147	1.0000	0.0000	150	0.9567	0.0433
Btwn Kenai/Skilak Lakes site 4, late, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	50	0.9600	0.0400
Btwn Kenai/Skilak Lakes site 5, late, 94	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	100	0.9300	0.0700
Hidden Creek, 92	50	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.9700	0.0300
Hidden Creek, 93	100	1.0000	0.0000	0.0000	97	1.0000	0.0000	100	0.9800	0.0200
Hidden Creek pooled	150	1.0000	0.0000	0.0000	197	1.0000	0.0000	200	0.9750	0.0250
Skilak Lake Outlet, 92	100	1.0000	0.0000	0.0000	94	1.0000	0.0000	98	0.9235	0.0765
Skilak Lake Outlet, early, 93	99	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.8900	0.1100
Skilak Lake Outlet, late, 93	100	1.0000	0.0000	0.0000	95	1.0000	0.0000	100	0.8900	0.1100
Skilak Lake Outlet, early, 94	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	200	0.9250	0.0750
Skilak Lake Outlet, late, 94	197	1.0000	0.0000	0.0000	199	1.0000	0.0000	197	0.9036	0.0964
Skilak Lake Outlet pooled	696	1.0000	0.0000	0.0000	688	1.0000	0.0000	695	0.9086	0.0914
Moose Creek, Kenai, 93	99	1.0000	0.0000	0.0000	97	1.0000	0.0000	99	0.9646	0.0354
Moose Creek, Kenai, 94	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.9750	0.0250
Moose Creek, Kenai pooled	199	1.0000	0.0000	0.0000	197	1.0000	0.0000	199	0.9698	0.0302

Appendix A. Continued.

Population	N	*sAAT-1,2** 100	77	122	N	*sAAT-3** 100	117	N	*mAAT-1** -100	-83
Susitna River (Yentna Drainages)										
Chelatna Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.8400	0.1600
Chelatna Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.8350	0.1650
Chelatna Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	200	0.8375	0.1625
Yentna River West Fork, 92	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	96	0.8594	0.1406
Yentna River West Fork, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.8600	0.1400
Yentna River West Fork pooled	200	1.0000	0.0000	0.0000	199	1.0000	0.0000	196	0.8597	0.1403
Hewitt Lake, 92	50	1.0000	0.0000	0.0000	49	1.0000	0.0000	50	0.9300	0.0700
Hewitt/Whiskey Lakes, 93	50	1.0000	0.0000	0.0000	50	0.9900	0.0100	50	0.8700	0.1300
Hewitt/Whiskey Lakes pooled	100	1.0000	0.0000	0.0000	99	0.9949	0.0051	100	0.9000	0.1000
Shell Lake, 92	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	100	0.8700	0.1300
Shell Lake, 93	98	1.0000	0.0000	0.0000	100	1.0000	0.0000	98	0.9388	0.0612
Shell Lake pooled	198	1.0000	0.0000	0.0000	199	1.0000	0.0000	198	0.9040	0.0960
Trinity Lake, 92	98	1.0000	0.0000	0.0000	100	1.0000	0.0000	99	0.8990	0.1010
Trinity/Movie Lakes, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	99	0.8939	0.1061
Trinity/Movie Lakes pooled	198	1.0000	0.0000	0.0000	200	1.0000	0.0000	198	0.8965	0.1035
Judd Lake, 92	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	99	0.6010	0.3990
Judd Lake, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	100	0.6350	0.3650
Judd Lake pooled	200	1.0000	0.0000	0.0000	198	1.0000	0.0000	199	0.6181	0.3819
Susitna River (Mainstem Drainages)										
Byers Lake, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	97	0.7423	0.2577
Stephan Lake, 93	100	0.9875	0.0125	0.0000	100	1.0000	0.0000	100	0.8200	0.1800
Stephan Lake, site 1, 1994	25	1.0000	0.0000	0.0000	20	1.0000	0.0000	24	0.7917	0.2083
Stephan Lake site 2, 94	25	1.0000	0.0000	0.0000	23	1.0000	0.0000	25	0.7800	0.2200
Stephan Lake pooled (not site 1)	125	0.9900	0.0100	0.0000	123	1.0000	0.0000	125	0.8120	0.1880
Larson Lake, 92	100	1.0000	0.0000	0.0000	95	1.0000	0.0000	100	0.6550	0.3450
Larson Lake, 93	98	1.0000	0.0000	0.0000	99	1.0000	0.0000	100	0.7250	0.2750
Larson Lake pooled	198	1.0000	0.0000	0.0000	194	1.0000	0.0000	200	0.6900	0.3100
Birch Creek, 93	50	1.0000	0.0000	0.0000	66	1.0000	0.0000	67	0.9403	0.0597
Red Shirt Lake, 93	34	0.9926	0.0000	0.0074	34	1.0000	0.0000	34	1.0000	0.0000
Western Cook Inlet Drainages										
Coal Creek West Fork, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	99	0.9242	0.0758
Coal Creek West Fork, 93	100	1.0000	0.0000	0.0000	100	0.9900	0.0100	100	0.9400	0.0600
Coal Creek West Fork pooled	200	1.0000	0.0000	0.0000	200	0.9950	0.0050	199	0.9322	0.0678
Chilligan River, 92	100	1.0000	0.0000	0.0000	97	1.0000	0.0000	100	0.9800	0.0200
Chilligan River, 94	50	1.0000	0.0000	0.0000	49	1.0000	0.0000	50	0.9600	0.0400
Chilligan River pooled	150	1.0000	0.0000	0.0000	146	1.0000	0.0000	150	0.9733	0.0267
McArthur River, 93	100	1.0000	0.0000	0.0000	100	0.9950	0.0050	100	0.9700	0.0300
Wolverine Creek 93	97	1.0000	0.0000	0.0000	100	1.0000	0.0000	92	0.8859	0.1141
Crescent River, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.9050	0.0950
Crescent River, 93	100	1.0000	0.0000	0.0000	98	1.0000	0.0000	100	0.9400	0.0600
Crescent River pooled	200	1.0000	0.0000	0.0000	198	1.0000	0.0000	200	0.9225	0.0775
Crescent Lake site 1, 94	50	1.0000	0.0000	0.0000	49	1.0000	0.0000	50	0.9900	0.0100
Crescent Lake site 2, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	50	0.9700	0.0300

Appendix A. Continued.

Population	N	*sAAT-1,2** 100	77	122	N	*sAAT-3** 100	117	N	*mAAT-1** -100	-83
Western Cook Inlet Drainages Continued										
Packers Lake, 92	99	1.0000	0.0000	0.0000	99	1.0000	0.0000	99	0.9798	0.0202
Packers Lake, 93	83	1.0000	0.0000	0.0000	81	1.0000	0.0000	83	0.9880	0.0120
Packers Lake pooled	182	1.0000	0.0000	0.0000	180	1.0000	0.0000	182	0.9835	0.0165
Kasilof River Drainage										
Bear Creek, 92	20	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.8800	0.1200
Bear Creek, 93	99	1.0000	0.0000	0.0000	66	1.0000	0.0000	100	0.9250	0.0750
Bear Creek pooled	119	1.0000	0.0000	0.0000	166	1.0000	0.0000	200	0.9025	0.0975
Moose Creek, Tustumena, 92	100	1.0000	0.0000	0.0000	94	1.0000	0.0000	100	0.9200	0.0800
Moose Creek, Tustumena, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.9300	0.0700
Moose Creek, Tustumena pooled	200	1.0000	0.0000	0.0000	194	1.0000	0.0000	200	0.9250	0.0750
Glacier Flat Creek, 92	20	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.8950	0.1050
Glacier Flat Creek, 93	100	1.0000	0.0000	0.0000	97	1.0000	0.0000	100	0.8800	0.1200
Glacier Flat Creek, 94	100	1.0000	0.0000	0.0000	97	0.9948	0.0052	99	0.9141	0.0859
Glacier Flat Creek pooled	220	1.0000	0.0000	0.0000	294	0.9983	0.0017	299	0.8963	0.1037
Nikolai Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.8400	0.1600
Nikolai Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.8850	0.1150
Nikolai Creek pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	200	0.8625	0.1375
Tustumena Lake site 1, 94	50	1.0000	0.0000	0.0000	46	1.0000	0.0000	50	0.9200	0.0800
Tustumena Lake site 2, 94	50	1.0000	0.0000	0.0000	45	1.0000	0.0000	50	0.9000	0.1000
Tustumena Lake pooled	100	1.0000	0.0000	0.0000	91	1.0000	0.0000	100	0.9100	0.0900
Seepage Creek, 94	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.8950	0.1050
Northeastern Cook Inlet Drainages										
Bishop Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	97	0.8402	0.1598
Daniels Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.9950	0.0050
Daniels Lake, 93	99	1.0000	0.0000	0.0000	100	1.0000	0.0000	99	0.9747	0.0253
Daniels Lake pooled	199	1.0000	0.0000	0.0000	200	1.0000	0.0000	199	0.9849	0.0151
Knik Arm (Little Susitna River Drainages)										
Nancy Lake, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	100	0.9700	0.0300
Cottonwood Creek, 93	95	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Fish Creek, 92	98	1.0000	0.0000	0.0000	99	1.0000	0.0000	98	1.0000	0.0000
Fish Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	100	0.9700	0.0300
Fish Creek, 94	97	1.0000	0.0000	0.0000	96	1.0000	0.0000	95	0.9895	0.0105
Fish Creek 93/94 pooled	197	1.0000	0.0000	0.0000	196	1.0000	0.0000	195	0.9795	0.0205

Appendix A. Continued.

Population	N	*mAAT-2** -100	-73	N	*mAH-1,2** 100	75	N	*mAH-4** 100	114
Kenai River Drainage									
Russian River, above/early, 92	98	0.9184	0.0816	100	0.9575	0.0425	100	1.0000	0.0000
Russian River, above/late, 92	98	0.8214	0.1786	100	1.0000	0.0000	100	1.0000	0.0000
Russian River, above/late, 93	100	0.8400	0.1600	99	1.0000	0.0000	76	1.0000	0.0000
Russian River, above/late pooled	198	0.8308	0.1692	199	1.0000	0.0000	176	1.0000	0.0000
Russian River, below, 93	96	0.9948	0.0052	98	0.9617	0.0383	92	1.0000	0.0000
Ptarmigan Creek, 92	100	1.0000	0.0000	100	0.9375	0.0625	100	1.0000	0.0000
Ptarmigan Creek, 93	82	1.0000	0.0000	98	0.9260	0.0740	97	1.0000	0.0000
Ptarmigan Creek pooled	182	1.0000	0.0000	198	0.9318	0.0682	197	1.0000	0.0000
Tern Lake, 92	50	1.0000	0.0000	50	0.9650	0.0350	50	1.0000	0.0000
Tern Lake, 93	100	0.9800	0.0200	100	0.9850	0.0150	100	0.9850	0.0150
Tern Lake pooled	150	0.9867	0.0133	150	0.9783	0.0217	150	0.9900	0.0100
Quartz Creek, 92	100	1.0000	0.0000	100	0.9750	0.0250	100	1.0000	0.0000
Quartz Creek, 93	96	0.9896	0.0104	98	0.9592	0.0408	99	1.0000	0.0000
Quartz Creek pooled	196	0.9949	0.0051	198	0.9672	0.0328	199	1.0000	0.0000
Btwn Kenai/Skilak Lakes, 92	100	1.0000	0.0000	96	0.9557	0.0443	100	1.0000	0.0000
Btwn Kenai/Skilak Lakes, early, 93	98	1.0000	0.0000	93	0.9624	0.0376	94	1.0000	0.0000
Btwn Kenai/Skilak Lakes, late, 93	100	1.0000	0.0000	99	0.9596	0.0404	100	1.0000	0.0000
Btwn Ken/Ski Lakes site 6 pooled	298	1.0000	0.0000	288	0.9592	0.0408	294	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, early, 94	50	0.9900	0.0100	45	0.9389	0.0611	50	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, late, 94	49	1.0000	0.0000	50	0.9650	0.0350	50	1.0000	0.0000
Btwn Ken/Ski Lakes site 1 pooled	99	0.9949	0.0051	95	0.9526	0.0474	100	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, early, 94	50	0.9900	0.0100	50	0.9900	0.0100	50	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, late, 94	50	0.9800	0.0200	50	0.9450	0.0550	50	1.0000	0.0000
Btwn Ken/Ski Lakes site 2 pooled	100	0.9850	0.0150	100	0.9675	0.0325	100	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, early, 94	100	0.9800	0.0200	100	0.9625	0.0375	97	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, late, 94	50	0.9500	0.0500	50	0.9650	0.0350	50	1.0000	0.0000
Btwn Ken/Ski Lakes site 3 pooled	150	0.9700	0.0300	150	0.9633	0.0367	147	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 4, late, 94	49	0.9694	0.0306	50	0.9700	0.0300	50	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 5, late, 94	100	0.9900	0.0100	100	0.9800	0.0200	100	1.0000	0.0000
Hidden Creek, 92	99	0.7424	0.2576	100	0.9475	0.0525	100	1.0000	0.0000
Hidden Creek, 93	100	0.7200	0.2800	100	0.9500	0.0500	100	1.0000	0.0000
Hidden Creek pooled	199	0.7312	0.2688	200	0.9488	0.0512	200	1.0000	0.0000
Skilak Lake Outlet, 92	99	1.0000	0.0000	98	0.9643	0.0357	98	1.0000	0.0000
Skilak Lake Outlet, early, 93	100	0.9950	0.0050	100	0.9675	0.0325	100	1.0000	0.0000
Skilak Lake Outlet, late, 93	100	0.9950	0.0050	100	0.9700	0.0300	100	1.0000	0.0000
Skilak Lake Outlet, early, 94	200	0.9925	0.0075	199	0.9749	0.0251	200	1.0000	0.0000
Skilak Lake Outlet, late, 94	196	0.9974	0.0026	199	0.9623	0.0377	200	1.0000	0.0000
Skilak Lake Outlet pooled	695	0.9957	0.0043	696	0.9680	0.0320	698	1.0000	0.0000
Moose Creek, Kenai, 93	98	0.9949	0.0051	80	0.9312	0.0688	98	1.0000	0.0000
Moose Creek, Kenai, 94	100	0.9800	0.0200	100	0.9375	0.0625	100	1.0000	0.0000
Moose Creek, Kenai pooled	198	0.9874	0.0126	180	0.9347	0.0653	198	1.0000	0.0000

Appendix A. Continued.

Population	N	*mAAT-2** -100	-73	N	*mAH-1,2** 100	75	N	*mAH-4** 100	114
Susitna River (Yentna Drainages)									
Chelatna Lake, 92	100	1.0000	0.0000	100	0.9650	0.0350	100	0.9850	0.0150
Chelatna Lake, 93	97	1.0000	0.0000	99	0.9646	0.0354	99	1.0000	0.0000
Chelatna Lake pooled	197	1.0000	0.0000	199	0.9648	0.0352	199	0.9925	0.0075
Yentna River West Fork, 92	100	1.0000	0.0000	100	0.9750	0.0250	100	1.0000	0.0000
Yentna River West Fork, 93	100	1.0000	0.0000	100	0.9775	0.0225	100	1.0000	0.0000
Yentna River West Fork pooled	200	1.0000	0.0000	200	0.9762	0.0238	200	1.0000	0.0000
Hewitt Lake, 92	50	1.0000	0.0000	50	0.9650	0.0350	50	1.0000	0.0000
Hewitt/Whiskey Lakes, 93	50	1.0000	0.0000	50	0.9950	0.0050	50	1.0000	0.0000
Hewitt/Whiskey Lakes pooled	100	1.0000	0.0000	100	0.9800	0.0200	100	1.0000	0.0000
Shell Lake, 92	100	1.0000	0.0000	100	0.9675	0.0325	100	1.0000	0.0000
Shell Lake, 93	100	1.0000	0.0000	93	0.9731	0.0269	99	1.0000	0.0000
Shell Lake pooled	200	1.0000	0.0000	193	0.9702	0.0298	199	1.0000	0.0000
Trinity Lake, 92	100	1.0000	0.0000	99	0.9949	0.0051	99	1.0000	0.0000
Trinity/Movie Lakes, 93	99	1.0000	0.0000	99	0.9949	0.0051	100	1.0000	0.0000
Trinity/Movie Lakes pooled	199	1.0000	0.0000	198	0.9949	0.0051	199	1.0000	0.0000
Judd Lake, 92	100	1.0000	0.0000	100	0.9850	0.0150	100	1.0000	0.0000
Judd Lake, 93	100	1.0000	0.0000	99	0.9571	0.0429	99	0.9949	0.0051
Judd Lake pooled	200	1.0000	0.0000	199	0.9711	0.0289	199	0.9975	0.0025
Susitna River (Mainstem Drainages)									
Byers Lake, 93	96	1.0000	0.0000	97	0.9459	0.0541	98	1.0000	0.0000
Stephan Lake, 93	100	1.0000	0.0000	100	0.9875	0.0125	100	1.0000	0.0000
Stephan Lake, site 1, 1994	25	1.0000	0.0000	25	0.9900	0.0100	25	1.0000	0.0000
Stephan Lake site 2, 94	25	1.0000	0.0000	25	1.0000	0.0000	25	1.0000	0.0000
Stephan Lake pooled (not site 1)	125	1.0000	0.0000	125	0.9900	0.0100	125	1.0000	0.0000
Larson Lake, 92	100	1.0000	0.0000	100	0.9850	0.0150	100	1.0000	0.0000
Larson Lake, 93	99	1.0000	0.0000	100	0.9975	0.0025	100	1.0000	0.0000
Larson Lake pooled	199	1.0000	0.0000	200	0.9912	0.0088	200	1.0000	0.0000
Birch Creek, 93	67	1.0000	0.0000	67	0.9851	0.0149	67	1.0000	0.0000
Red Shirt Lake, 93	34	1.0000	0.0000	34	0.9559	0.0441	34	1.0000	0.0000
Western Cook Inlet Drainages									
Coal Creek West Fork, 92	100	1.0000	0.0000	100	0.8800	0.1200	100	1.0000	0.0000
Coal Creek West Fork, 93	91	1.0000	0.0000	100	0.9100	0.0900	100	1.0000	0.0000
Coal Creek West Fork pooled	191	1.0000	0.0000	200	0.8950	0.1050	200	1.0000	0.0000
Chilligan River, 92	100	1.0000	0.0000	99	0.9975	0.0025	100	1.0000	0.0000
Chilligan River, 94	50	1.0000	0.0000	50	0.9950	0.0050	50	1.0000	0.0000
Chilligan River pooled	150	1.0000	0.0000	149	0.9966	0.0034	150	1.0000	0.0000
McArthur River, 93	99	0.9899	0.0101	100	0.9275	0.0725	100	1.0000	0.0000
Wolverine Creek 93	99	0.9949	0.0051	64	0.8672	0.1328	91	1.0000	0.0000
Crescent River, 92	100	1.0000	0.0000	100	0.9350	0.0650	100	1.0000	0.0000
Crescent River, 93	100	1.0000	0.0000	100	0.9625	0.0375	100	1.0000	0.0000
Crescent River pooled	200	1.0000	0.0000	200	0.9488	0.0512	200	1.0000	0.0000
Crescent Lake site 1, 94	50	1.0000	0.0000	50	0.9650	0.0350	50	1.0000	0.0000
Crescent Lake site 2, 94	50	1.0000	0.0000	50	0.9900	0.0100	50	1.0000	0.0000

Appendix A. Continued.

Population	N	*mAAT-2** -100	-73	N	*mAH-1,2** 100	75	N	*mAH-4** 100	114
Western Cook Inlet Drainages Continued									
Packers Lake, 92	99	1.0000	0.0000	98	0.9668	0.0332	100	1.0000	0.0000
Packers Lake, 93	81	1.0000	0.0000				81	1.0000	0.0000
Packers Lake pooled	180	1.0000	0.0000	98	0.9668	0.0332	181	1.0000	0.0000
Kasilof River Drainage									
Bear Creek, 92	99	1.0000	0.0000	100	0.9625	0.0375	99	1.0000	0.0000
Bear Creek, 93	100	1.0000	0.0000	99	0.9621	0.0379	100	1.0000	0.0000
Bear Creek pooled	199	1.0000	0.0000	199	0.9623	0.0377	199	1.0000	0.0000
Moose Creek, Tustumena, 92	100	1.0000	0.0000	99	0.9646	0.0354	100	1.0000	0.0000
Moose Creek, Tustumena, 93	99	1.0000	0.0000	97	0.9562	0.0438	100	1.0000	0.0000
Moose Creek, Tustumena pooled	199	1.0000	0.0000	196	0.9605	0.0395	200	1.0000	0.0000
Glacier Flat Creek, 92	100	1.0000	0.0000	99	0.9798	0.0202	100	1.0000	0.0000
Glacier Flat Creek, 93	100	1.0000	0.0000	100	0.9575	0.0425	100	1.0000	0.0000
Glacier Flat Creek, 94	98	0.9949	0.0051	100	0.9600	0.0400	100	1.0000	0.0000
Glacier Flat Creek pooled	298	0.9983	0.0017	299	0.9657	0.0343	300	1.0000	0.0000
Nikolai Creek, 92	100	1.0000	0.0000	86	0.9564	0.0436	100	1.0000	0.0000
Nikolai Creek, 93	100	1.0000	0.0000	100	0.9400	0.0600	100	1.0000	0.0000
Nikolai Creek pooled	200	1.0000	0.0000	186	0.9476	0.0524	200	1.0000	0.0000
Tustumena Lake site 1, 94	50	1.0000	0.0000	50	0.9600	0.0400	50	1.0000	0.0000
Tustumena Lake site 2, 94	50	1.0000	0.0000	50	0.9900	0.0100	50	1.0000	0.0000
Tustumena Lake pooled	100	1.0000	0.0000	100	0.9750	0.0250	100	1.0000	0.0000
Seepage Creek, 94	100	1.0000	0.0000	100	0.9650	0.0350	100	1.0000	0.0000
Northeastern Cook Inlet Drainages									
Bishop Creek, 93	98	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Daniels Lake, 92	100	1.0000	0.0000	100	0.9950	0.0050	100	1.0000	0.0000
Daniels Lake, 93	100	0.9950	0.0050	100	1.0000	0.0000	100	1.0000	0.0000
Daniels Lake pooled	200	0.9975	0.0025	200	0.9975	0.0025	200	1.0000	0.0000
Knik Arm (Little Susitna River Drainages)									
Nancy Lake, 93	99	1.0000	0.0000	99	0.9646	0.0354	100	1.0000	0.0000
Cottonwood Creek, 93	98	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Fish Creek, 92	100	1.0000	0.0000	98	1.0000	0.0000	98	1.0000	0.0000
Fish Creek, 93	100	1.0000	0.0000	100	0.9925	0.0075	100	1.0000	0.0000
Fish Creek, 94	95	1.0000	0.0000	95	0.9947	0.0053	96	1.0000	0.0000
Fish Creek 93/94 pooled	195	1.0000	0.0000	195	0.9936	0.0064	196	1.0000	0.0000

Appendix A. Continued.

Population	N	sAH* 100	117	83	75	N	ALAT* 100	91	108	95
Kenai River Drainage										
Russian River, above/early, 92	100	0.2600	0.7400	0.0000	0.0000	100	0.8550	0.1400	0.0000	0.0050
Russian River, above/late, 92	100	0.2850	0.7150	0.0000	0.0000	100	0.8500	0.1350	0.0000	0.0150
Russian River, above/late, 93	99	0.3030	0.6970	0.0000	0.0000	100	0.8200	0.1750	0.0000	0.0050
Russian River, above/late pooled	199	0.2940	0.7060	0.0000	0.0000	200	0.8350	0.1550	0.0000	0.0100
Russian River, below, 93	99	0.9545	0.0455	0.0000	0.0000	100	0.6500	0.2600	0.0000	0.0900
Ptarmigan Creek, 92	100	0.9950	0.0050	0.0000	0.0000	100	0.6350	0.3250	0.0000	0.0400
Ptarmigan Creek, 93	98	0.9847	0.0153	0.0000	0.0000	97	0.6082	0.3505	0.0000	0.0412
Ptarmigan Creek pooled	198	0.9899	0.0101	0.0000	0.0000	197	0.6218	0.3376	0.0000	0.0406
Tern Lake, 92	50	0.9900	0.0100	0.0000	0.0000	50	0.6700	0.3000	0.0000	0.0300
Tern Lake, 93	100	1.0000	0.0000	0.0000	0.0000	98	0.6939	0.2857	0.0000	0.0204
Tern Lake pooled	150	0.9967	0.0033	0.0000	0.0000	148	0.6858	0.2905	0.0000	0.0236
Quartz Creek, 92	100	0.9950	0.0050	0.0000	0.0000	99	0.5354	0.4394	0.0000	0.0253
Quartz Creek, 93	100	0.9950	0.0050	0.0000	0.0000	100	0.4350	0.5100	0.0000	0.0550
Quartz Creek pooled	200	0.9950	0.0050	0.0000	0.0000	199	0.4849	0.4749	0.0000	0.0402
Btwn Kenai/Skilak Lakes, 92	100	0.9750	0.0200	0.0050	0.0000	99	0.6566	0.2626	0.0101	0.0707
Btwn Kenai/Skilak Lakes, early, 93	97	0.9639	0.0361	0.0000	0.0000	97	0.6649	0.2680	0.0052	0.0619
Btwn Kenai/Skilak Lakes, late, 93	100	0.9800	0.0200	0.0000	0.0000	100	0.6200	0.3200	0.0000	0.0600
Btwn Ken/Ski Lakes site 6 pooled	297	0.9731	0.0253	0.0017	0.0000	296	0.6470	0.2838	0.0051	0.0642
Btwn Kenai/Skilak Lakes site 1, early, 94	50	0.9700	0.0300	0.0000	0.0000	48	0.7396	0.2396	0.0000	0.0208
Btwn Kenai/Skilak Lakes site 1, late, 94	50	0.9500	0.0300	0.0200	0.0000	50	0.6500	0.3000	0.0000	0.0500
Btwn Ken/Ski Lakes site 1 pooled	100	0.9600	0.0300	0.0100	0.0000	98	0.6939	0.2704	0.0000	0.0357
Btwn Kenai/Skilak Lakes site 2, early, 94	50	0.9700	0.0300	0.0000	0.0000	48	0.6146	0.3646	0.0000	0.0208
Btwn Kenai/Skilak Lakes site 2, late, 94	50	0.9800	0.0200	0.0000	0.0000	50	0.6900	0.2600	0.0000	0.0500
Btwn Ken/Ski Lakes site 2 pooled	100	0.9750	0.0250	0.0000	0.0000	98	0.6531	0.3112	0.0000	0.0357
Btwn Kenai/Skilak Lakes site 3, early, 94	100	0.9800	0.0150	0.0000	0.0050	98	0.6122	0.3214	0.0000	0.0663
Btwn Kenai/Skilak Lakes site 3, late, 94	50	0.9800	0.0200	0.0000	0.0000	50	0.6900	0.2700	0.0000	0.0400
Btwn Ken/Ski Lakes site 3 pooled	150	0.9800	0.0167	0.0000	0.0033	148	0.6385	0.3041	0.0000	0.0574
Btwn Kenai/Skilak Lakes site 4, late, 94	50	1.0000	0.0000	0.0000	0.0000	50	0.6300	0.2900	0.0100	0.0700
Btwn Kenai/Skilak Lakes site 5, late, 94	100	0.9800	0.0200	0.0000	0.0000	100	0.6900	0.2750	0.0000	0.0350
Hidden Creek, 92	100	1.0000	0.0000	0.0000	0.0000	100	0.8300	0.0500	0.0000	0.1200
Hidden Creek, 93	100	1.0000	0.0000	0.0000	0.0000	100	0.7900	0.0950	0.0000	0.1150
Hidden Creek pooled	200	1.0000	0.0000	0.0000	0.0000	200	0.8100	0.0725	0.0000	0.1175
Skilak Lake Outlet, 92	99	0.9697	0.0303	0.0000	0.0000	96	0.7031	0.2552	0.0000	0.0417
Skilak Lake Outlet, early, 93	99	0.9697	0.0303	0.0000	0.0000	98	0.6735	0.2296	0.0051	0.0918
Skilak Lake Outlet, late, 93	100	0.9950	0.0050	0.0000	0.0000	98	0.6633	0.2551	0.0051	0.0765
Skilak Lake Outlet, early, 94	199	0.9799	0.0176	0.0025	0.0000	199	0.6985	0.2513	0.0000	0.0503
Skilak Lake Outlet, late, 94	196	0.9796	0.0204	0.0000	0.0000	196	0.6913	0.2526	0.0000	0.0561
Skilak Lake Outlet pooled	693	0.9791	0.0202	0.0007	0.0000	687	0.6885	0.2496	0.0015	0.0604
Moose Creek, Kenai, 93	100	0.9750	0.0250	0.0000	0.0000	98	0.4082	0.5918	0.0000	0.0000
Moose Creek, Kenai, 94	99	0.9848	0.0152	0.0000	0.0000	99	0.3586	0.6364	0.0000	0.0051
Moose Creek, Kenai pooled	199	0.9799	0.0201	0.0000	0.0000	197	0.3832	0.6142	0.0000	0.0025

Appendix A. Continued.

Population	N	sAH* 100	sAH* 117	sAH* 83	sAH* 75	N	ALAT* 100	ALAT* 91	ALAT* 108	ALAT* 95
Susitna River (Yentna Drainages)										
Chelatna Lake, 92	100	1.0000	0.0000	0.0000	0.0000	100	0.4750	0.5200	0.0000	0.0050
Chelatna Lake, 93	100	1.0000	0.0000	0.0000	0.0000	98	0.4490	0.5510	0.0000	0.0000
Chelatna Lake pooled	200	1.0000	0.0000	0.0000	0.0000	198	0.4621	0.5354	0.0000	0.0025
Yentna River West Fork, 92	100	0.9950	0.0050	0.0000	0.0000	100	0.5500	0.4400	0.0000	0.0100
Yentna River West Fork, 93	100	0.9950	0.0050	0.0000	0.0000	99	0.5354	0.4596	0.0000	0.0051
Yentna River West Fork pooled	200	0.9950	0.0050	0.0000	0.0000	199	0.5427	0.4497	0.0000	0.0075
Hewitt Lake, 92	50	1.0000	0.0000	0.0000	0.0000	49	0.7551	0.2449	0.0000	0.0000
Hewitt/Whiskey Lakes, 93	50	1.0000	0.0000	0.0000	0.0000	50	0.7000	0.3000	0.0000	0.0000
Hewitt/Whiskey Lakes pooled	100	1.0000	0.0000	0.0000	0.0000	99	0.7273	0.2727	0.0000	0.0000
Shell Lake, 92	100	1.0000	0.0000	0.0000	0.0000	100	0.4100	0.5650	0.0000	0.0250
Shell Lake, 93	100	1.0000	0.0000	0.0000	0.0000	100	0.4600	0.5150	0.0000	0.0250
Shell Lake pooled	200	1.0000	0.0000	0.0000	0.0000	200	0.4350	0.5400	0.0000	0.0250
Trinity Lake, 92	100	1.0000	0.0000	0.0000	0.0000	99	0.7727	0.2222	0.0000	0.0051
Trinity/Movie Lakes, 93	100	1.0000	0.0000	0.0000	0.0000	100	0.7700	0.2300	0.0000	0.0000
Trinity/Movie Lakes pooled	200	1.0000	0.0000	0.0000	0.0000	199	0.7714	0.2261	0.0000	0.0025
Judd Lake, 92	100	1.0000	0.0000	0.0000	0.0000	99	0.5859	0.3636	0.0000	0.0505
Judd Lake, 93	100	1.0000	0.0000	0.0000	0.0000	99	0.5859	0.3283	0.0000	0.0859
Judd Lake pooled	200	1.0000	0.0000	0.0000	0.0000	198	0.5859	0.3460	0.0000	0.0682
Susitna River (Mainstem Drainages)										
Byers Lake, 93	100	1.0000	0.0000	0.0000	0.0000	100	0.6800	0.2250	0.0000	0.0950
Stephan Lake, 93	100	0.9800	0.0200	0.0000	0.0000	100	0.5850	0.3000	0.0000	0.1150
Stephan Lake, site 1, 1994	25	0.9800	0.0200	0.0000	0.0000	25	0.4600	0.5400	0.0000	0.0000
Stephan Lake site 2, 94	25	1.0000	0.0000	0.0000	0.0000	25	0.4200	0.3800	0.0000	0.2000
Stephan Lake pooled (not site 1)	125	0.9840	0.0160	0.0000	0.0000	125	0.5520	0.3160	0.0000	0.1320
Larson Lake, 92	100	1.0000	0.0000	0.0000	0.0000	100	0.7350	0.2450	0.0050	0.0150
Larson Lake, 93	100	1.0000	0.0000	0.0000	0.0000	99	0.7172	0.2677	0.0000	0.0152
Larson Lake pooled	200	1.0000	0.0000	0.0000	0.0000	199	0.7261	0.2563	0.0025	0.0151
Birch Creek, 93	67	1.0000	0.0000	0.0000	0.0000	63	0.5714	0.4286	0.0000	0.0000
Red Shirt Lake, 93	34	1.0000	0.0000	0.0000	0.0000	34	0.4412	0.5441	0.0000	0.0147
Western Cook Inlet Drainages										
Coal Creek West Fork, 92	100	1.0000	0.0000	0.0000	0.0000	100	0.4050	0.5900	0.0000	0.0050
Coal Creek West Fork, 93	98	1.0000	0.0000	0.0000	0.0000	100	0.3450	0.6150	0.0000	0.0400
Coal Creek West Fork pooled	198	1.0000	0.0000	0.0000	0.0000	200	0.3750	0.6025	0.0000	0.0225
Chilligan River, 92	100	1.0000	0.0000	0.0000	0.0000	100	0.5550	0.4450	0.0000	0.0000
Chilligan River, 94	50	1.0000	0.0000	0.0000	0.0000	50	0.6000	0.4000	0.0000	0.0000
Chilligan River pooled	150	1.0000	0.0000	0.0000	0.0000	150	0.5700	0.4300	0.0000	0.0000
McArthur River, 93	100	1.0000	0.0000	0.0000	0.0000	98	0.6071	0.2245	0.0000	0.1684
Wolverine Creek 93	98	0.9898	0.0102	0.0000	0.0000	97	0.1134	0.8866	0.0000	0.0000
Crescent River, 92	100	1.0000	0.0000	0.0000	0.0000	100	0.5200	0.4700	0.0000	0.0100
Crescent River, 93	100	1.0000	0.0000	0.0000	0.0000	100	0.5350	0.4450	0.0000	0.0200
Crescent River pooled	200	1.0000	0.0000	0.0000	0.0000	200	0.5275	0.4575	0.0000	0.0150
Crescent Lake site 1, 94	50	1.0000	0.0000	0.0000	0.0000	50	0.5800	0.3400	0.0000	0.0800
Crescent Lake site 2, 94	50	1.0000	0.0000	0.0000	0.0000	50	0.5200	0.4800	0.0000	0.0000

Appendix A. Continued.

Population	N	*sAH** 100	117	83	75	N	*ALAT** 100	91	108	95
Western Cook Inlet Drainages										
Packers Lake, 92	100	0.9950	0.0050	0.0000	0.0000	99	0.3232	0.6768	0.0000	0.0000
Packers Lake, 93	81	1.0000	0.0000	0.0000	0.0000	83	0.3554	0.6386	0.0000	0.0060
Packers Lake pooled	181	0.9972	0.0028	0.0000	0.0000	182	0.3379	0.6593	0.0000	0.0027
Kasilof River Drainage										
Bear Creek, 92	100	1.0000	0.0000	0.0000	0.0000	99	0.5808	0.3182	0.0000	0.1010
Bear Creek, 93	99	1.0000	0.0000	0.0000	0.0000	100	0.5150	0.3650	0.0000	0.1200
Bear Creek pooled	199	1.0000	0.0000	0.0000	0.0000	199	0.5477	0.3417	0.0000	0.1106
Moose Creek, Tustumena, 92	100	1.0000	0.0000	0.0000	0.0000	100	0.5650	0.3250	0.0000	0.1100
Moose Creek, Tustumena, 93	100	1.0000	0.0000	0.0000	0.0000	100	0.5900	0.3200	0.0000	0.0900
Moose Creek, Tustumena pooled	200	1.0000	0.0000	0.0000	0.0000	200	0.5775	0.3225	0.0000	0.1000
Glacier Flat Creek, 92	100	0.9950	0.0050	0.0000	0.0000	100	0.5000	0.3400	0.0000	0.1600
Glacier Flat Creek, 93	98	1.0000	0.0000	0.0000	0.0000	99	0.5909	0.3030	0.0000	0.1061
Glacier Flat Creek, 94	100	1.0000	0.0000	0.0000	0.0000	99	0.5556	0.2828	0.0000	0.1616
Glacier Flat Creek pooled	298	0.9983	0.0017	0.0000	0.0000	298	0.5487	0.3087	0.0000	0.1426
Nikolai Creek, 92	100	1.0000	0.0000	0.0000	0.0000	100	0.5900	0.2900	0.0000	0.1200
Nikolai Creek, 93	100	1.0000	0.0000	0.0000	0.0000	99	0.5253	0.3232	0.0000	0.1515
Nikolai Creek pooled	200	1.0000	0.0000	0.0000	0.0000	199	0.5578	0.3065	0.0000	0.1357
Tustumena Lake site 1, 94	50	0.9900	0.0100	0.0000	0.0000	50	0.5100	0.3400	0.0000	0.1500
Tustumena Lake site 2, 94	50	1.0000	0.0000	0.0000	0.0000	50	0.5400	0.3100	0.0000	0.1500
Tustumena Lake pooled	100	0.9950	0.0050	0.0000	0.0000	100	0.5250	0.3250	0.0000	0.1500
Seepage Creek, 94	100	1.0000	0.0000	0.0000	0.0000	100	0.5150	0.3500	0.0000	0.1350
Northeastern Cook Inlet Drainages										
Bishop Creek, 93	100	1.0000	0.0000	0.0000	0.0000	100	0.3300	0.6200	0.0000	0.0500
Daniels Lake, 92	100	0.9800	0.0200	0.0000	0.0000	100	0.4850	0.4050	0.0000	0.1100
Daniels Lake, 93	100	0.9600	0.0400	0.0000	0.0000	100	0.4550	0.3650	0.0000	0.1800
Daniels Lake pooled	200	0.9700	0.0300	0.0000	0.0000	200	0.4700	0.3850	0.0000	0.1450
Knik Arm (Little Susitna River Drainages)										
Nancy Lake, 93	100	1.0000	0.0000	0.0000	0.0000	100	0.4600	0.5400	0.0000	0.0000
Cottonwood Creek, 93	99	1.0000	0.0000	0.0000	0.0000	100	0.5700	0.4300	0.0000	0.0000
Fish Creek, 92	98	1.0000	0.0000	0.0000	0.0000	100	0.5700	0.4250	0.0000	0.0050
Fish Creek, 93	100	1.0000	0.0000	0.0000	0.0000	100	0.6900	0.2950	0.0000	0.0150
Fish Creek, 94	96	1.0000	0.0000	0.0000	0.0000	100	0.6800	0.3000	0.0000	0.0200
Fish Creek 93/94 pooled	196	1.0000	0.0000	0.0000	0.0000	200	0.6850	0.2975	0.0000	0.0175

Appendix A. Continued.

Population	N	*CK-A2** 100	125	N	*CK-B** 100	102	N	*FDH** 100	128
Kenai River Drainage									
Russian River, above/early, 92	100	1.0000	0.0000	100	1.0000	0.0000	79	1.0000	0.0000
Russian River, above/late, 92	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Russian River, above/late, 93	97	1.0000	0.0000	100	0.9950	0.0050	76	1.0000	0.0000
Russian River, above/late pooled	197	1.0000	0.0000	200	0.9975	0.0025	176	1.0000	0.0000
Russian River, below, 93	99	1.0000	0.0000	100	1.0000	0.0000	96	1.0000	0.0000
Ptarmigan Creek, 92	100	1.0000	0.0000	100	1.0000	0.0000	100	0.9950	0.0050
Ptarmigan Creek, 93	97	1.0000	0.0000	98	1.0000	0.0000	96	1.0000	0.0000
Ptarmigan Creek pooled	197	1.0000	0.0000	198	1.0000	0.0000	196	0.9974	0.0026
Tern Lake, 92	50	1.0000	0.0000	50	1.0000	0.0000	49	1.0000	0.0000
Tern Lake, 93	98	1.0000	0.0000	100	1.0000	0.0000	99	1.0000	0.0000
Tern Lake pooled	148	1.0000	0.0000	150	1.0000	0.0000	148	1.0000	0.0000
Quartz Creek, 92	99	0.9747	0.0253	100	1.0000	0.0000	99	1.0000	0.0000
Quartz Creek, 93	100	0.9950	0.0050	100	1.0000	0.0000	99	1.0000	0.0000
Quartz Creek pooled	199	0.9849	0.0151	200	1.0000	0.0000	198	1.0000	0.0000
Btwn Kenai/Skilak Lakes, 92	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Btwn Kenai/Skilak Lakes, early, 93	97	1.0000	0.0000	96	1.0000	0.0000	97	1.0000	0.0000
Btwn Kenai/Skilak Lakes, late, 93	100	0.9950	0.0050	99	1.0000	0.0000	99	0.9949	0.0051
Btwn Ken/Ski Lakes site 6 pooled	297	0.9983	0.0017	295	1.0000	0.0000	296	0.9983	0.0017
Btwn Kenai/Skilak Lakes site 1, early, 94	50	1.0000	0.0000	50	1.0000	0.0000	50	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, late, 94	50	1.0000	0.0000	50	1.0000	0.0000	50	1.0000	0.0000
Btwn Ken/Ski Lakes site 1 pooled	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, early, 94	50	1.0000	0.0000	50	1.0000	0.0000	50	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, late, 94	50	1.0000	0.0000	50	1.0000	0.0000	50	1.0000	0.0000
Btwn Ken/Ski Lakes site 2 pooled	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, early, 94	98	1.0000	0.0000	100	1.0000	0.0000	98	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, late, 94	50	1.0000	0.0000	50	1.0000	0.0000	50	1.0000	0.0000
Btwn Ken/Ski Lakes site 3 pooled	148	1.0000	0.0000	150	1.0000	0.0000	148	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 4, late, 94	50	1.0000	0.0000	48	1.0000	0.0000	50	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 5, late, 94	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Hidden Creek, 92	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Hidden Creek, 93	100	1.0000	0.0000	100	1.0000	0.0000	99	1.0000	0.0000
Hidden Creek pooled	200	1.0000	0.0000	200	1.0000	0.0000	199	1.0000	0.0000
Skilak Lake Outlet, 92	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Skilak Lake Outlet, early, 93	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Skilak Lake Outlet, late, 93	100	1.0000	0.0000	100	1.0000	0.0000	99	1.0000	0.0000
Skilak Lake Outlet, early, 94	200	1.0000	0.0000	200	1.0000	0.0000	199	1.0000	0.0000
Skilak Lake Outlet, late, 94	195	1.0000	0.0000	200	1.0000	0.0000	199	1.0000	0.0000
Skilak Lake Outlet pooled	695	1.0000	0.0000	700	1.0000	0.0000	697	1.0000	0.0000
Moose Creek, Kenai, 93	99	1.0000	0.0000	100	1.0000	0.0000	99	1.0000	0.0000
Moose Creek, Kenai, 94	99	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Moose Creek, Kenai pooled	198	1.0000	0.0000	200	1.0000	0.0000	199	1.0000	0.0000

Appendix A. Continued.

Population	N	*CK-A2** 100	125	N	*CK-B** 100	102	N	*FDH** 100	128
Susitna River (Yentna Drainages)									
Chelatna Lake, 92	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Chelatna Lake, 93	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Chelatna Lake pooled	200	1.0000	0.0000	200	1.0000	0.0000	200	1.0000	0.0000
Yentna River West Fork, 92	100	1.0000	0.0000	99	1.0000	0.0000	100	1.0000	0.0000
Yentna River West Fork, 93	97	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Yentna River West Fork pooled	197	1.0000	0.0000	199	1.0000	0.0000	200	1.0000	0.0000
Hewitt Lake, 92	49	1.0000	0.0000	49	1.0000	0.0000	50	1.0000	0.0000
Hewitt/Whiskey Lakes, 93	50	1.0000	0.0000	50	1.0000	0.0000	50	1.0000	0.0000
Hewitt/Whiskey Lakes pooled	99	1.0000	0.0000	99	1.0000	0.0000	100	1.0000	0.0000
Shell Lake, 92	100	1.0000	0.0000	99	1.0000	0.0000	100	1.0000	0.0000
Shell Lake, 93	100	1.0000	0.0000	100	1.0000	0.0000	93	1.0000	0.0000
Shell Lake pooled	200	1.0000	0.0000	199	1.0000	0.0000	193	1.0000	0.0000
Trinity Lake, 92	80	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Trinity/Movie Lakes, 93	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Trinity/Movie Lakes pooled	180	1.0000	0.0000	200	1.0000	0.0000	200	1.0000	0.0000
Judd Lake, 92	80	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Judd Lake, 93	100	1.0000	0.0000	99	1.0000	0.0000	100	1.0000	0.0000
Judd Lake pooled	180	1.0000	0.0000	199	1.0000	0.0000	200	1.0000	0.0000
Susitna River (Mainstem Drainages)									
Byers Lake, 93	98	1.0000	0.0000	99	1.0000	0.0000	100	1.0000	0.0000
Stephan Lake, 93	99	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Stephan Lake, site 1, 1994	25	1.0000	0.0000	21	1.0000	0.0000	25	1.0000	0.0000
Stephan Lake site 2, 94	25	1.0000	0.0000	25	1.0000	0.0000	25	1.0000	0.0000
Stephan Lake pooled (not site 1)	124	1.0000	0.0000	125	1.0000	0.0000	125	1.0000	0.0000
Larson Lake, 92	80	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Larson Lake, 93	99	1.0000	0.0000	100	1.0000	0.0000	98	1.0000	0.0000
Larson Lake pooled	179	1.0000	0.0000	200	1.0000	0.0000	198	1.0000	0.0000
Birch Creek, 93	67	1.0000	0.0000	65	1.0000	0.0000	66	1.0000	0.0000
Red Shirt Lake, 93	34	1.0000	0.0000	34	1.0000	0.0000	34	1.0000	0.0000
Western Cook Inlet Drainages									
Coal Creek West Fork, 92	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Coal Creek West Fork, 93	100	1.0000	0.0000	100	1.0000	0.0000	96	1.0000	0.0000
Coal Creek West Fork pooled	200	1.0000	0.0000	200	1.0000	0.0000	196	1.0000	0.0000
Chilligan River, 92	99	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Chilligan River, 94	50	1.0000	0.0000	50	1.0000	0.0000	50	1.0000	0.0000
Chilligan River pooled	149	1.0000	0.0000	150	1.0000	0.0000	150	1.0000	0.0000
McArthur River, 93	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Wolverine Creek 93	99	1.0000	0.0000	100	1.0000	0.0000	97	1.0000	0.0000
Crescent River, 92	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Crescent River, 93	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Crescent River pooled	200	1.0000	0.0000	200	1.0000	0.0000	200	1.0000	0.0000
Crescent Lake site 1, 94	50	1.0000	0.0000	50	1.0000	0.0000	50	1.0000	0.0000
Crescent Lake site 2, 94	50	1.0000	0.0000	50	1.0000	0.0000	50	1.0000	0.0000

Appendix A. Continued.

Population	N	*CK-A2** 100	125	N	*CK-B** 100	102	N	*FDH** 100	128
Western Cook Inlet Drainages Continued									
Packers Lake, 92	100	1.0000	0.0000	99	1.0000	0.0000	96	1.0000	0.0000
Packers Lake, 93	83	1.0000	0.0000	83	1.0000	0.0000	80	1.0000	0.0000
Packers Lake pooled	183	1.0000	0.0000	182	1.0000	0.0000	176	1.0000	0.0000
Kasilof River Drainage									
Bear Creek, 92	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Bear Creek, 93	99	1.0000	0.0000	99	1.0000	0.0000	100	1.0000	0.0000
Bear Creek pooled	199	1.0000	0.0000	199	1.0000	0.0000	200	1.0000	0.0000
Moose Creek, Tustumena, 92	96	1.0000	0.0000	100	1.0000	0.0000	92	1.0000	0.0000
Moose Creek, Tustumena, 93	100	1.0000	0.0000	99	1.0000	0.0000	100	1.0000	0.0000
Moose Creek, Tustumena pooled	196	1.0000	0.0000	199	1.0000	0.0000	192	1.0000	0.0000
Glacier Flat Creek, 92	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Glacier Flat Creek, 93	100	0.9950	0.0050	100	1.0000	0.0000	100	1.0000	0.0000
Glacier Flat Creek, 94	94	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Glacier Flat Creek pooled	294	0.9983	0.0017	300	1.0000	0.0000	300	1.0000	0.0000
Nikolai Creek, 92	80	1.0000	0.0000	100	0.9900	0.0100	100	1.0000	0.0000
Nikolai Creek, 93	100	1.0000	0.0000	100	0.9950	0.0050	99	1.0000	0.0000
Nikolai Creek pooled	180	1.0000	0.0000	200	0.9925	0.0075	199	1.0000	0.0000
Tustumena Lake site 1, 94	50	1.0000	0.0000	44	1.0000	0.0000	50	1.0000	0.0000
Tustumena Lake site 2, 94	50	1.0000	0.0000	50	1.0000	0.0000	50	1.0000	0.0000
Tustumena Lake pooled	100	1.0000	0.0000	94	1.0000	0.0000	100	1.0000	0.0000
Seepage Creek, 94	100	1.0000	0.0000	97	1.0000	0.0000	98	1.0000	0.0000
Northeastern Cook Inlet Drainages									
Bishop Creek, 93	98	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Daniels Lake, 92	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Daniels Lake, 93	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Daniels Lake pooled	200	1.0000	0.0000	200	1.0000	0.0000	200	1.0000	0.0000
Knik Arm (Little Susitna River Drainages)									
Nancy Lake, 93	100	1.0000	0.0000	100	1.0000	0.0000	100	1.0000	0.0000
Cottonwood Creek, 93	99	1.0000	0.0000	100	1.0000	0.0000	96	1.0000	0.0000
Fish Creek, 92	100	1.0000	0.0000	100	1.0000	0.0000	40	1.0000	0.0000
Fish Creek, 93	98	1.0000	0.0000	100	1.0000	0.0000	99	1.0000	0.0000
Fish Creek, 94	100	1.0000	0.0000	100	1.0000	0.0000	97	1.0000	0.0000
Fish Creek 93/94 pooled	198	1.0000	0.0000	200	1.0000	0.0000	196	1.0000	0.0000

Appendix A. Continued.

Population	N	*GAPDH-2** 100	50	208	N	*G3PDH-1,2** -100	-150	-175	0
Kenai River Drainage									
Russian River, above/early, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Russian River, above/late, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Russian River, above/late, 93	98	0.9949	0.0051	0.0000	96	1.0000	0.0000	0.0000	0.0000
Russian River, above/late pooled	198	0.9975	0.0025	0.0000	196	1.0000	0.0000	0.0000	0.0000
Russian River, below, 93	99	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000	0.0000
Ptarmigan Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Ptarmigan Creek, 93	97	1.0000	0.0000	0.0000	98	1.0000	0.0000	0.0000	0.0000
Ptarmigan Creek pooled	197	1.0000	0.0000	0.0000	198	1.0000	0.0000	0.0000	0.0000
Tern Lake, 92	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Tern Lake, 93	100	1.0000	0.0000	0.0000	100	0.9975	0.0000	0.0025	0.0000
Tern Lake pooled	150	1.0000	0.0000	0.0000	150	0.9983	0.0000	0.0017	0.0000
Quartz Creek, 92	96	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000	0.0000
Quartz Creek, 93	99	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000	0.0000
Quartz Creek pooled	195	1.0000	0.0000	0.0000	198	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, 92	99	1.0000	0.0000	0.0000	100	0.9950	0.0050	0.0000	0.0000
Btwn Kenai/Skilak Lakes, early, 93	96	0.9844	0.0156	0.0000	99	0.9949	0.0000	0.0000	0.0051
Btwn Kenai/Skilak Lakes, late, 93	99	0.9848	0.0152	0.0000	97	0.9974	0.0026	0.0000	0.0000
Btwn Ken/Ski Lakes site 6 pooled	294	0.9898	0.0102	0.0000	296	0.9958	0.0025	0.0000	0.0017
Btwn Kenai/Skilak Lakes site 1, early, 94	50	0.9800	0.0200	0.0000	50	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, late, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 1 pooled	100	0.9900	0.0100	0.0000	100	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, early, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, late, 94	50	1.0000	0.0000	0.0000	50	0.9950	0.0050	0.0000	0.0000
Btwn Ken/Ski Lakes site 2 pooled	100	1.0000	0.0000	0.0000	100	0.9975	0.0025	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, early, 94	100	0.9950	0.0050	0.0000	100	0.9975	0.0025	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, late, 94	50	0.9900	0.0100	0.0000	50	1.0000	0.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 3 pooled	150	0.9933	0.0067	0.0000	150	0.9983	0.0017	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 4, late, 94	50	0.9900	0.0100	0.0000	50	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 5, late, 94	100	1.0000	0.0000	0.0000	100	0.9975	0.0025	0.0000	0.0000
Hidden Creek, 92	100	0.9900	0.0000	0.0100	100	1.0000	0.0000	0.0000	0.0000
Hidden Creek, 93	100	0.9750	0.0000	0.0250	100	1.0000	0.0000	0.0000	0.0000
Hidden Creek pooled	200	0.9825	0.0000	0.0175	200	1.0000	0.0000	0.0000	0.0000
Skilak Lake Outlet, 92	99	0.9848	0.0152	0.0000	100	0.9975	0.0025	0.0000	0.0000
Skilak Lake Outlet, early, 93	100	0.9900	0.0100	0.0000	100	1.0000	0.0000	0.0000	0.0000
Skilak Lake Outlet, late, 93	100	0.9800	0.0200	0.0000	96	1.0000	0.0000	0.0000	0.0000
Skilak Lake Outlet, early, 94	200	0.9950	0.0050	0.0000	200	0.9988	0.0012	0.0000	0.0000
Skilak Lake Outlet, late, 94	197	0.9949	0.0051	0.0000	200	1.0000	0.0000	0.0000	0.0000
Skilak Lake Outlet pooled	696	0.9907	0.0093	0.0000	696	0.9993	0.0007	0.0000	0.0000
Moose Creek, Kenai, 93	98	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Moose Creek, Kenai, 94	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Moose Creek, Kenai pooled	198	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000

Appendix A. Continued.

Population	N	*GAPDH-2** 100	50	208	N	*G3PDH-1,2** -100	-150	-175	0
Susitna River (Yentna Drainages)									
Chelatna Lake, 92	96	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Chelatna Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Chelatna Lake pooled	196	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000
Yentna River West Fork, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Yentna River West Fork, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Yentna River West Fork pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000
Hewitt Lake, 92	50	1.0000	0.0000	0.0000	49	1.0000	0.0000	0.0000	0.0000
Hewitt/Whiskey Lakes, 93	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Hewitt/Whiskey Lakes pooled	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000	0.0000
Shell Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Shell Lake, 93	99	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000	0.0000
Shell Lake pooled	199	1.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000	0.0000
Trinity Lake, 92	98	1.0000	0.0000	0.0000	20	1.0000	0.0000	0.0000	0.0000
Trinity/Movie Lakes, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Trinity/Movie Lakes pooled	198	1.0000	0.0000	0.0000	120	1.0000	0.0000	0.0000	0.0000
Judd Lake, 92	100	1.0000	0.0000	0.0000	20	1.0000	0.0000	0.0000	0.0000
Judd Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Judd Lake pooled	200	1.0000	0.0000	0.0000	120	1.0000	0.0000	0.0000	0.0000
Susitna River (Mainstem Drainages)									
Byers Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Stephan Lake, 93	99	0.9545	0.0455	0.0000	100	1.0000	0.0000	0.0000	0.0000
Stephan Lake, site 1, 1994	25	1.0000	0.0000	0.0000	25	1.0000	0.0000	0.0000	0.0000
Stephan Lake site 2, 94	25	0.9400	0.0600	0.0000	25	1.0000	0.0000	0.0000	0.0000
Stephan Lake pooled (not site 1)	124	0.9516	0.0484	0.0000	125	1.0000	0.0000	0.0000	0.0000
Larson Lake, 92	100	1.0000	0.0000	0.0000	20	1.0000	0.0000	0.0000	0.0000
Larson Lake, 93	100	1.0000	0.0000	0.0000	76	1.0000	0.0000	0.0000	0.0000
Larson Lake pooled	200	1.0000	0.0000	0.0000	96	1.0000	0.0000	0.0000	0.0000
Birch Creek, 93	67	1.0000	0.0000	0.0000	67	1.0000	0.0000	0.0000	0.0000
Red Shirt Lake, 93	33	1.0000	0.0000	0.0000	34	1.0000	0.0000	0.0000	0.0000
Western Cook Inlet Drainages									
Coal Creek West Fork, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Coal Creek West Fork, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Coal Creek West Fork pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000
Chilligan River, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Chilligan River, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Chilligan River pooled	150	1.0000	0.0000	0.0000	150	1.0000	0.0000	0.0000	0.0000
McArthur River, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Wolverine Creek 93	95	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000	0.0000
Crescent River, 92	100	0.9950	0.0000	0.0050	100	1.0000	0.0000	0.0000	0.0000
Crescent River, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000	0.0000
Crescent River pooled	200	0.9975	0.0000	0.0025	199	1.0000	0.0000	0.0000	0.0000
Crescent Lake site 1, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Crescent Lake site 2, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000

Appendix A. Continued.

Population	N	*GAPDH-2** 100	50	208	N	*G3PDH-1,2** -100	-150	-175	0
Western Cook Inlet Drainages Continued									
Packers Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Packers Lake, 93	83	1.0000	0.0000	0.0000	83	1.0000	0.0000	0.0000	0.0000
Packers Lake pooled	183	1.0000	0.0000	0.0000	183	1.0000	0.0000	0.0000	0.0000
Kasilof River Drainage									
Bear Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Bear Creek, 93	98	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000	0.0000
Bear Creek pooled	198	1.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000	0.0000
Moose Creek, Tustumena, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Moose Creek, Tustumena, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Moose Creek, Tustumena pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000
Glacier Flat Creek, 92	96	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Glacier Flat Creek, 93	100	0.9950	0.0050	0.0000	100	1.0000	0.0000	0.0000	0.0000
Glacier Flat Creek, 94	99	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000	0.0000
Glacier Flat Creek pooled	295	0.9983	0.0017	0.0000	299	1.0000	0.0000	0.0000	0.0000
Nikolai Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Nikolai Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Nikolai Creek pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000
Tustumena Lake site 1, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Tustumena Lake site 2, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Tustumena Lake pooled	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Seepage Creek, 94	100	1.0000	0.0000	0.0000	98	1.0000	0.0000	0.0000	0.0000
Northeastern Cook Inlet Drainages									
Bishop Creek, 93	99	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000	0.0000
Daniels Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Daniels Lake, 93	99	1.0000	0.0000	0.0000	98	1.0000	0.0000	0.0000	0.0000
Daniels Lake pooled	199	1.0000	0.0000	0.0000	198	1.0000	0.0000	0.0000	0.0000
Knik Arm (Little Susitna River Drainages)									
Nancy Lake, 93	99	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Cottonwood Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Fish Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Fish Creek, 93	99	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Fish Creek, 94	95	1.0000	0.0000	0.0000	96	1.0000	0.0000	0.0000	0.0000
Fish Creek 93/94 pooled	194	1.0000	0.0000	0.0000	196	1.0000	0.0000	0.0000	0.0000

Appendix A. Continued.

Population	N	*G3PDH-4** 100	108	N	*GPI-B1,2** 100	132	143
Kenai River Drainage							
Russian River, above/early, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Russian River, above/late, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Russian River, above/late, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Russian River, above/late pooled	200	1.0000	0.0000	200	1.0000	0.0000	0.0000
Russian River, below, 93	99	1.0000	0.0000	100	1.0000	0.0000	0.0000
Ptarmigan Creek, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Ptarmigan Creek, 93	98	1.0000	0.0000	97	1.0000	0.0000	0.0000
Ptarmigan Creek pooled	198	1.0000	0.0000	197	1.0000	0.0000	0.0000
Tern Lake, 92	48	1.0000	0.0000	50	1.0000	0.0000	0.0000
Tern Lake, 93	100	1.0000	0.0000	98	1.0000	0.0000	0.0000
Tern Lake pooled	148	1.0000	0.0000	148	1.0000	0.0000	0.0000
Quartz Creek, 92	100	1.0000	0.0000	99	0.9924	0.0076	0.0000
Quartz Creek, 93	99	1.0000	0.0000	100	0.9950	0.0050	0.0000
Quartz Creek pooled	199	1.0000	0.0000	199	0.9937	0.0063	0.0000
Btwn Kenai/Skilak Lakes, 92	80	1.0000	0.0000	100	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, early, 93	97	1.0000	0.0000	97	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, late, 93	97	1.0000	0.0000	99	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 6 pooled	274	1.0000	0.0000	296	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, early, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, late, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 1 pooled	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, early, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, late, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 2 pooled	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, early, 94	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, late, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 3 pooled	150	1.0000	0.0000	150	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 4, late, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 5, late, 94	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Hidden Creek, 92	100	1.0000	0.0000	100	0.9950	0.0050	0.0000
Hidden Creek, 93	100	1.0000	0.0000	100	0.9975	0.0025	0.0000
Hidden Creek pooled	200	1.0000	0.0000	200	0.9962	0.0038	0.0000
Skilak Lake Outlet, 92	79	1.0000	0.0000	100	1.0000	0.0000	0.0000
Skilak Lake Outlet, early, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Skilak Lake Outlet, late, 93	100	1.0000	0.0000	100	0.9975	0.0025	0.0000
Skilak Lake Outlet, early, 94	200	1.0000	0.0000	199	1.0000	0.0000	0.0000
Skilak Lake Outlet, late, 94	200	1.0000	0.0000	199	1.0000	0.0000	0.0000
Skilak Lake Outlet pooled	679	1.0000	0.0000	698	0.9996	0.0004	0.0000
Moose Creek, Kenai, 93	99	1.0000	0.0000	98	0.9974	0.0026	0.0000
Moose Creek, Kenai, 94	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Moose Creek, Kenai pooled	199	1.0000	0.0000	198	0.9987	0.0013	0.0000

Appendix A. Continued.

Population	N	*G3PDH-4** 100	108	N	*GPI-B1,2** 100	132	143
Susitna River (Yentna Drainages)							
Chelatna Lake, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Chelatna Lake, 93	100	1.0000	0.0000	99	1.0000	0.0000	0.0000
Chelatna Lake pooled	200	1.0000	0.0000	199	1.0000	0.0000	0.0000
Yentna River West Fork, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Yentna River West Fork, 93	100	1.0000	0.0000	96	1.0000	0.0000	0.0000
Yentna River West Fork pooled	200	1.0000	0.0000	196	1.0000	0.0000	0.0000
Hewitt Lake, 92	50	1.0000	0.0000	50	1.0000	0.0000	0.0000
Hewitt/Whiskey Lakes, 93	50	1.0000	0.0000	50	1.0000	0.0000	0.0000
Hewitt/Whiskey Lakes pooled	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Shell Lake, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Shell Lake, 93	99	1.0000	0.0000	100	1.0000	0.0000	0.0000
Shell Lake pooled	199	1.0000	0.0000	200	1.0000	0.0000	0.0000
Trinity Lake, 92	98	1.0000	0.0000	100	1.0000	0.0000	0.0000
Trinity/Movie Lakes, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Trinity/Movie Lakes pooled	198	1.0000	0.0000	200	1.0000	0.0000	0.0000
Judd Lake, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Judd Lake, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Judd Lake pooled	200	1.0000	0.0000	200	1.0000	0.0000	0.0000
Susitna River (Mainstem Drainages)							
Byers Lake, 93	100	1.0000	0.0000	100	0.9975	0.0000	0.0025
Stephan Lake, 93	99	1.0000	0.0000	100	1.0000	0.0000	0.0000
Stephan Lake, site 1, 1994	25	1.0000	0.0000	25	1.0000	0.0000	0.0000
Stephan Lake site 2, 94	25	1.0000	0.0000	25	1.0000	0.0000	0.0000
Stephan Lake pooled (not site 1)	124	1.0000	0.0000	125	1.0000	0.0000	0.0000
Larson Lake, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Larson Lake, 93	100	1.0000	0.0000	99	0.9975	0.0025	0.0000
Larson Lake pooled	200	1.0000	0.0000	199	0.9987	0.0013	0.0000
Birch Creek, 93	67	1.0000	0.0000	67	1.0000	0.0000	0.0000
Red Shirt Lake, 93	34	1.0000	0.0000	34	1.0000	0.0000	0.0000
Western Cook Inlet Drainages							
Coal Creek West Fork, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Coal Creek West Fork, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Coal Creek West Fork pooled	200	1.0000	0.0000	200	1.0000	0.0000	0.0000
Chilligan River, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Chilligan River, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000
Chilligan River pooled	150	1.0000	0.0000	150	1.0000	0.0000	0.0000
McArthur River, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Wolverine Creek 93	100	1.0000	0.0000	99	0.9975	0.0025	0.0000
Crescent River, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Crescent River, 93	99	1.0000	0.0000	100	1.0000	0.0000	0.0000
Crescent River pooled	199	1.0000	0.0000	200	1.0000	0.0000	0.0000
Crescent Lake site 1, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000
Crescent Lake site 2, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000

Appendix A. Continued.

Population	N	*G3PDH-4** 100	108	N	*GPI-B1,2** 100	132	143
Western Cook Inlet Drainages Continued							
Packers Lake, 92	96	1.0000	0.0000	100	1.0000	0.0000	0.0000
Packers Lake, 93	83	1.0000	0.0000	83	1.0000	0.0000	0.0000
Packers Lake pooled	179	1.0000	0.0000	183	1.0000	0.0000	0.0000
Kasilof River Drainage							
Bear Creek, 92	100	0.9950	0.0050	100	0.9675	0.0325	0.0000
Bear Creek, 93	100	0.9900	0.0100	100	0.9750	0.0250	0.0000
Bear Creek pooled	200	0.9925	0.0075	200	0.9712	0.0288	0.0000
Moose Creek, Tustumena, 92	100	0.9950	0.0050	100	0.9625	0.0375	0.0000
Moose Creek, Tustumena, 93	100	0.9950	0.0050	100	0.9625	0.0375	0.0000
Moose Creek, Tustumena pooled	200	0.9950	0.0050	200	0.9625	0.0375	0.0000
Glacier Flat Creek, 92	100	0.9850	0.0150	100	0.9700	0.0300	0.0000
Glacier Flat Creek, 93	100	0.9800	0.0200	100	0.9900	0.0100	0.0000
Glacier Flat Creek, 94	99	0.9798	0.0202	99	0.9975	0.0025	0.0000
Glacier Flat Creek pooled	299	0.9816	0.0184	299	0.9858	0.0142	0.0000
Nikolai Creek, 92	100	0.9900	0.0100	100	0.9575	0.0425	0.0000
Nikolai Creek, 93	100	0.9900	0.0100	100	0.9800	0.0200	0.0000
Nikolai Creek pooled	200	0.9900	0.0100	200	0.9688	0.0312	0.0000
Tustumena Lake site 1, 94	50	0.9900	0.0100	50	1.0000	0.0000	0.0000
Tustumena Lake site 2, 94	49	1.0000	0.0000	50	0.9850	0.0150	0.0000
Tustumena Lake pooled	99	0.9949	0.0051	100	0.9925	0.0075	0.0000
Seepage Creek, 94	100	1.0000	0.0000	100	0.9650	0.0350	0.0000
Northeastern Cook Inlet Drainages							
Bishop Creek, 93	99	1.0000	0.0000	100	1.0000	0.0000	0.0000
Daniels Lake, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Daniels Lake, 93	99	1.0000	0.0000	100	1.0000	0.0000	0.0000
Daniels Lake pooled	199	1.0000	0.0000	200	1.0000	0.0000	0.0000
Knik Arm (Little Susitna River Drainages)							
Nancy Lake, 93	100	1.0000	0.0000	98	1.0000	0.0000	0.0000
Cottonwood Creek, 93	99	1.0000	0.0000	100	1.0000	0.0000	0.0000
Fish Creek, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Fish Creek, 93	100	0.9900	0.0100	100	0.9975	0.0025	0.0000
Fish Creek, 94	95	1.0000	0.0000	100	1.0000	0.0000	0.0000
Fish Creek 93/94 pooled	195	0.9949	0.0051	200	0.9988	0.0012	0.0000

Appendix A. Continued.

Population	N	*GPI-A** 100	94	107	N	*mIDHP-1** 100	33	77
Kenai River Drainage								
Russian River, above/early, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Russian River, above/late, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Russian River, above/late, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Russian River, above/late pooled	200	1.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000
Russian River, below, 93	99	0.9848	0.0152	0.0000	99	1.0000	0.0000	0.0000
Ptarmigan Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Ptarmigan Creek, 93	97	1.0000	0.0000	0.0000	98	1.0000	0.0000	0.0000
Ptarmigan Creek pooled	197	1.0000	0.0000	0.0000	198	1.0000	0.0000	0.0000
Tern Lake, 92	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Tern Lake, 93	98	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Tern Lake pooled	148	1.0000	0.0000	0.0000	150	1.0000	0.0000	0.0000
Quartz Creek, 92	99	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Quartz Creek, 93	99	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Quartz Creek pooled	198	1.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, early, 93	97	1.0000	0.0000	0.0000	97	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, late, 93	99	0.9949	0.0000	0.0051	97	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 6 pooled	296	0.9983	0.0000	0.0017	294	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, early, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, late, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 1 pooled	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, early, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, late, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 2 pooled	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, early, 94	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, late, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 3 pooled	150	1.0000	0.0000	0.0000	149	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 4, late, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 5, late, 94	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Hidden Creek, 92	100	0.9900	0.0000	0.0100	100	1.0000	0.0000	0.0000
Hidden Creek, 93	100	0.9850	0.0000	0.0150	100	1.0000	0.0000	0.0000
Hidden Creek pooled	200	0.9875	0.0000	0.0125	200	1.0000	0.0000	0.0000
Skilak Lake Outlet, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Skilak Lake Outlet, early, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Skilak Lake Outlet, late, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Skilak Lake Outlet, early, 94	199	1.0000	0.0000	0.0000	200	0.9975	0.0025	0.0000
Skilak Lake Outlet, late, 94	199	1.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000
Skilak Lake Outlet pooled	698	1.0000	0.0000	0.0000	698	0.9993	0.0007	0.0000
Moose Creek, Kenai, 93	98	1.0000	0.0000	0.0000	98	1.0000	0.0000	0.0000
Moose Creek, Kenai, 94	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Moose Creek, Kenai pooled	198	1.0000	0.0000	0.0000	198	1.0000	0.0000	0.0000

Appendix A. Continued.

Population	N	*GPI-A** 100	94	107	N	*mIDHP-1** 100	33	77
Susitna River (Yentna Drainages)								
Chelatna Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Chelatna Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Chelatna Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Yentna River West Fork, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Yentna River West Fork, 93	96	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Yentna River West Fork pooled	196	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Hewitt Lake, 92	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Hewitt/Whiskey Lakes, 93	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Hewitt/Whiskey Lakes pooled	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Shell Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Shell Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Shell Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Trinity Lake, 92	100	1.0000	0.0000	0.0000	98	1.0000	0.0000	0.0000
Trinity/Movie Lakes, 93	100	1.0000	0.0000	0.0000	98	1.0000	0.0000	0.0000
Trinity/Movie Lakes pooled	200	1.0000	0.0000	0.0000	196	1.0000	0.0000	0.0000
Judd Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Judd Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Judd Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Susitna River (Mainstem Drainages)								
Byers Lake, 93	98	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Stephan Lake, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Stephan Lake, site 1, 1994	25	1.0000	0.0000	0.0000	25	1.0000	0.0000	0.0000
Stephan Lake site 2, 94	25	1.0000	0.0000	0.0000	25	1.0000	0.0000	0.0000
Stephan Lake pooled (not site 1)	125	1.0000	0.0000	0.0000	124	1.0000	0.0000	0.0000
Larson Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Larson Lake, 93	99	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Larson Lake pooled	199	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Birch Creek, 93	67	1.0000	0.0000	0.0000	67	1.0000	0.0000	0.0000
Red Shirt Lake, 93	34	1.0000	0.0000	0.0000	34	1.0000	0.0000	0.0000
Western Cook Inlet Drainages								
Coal Creek West Fork, 92	100	1.0000	0.0000	0.0000	100	0.9900	0.0100	0.0000
Coal Creek West Fork, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Coal Creek West Fork pooled	200	1.0000	0.0000	0.0000	199	0.9950	0.0050	0.0000
Chilligan River, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Chilligan River, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Chilligan River pooled	150	1.0000	0.0000	0.0000	150	1.0000	0.0000	0.0000
McArthur River, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Wolverine Creek 93	99	1.0000	0.0000	0.0000	97	0.9948	0.0052	0.0000
Crescent River, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Crescent River, 93	100	1.0000	0.0000	0.0000	98	1.0000	0.0000	0.0000
Crescent River pooled	200	1.0000	0.0000	0.0000	198	1.0000	0.0000	0.0000
Crescent Lake site 1, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Crescent Lake site 2, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000

Appendix A. Continued.

Population	N	*GPI-A** 100	94	107	N	*mIDHP-1** 100	33	77
Western Cook Inlet Drainages Continued								
Packers Lake, 92	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Packers Lake, 93	83	1.0000	0.0000	0.0000	83	1.0000	0.0000	0.0000
Packers Lake pooled	183	1.0000	0.0000	0.0000	182	1.0000	0.0000	0.0000
Kasilof River Drainage								
Bear Creek, 92	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Bear Creek, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Bear Creek pooled	200	1.0000	0.0000	0.0000	198	1.0000	0.0000	0.0000
Moose Creek, Tustumena, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Moose Creek, Tustumena, 93	100	1.0000	0.0000	0.0000	100	0.9900	0.0000	0.0100
Moose Creek, Tustumena pooled	200	1.0000	0.0000	0.0000	200	0.9950	0.0000	0.0050
Glacier Flat Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Glacier Flat Creek, 93	100	1.0000	0.0000	0.0000	100	0.9750	0.0000	0.0250
Glacier Flat Creek, 94	99	1.0000	0.0000	0.0000	100	0.9800	0.0000	0.0200
Glacier Flat Creek pooled	299	1.0000	0.0000	0.0000	300	0.9850	0.0000	0.0150
Nikolai Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Nikolai Creek, 93	100	1.0000	0.0000	0.0000	99	0.9949	0.0000	0.0051
Nikolai Creek pooled	200	1.0000	0.0000	0.0000	199	0.9975	0.0000	0.0025
Tustumena Lake site 1, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Tustumena Lake site 2, 94	50	1.0000	0.0000	0.0000	46	1.0000	0.0000	0.0000
Tustumena Lake pooled	100	1.0000	0.0000	0.0000	96	1.0000	0.0000	0.0000
Seepage Creek, 94	100	1.0000	0.0000	0.0000	100	0.9900	0.0000	0.0100
Northeastern Cook Inlet Drainages								
Bishop Creek, 93	99	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Daniels Lake, 92	100	0.9600	0.0000	0.0400	100	1.0000	0.0000	0.0000
Daniels Lake, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Daniels Lake pooled	200	0.9800	0.0000	0.0200	199	1.0000	0.0000	0.0000
Knik Arm (Little Susitna River Drainages)								
Nancy Lake, 93	98	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Cottonwood Creek, 93	100	1.0000	0.0000	0.0000	97	1.0000	0.0000	0.0000
Fish Creek, 92	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Fish Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Fish Creek, 94	100	1.0000	0.0000	0.0000	95	1.0000	0.0000	0.0000
Fish Creek 93/94 pooled	200	1.0000	0.0000	0.0000	195	1.0000	0.0000	0.0000

Appendix A. Continued.

Population	N	*sIDHP-1** 100	72	84	61	94	N	*sIDHP-2** 100	75	92
Kenai River Drainage										
Russian River, above/early, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Russian River, above/late, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Russian River, above/late, 93	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Russian River, above/late pooled	200	1.0000	0.0000	0.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Russian River, below, 93	98	0.9847	0.0051	0.0051	0.0051	0.0000	99	1.0000	0.0000	0.0000
Ptarmigan Creek, 92	100	0.9900	0.0050	0.0050	0.0000	0.0000	100	1.0000	0.0000	0.0000
Ptarmigan Creek, 93	98	0.9796	0.0051	0.0153	0.0000	0.0000	98	1.0000	0.0000	0.0000
Ptarmigan Creek pooled	198	0.9848	0.0051	0.0101	0.0000	0.0000	198	1.0000	0.0000	0.0000
Tern Lake, 92	50	1.0000	0.0000	0.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Tern Lake, 93	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Tern Lake pooled	150	1.0000	0.0000	0.0000	0.0000	0.0000	150	1.0000	0.0000	0.0000
Quartz Creek, 92	100	0.9950	0.0050	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Quartz Creek, 93	100	0.9950	0.0000	0.0000	0.0050	0.0000	107	0.9293	0.0000	0.0047
Quartz Creek pooled	200	0.9950	0.0025	0.0000	0.0025	0.0000	207	0.9634	0.0000	0.0024
Btwn Kenai/Skilak Lakes, 92	100	0.9950	0.0050	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, early, 93	97	0.9948	0.0000	0.0052	0.0000	0.0000	97	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, late, 93	100	0.9950	0.0000	0.0050	0.0000	0.0000	100	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 6 pooled	297	0.9949	0.0017	0.0034	0.0000	0.0000	297	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, early, 94	50	1.0000	0.0000	0.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, late, 94	50	1.0000	0.0000	0.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 1 pooled	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, early, 94	50	0.9700	0.0000	0.0300	0.0000	0.0000	49	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, late, 94	50	0.9900	0.0000	0.0100	0.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 2 pooled	100	0.9800	0.0000	0.0200	0.0000	0.0000	99	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, early, 94	100	0.9900	0.0000	0.0100	0.0000	0.0000	99	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, late, 94	50	1.0000	0.0000	0.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 3 pooled	150	0.9933	0.0000	0.0067	0.0000	0.0000	149	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 4, late, 94	50	1.0000	0.0000	0.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 5, late, 94	99	1.0000	0.0000	0.0000	0.0000	0.0000	98	1.0000	0.0000	0.0000
Hidden Creek, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	117	0.8268	0.0256	0.0000
Hidden Creek, 93	100	1.0000	0.0000	0.0000	0.0000	0.0000	114	0.8586	0.0175	0.0000
Hidden Creek pooled	200	1.0000	0.0000	0.0000	0.0000	0.0000	231	0.8425	0.0216	0.0000
Skilak Lake Outlet, 92	99	0.9899	0.0000	0.0051	0.0051	0.0000	99	1.0000	0.0000	0.0000
Skilak Lake Outlet, early, 93	100	0.9900	0.0050	0.0000	0.0050	0.0000	100	1.0000	0.0000	0.0000
Skilak Lake Outlet, late, 93	99	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Skilak Lake Outlet, early, 94	200	0.9925	0.0025	0.0025	0.0000	0.0025	199	1.0000	0.0000	0.0000
Skilak Lake Outlet, late, 94	198	0.9924	0.0051	0.0025	0.0000	0.0000	198	1.0000	0.0000	0.0000
Skilak Lake Outlet pooled	696	0.9928	0.0029	0.0022	0.0014	0.0007	696	1.0000	0.0000	0.0000
Moose Creek, Kenai, 93	100	0.9950	0.0000	0.0050	0.0000	0.0000	114	0.8586	0.0000	0.0175
Moose Creek, Kenai, 94	100	0.9950	0.0050	0.0000	0.0000	0.0000	121	0.7879	0.0000	0.0371
Moose Creek, Kenai pooled	200	0.9950	0.0025	0.0025	0.0000	0.0000	235	0.8222	0.0000	0.0276

Appendix A. Continued.

Population	N	100	72	*sIDHP-1** 84	61	94	N	100	*sIDHP-2** 75	92
Susitna River (Yentna Drainages)										
Chelatna Lake, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Chelatna Lake, 93	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Chelatna Lake pooled	200	1.0000	0.0000	0.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Yentna River West Fork, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Yentna River West Fork, 93	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Yentna River West Fork pooled	200	1.0000	0.0000	0.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Hewitt Lake, 92	50	1.0000	0.0000	0.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Hewitt/Whiskey Lakes, 93	50	1.0000	0.0000	0.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Hewitt/Whiskey Lakes pooled	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Shell Lake, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Shell Lake, 93	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Shell Lake pooled	200	1.0000	0.0000	0.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Trinity Lake, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Trinity/Movie Lakes, 93	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Trinity/Movie Lakes pooled	200	1.0000	0.0000	0.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Judd Lake, 92	99	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Judd Lake, 93	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Judd Lake pooled	199	1.0000	0.0000	0.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Susitna River (Mainstem Drainages)										
Byers Lake, 93	99	1.0000	0.0000	0.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Stephan Lake, 93	94	0.8723	0.0000	0.0000	0.0000	0.1277	99	1.0000	0.0000	0.0000
Stephan Lake, site 1, 1994	25	0.9400	0.0000	0.0000	0.0000	0.0600	25	1.0000	0.0000	0.0000
Stephan Lake site 2, 94	25	0.8800	0.0000	0.0000	0.0000	0.1200	25	1.0000	0.0000	0.0000
Stephan Lake pooled (not site 1)	119	0.8739	0.0000	0.0000	0.0000	0.1261	124	1.0000	0.0000	0.0000
Larson Lake, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Larson Lake, 93	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Larson Lake pooled	200	1.0000	0.0000	0.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Birch Creek, 93	67	1.0000	0.0000	0.0000	0.0000	0.0000	67	1.0000	0.0000	0.0000
Red Shirt Lake, 93	34	1.0000	0.0000	0.0000	0.0000	0.0000	34	1.0000	0.0000	0.0000
Western Cook Inlet Drainages										
Coal Creek West Fork, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Coal Creek West Fork, 93	97	1.0000	0.0000	0.0000	0.0000	0.0000	97	1.0000	0.0000	0.0000
Coal Creek West Fork pooled	197	1.0000	0.0000	0.0000	0.0000	0.0000	197	1.0000	0.0000	0.0000
Chilligan River, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Chilligan River, 94	50	1.0000	0.0000	0.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Chilligan River pooled	150	1.0000	0.0000	0.0000	0.0000	0.0000	150	1.0000	0.0000	0.0000
McArthur River, 93	100	0.9850	0.0000	0.0000	0.0000	0.0150	100	1.0000	0.0000	0.0000
Wolverine Creek 93	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Crescent River, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Crescent River, 93	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Crescent River pooled	200	1.0000	0.0000	0.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Crescent Lake site 1, 94	50	0.9900	0.0000	0.0000	0.0100	0.0000	50	1.0000	0.0000	0.0000
Crescent Lake site 2, 94	50	1.0000	0.0000	0.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000

Appendix A. Continued.

Population	N	*sIDHP-1** 100	72	84	61	94	N	*sIDHP-2** 100	75	92
Western Cook Inlets Drainages Continued										
Packers Lake, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	98	1.0000	0.0000	0.0000
Packers Lake, 93	82	1.0000	0.0000	0.0000	0.0000	0.0000	82	1.0000	0.0000	0.0000
Packers Lake pooled	182	1.0000	0.0000	0.0000	0.0000	0.0000	180	1.0000	0.0000	0.0000
Kasilof River Drainage										
Bear Creek, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Bear Creek, 93	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Bear Creek pooled	200	1.0000	0.0000	0.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Moose Creek, Tustumena, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Moose Creek, Tustumena, 93	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Moose Creek, Tustumena pooled	200	1.0000	0.0000	0.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Glacier Flat Creek, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Glacier Flat Creek, 93	97	1.0000	0.0000	0.0000	0.0000	0.0000	97	1.0000	0.0000	0.0000
Glacier Flat Creek, 94	100	1.0000	0.0000	0.0000	0.0000	0.0000	70	1.0000	0.0000	0.0000
Glacier Flat Creek pooled	297	1.0000	0.0000	0.0000	0.0000	0.0000	267	1.0000	0.0000	0.0000
Nikolai Creek, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Nikolai Creek, 93	100	0.9950	0.0050	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Nikolai Creek pooled	200	0.9975	0.0025	0.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Tustumena Lake site 1, 94	50	0.9900	0.0100	0.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Tustumena Lake site 2, 94	50	1.0000	0.0000	0.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Tustumena Lake pooled	100	0.9950	0.0050	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Seepage Creek, 94	100	0.9950	0.0050	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Northeastern Cook Inlet Drainages										
Bishop Creek, 93	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Daniels Lake, 92	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Daniels Lake, 93	98	1.0000	0.0000	0.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Daniels Lake pooled	198	1.0000	0.0000	0.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000
Knik Arm (Little Susitna River Drainages)										
Nancy Lake, 93	100	1.0000	0.0000	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Cottonwood Creek, 93	99	1.0000	0.0000	0.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Fish Creek, 92	97	0.9742	0.0258	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Fish Creek, 93	100	0.9850	0.0150	0.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Fish Creek, 94	98	0.9796	0.0204	0.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Fish Creek 93/94 pooled	198	0.9823	0.0177	0.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000

Appendix A. Continued.

Population	N	*LDH-A2** 100	150	N	*LDH-B2** 100	110	85
Kenai River Drainage							
Russian River, above/early, 92	100	1.0000	0.0000	99	0.4949	0.5051	0.0000
Russian River, above/late, 92	100	1.0000	0.0000	100	0.6800	0.3200	0.0000
Russian River, above/late, 93	96	1.0000	0.0000	97	0.7320	0.2680	0.0000
Russian River, above/late pooled	196	1.0000	0.0000	197	0.7056	0.2944	0.0000
Russian River, below, 93	99	1.0000	0.0000	99	0.9242	0.0758	0.0000
Ptarmigan Creek, 92	100	1.0000	0.0000	100	0.8950	0.1050	0.0000
Ptarmigan Creek, 93	98	1.0000	0.0000	98	0.8827	0.1173	0.0000
Ptarmigan Creek pooled	198	1.0000	0.0000	198	0.8889	0.1111	0.0000
Tern Lake, 92	50	1.0000	0.0000	50	0.8500	0.1500	0.0000
Tern Lake, 93	98	1.0000	0.0000	100	0.8250	0.1750	0.0000
Tern Lake pooled	148	1.0000	0.0000	150	0.8333	0.1667	0.0000
Quartz Creek, 92	99	1.0000	0.0000	100	0.9150	0.0850	0.0000
Quartz Creek, 93	100	1.0000	0.0000	100	0.8600	0.1400	0.0000
Quartz Creek pooled	199	1.0000	0.0000	200	0.8875	0.1125	0.0000
Btwn Kenai/Skilak Lakes, 92	100	1.0000	0.0000	100	0.8700	0.1300	0.0000
Btwn Kenai/Skilak Lakes, early, 93	97	1.0000	0.0000	97	0.8763	0.1237	0.0000
Btwn Kenai/Skilak Lakes, late, 93	95	0.9947	0.0053	97	0.9072	0.0928	0.0000
Btwn Ken/Ski Lakes site 6 pooled	292	0.9983	0.0017	294	0.8844	0.1156	0.0000
Btwn Kenai/Skilak Lakes site 1, early, 94	50	1.0000	0.0000	50	0.8300	0.1700	0.0000
Btwn Kenai/Skilak Lakes site 1, late, 94	50	1.0000	0.0000	50	0.8500	0.1500	0.0000
Btwn Ken/Ski Lakes site 1 pooled	100	1.0000	0.0000	100	0.8400	0.1600	0.0000
Btwn Kenai/Skilak Lakes site 2, early, 94	50	1.0000	0.0000	50	0.8900	0.1100	0.0000
Btwn Kenai/Skilak Lakes site 2, late, 94	50	1.0000	0.0000	50	0.8700	0.1300	0.0000
Btwn Ken/Ski Lakes site 2 pooled	100	1.0000	0.0000	100	0.8800	0.1200	0.0000
Btwn Kenai/Skilak Lakes site 3, early, 94	100	1.0000	0.0000	100	0.9050	0.0950	0.0000
Btwn Kenai/Skilak Lakes site 3, late, 94	50	1.0000	0.0000	50	0.8900	0.1100	0.0000
Btwn Ken/Ski Lakes site 3 pooled	150	1.0000	0.0000	150	0.9000	0.1000	0.0000
Btwn Kenai/Skilak Lakes site 4, late, 94	50	1.0000	0.0000	50	0.8700	0.1300	0.0000
Btwn Kenai/Skilak Lakes site 5, late, 94	100	1.0000	0.0000	100	0.9450	0.0550	0.0000
Hidden Creek, 92	100	1.0000	0.0000	100	0.9650	0.0350	0.0000
Hidden Creek, 93	100	1.0000	0.0000	100	0.9800	0.0200	0.0000
Hidden Creek pooled	200	1.0000	0.0000	200	0.9725	0.0275	0.0000
Skilak Lake Outlet, 92	100	1.0000	0.0000	100	0.9400	0.0600	0.0000
Skilak Lake Outlet, early, 93	100	1.0000	0.0000	100	0.9000	0.1000	0.0000
Skilak Lake Outlet, late, 93	100	1.0000	0.0000	99	0.9192	0.0808	0.0000
Skilak Lake Outlet, early, 94	193	1.0000	0.0000	200	0.9200	0.0800	0.0000
Skilak Lake Outlet, late, 94	198	1.0000	0.0000	200	0.9100	0.0900	0.0000
Skilak Lake Outlet pooled	691	1.0000	0.0000	699	0.9170	0.0830	0.0000
Moose Creek, Kenai, 93	99	1.0000	0.0000	100	0.9050	0.0950	0.0000
Moose Creek, Kenai, 94	100	1.0000	0.0000	100	0.9150	0.0850	0.0000
Moose Creek, Kenai pooled	199	1.0000	0.0000	200	0.9100	0.0900	0.0000

Appendix A. Continued.

Population	N	*LDH-A2** 100	150	N	*LDH-B2** 100	110	85
Susitna River (Yentna Drainages)							
Chelatna Lake, 92	100	1.0000	0.0000	100	0.9450	0.0550	0.0000
Chelatna Lake, 93	100	1.0000	0.0000	100	0.9300	0.0700	0.0000
Chelatna Lake pooled	200	1.0000	0.0000	200	0.9375	0.0625	0.0000
Yentna River West Fork, 92	100	1.0000	0.0000	100	0.8850	0.1150	0.0000
Yentna River West Fork, 93	97	1.0000	0.0000	100	0.9100	0.0900	0.0000
Yentna River West Fork pooled	197	1.0000	0.0000	200	0.8975	0.1025	0.0000
Hewitt Lake, 92	49	1.0000	0.0000	50	1.0000	0.0000	0.0000
Hewitt/Whiskey Lakes, 93	50	1.0000	0.0000	49	0.9796	0.0204	0.0000
Hewitt/Whiskey Lakes pooled	99	1.0000	0.0000	99	0.9899	0.0101	0.0000
Shell Lake, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Shell Lake, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Shell Lake pooled	200	1.0000	0.0000	200	1.0000	0.0000	0.0000
Trinity Lake, 92	99	1.0000	0.0000	100	0.9050	0.0950	0.0000
Trinity/Movie Lakes, 93	100	1.0000	0.0000	100	0.9600	0.0400	0.0000
Trinity/Movie Lakes pooled	199	1.0000	0.0000	200	0.9325	0.0675	0.0000
Judd Lake, 92	100	1.0000	0.0000	100	0.8950	0.1000	0.0050
Judd Lake, 93	97	1.0000	0.0000	100	0.8900	0.1100	0.0000
Judd Lake pooled	197	1.0000	0.0000	200	0.8925	0.1050	0.0025
Susitna River (Mainstem Drainages)							
Byers Lake, 93	95	1.0000	0.0000	100	0.9600	0.0400	0.0000
Stephan Lake, 93	99	1.0000	0.0000	100	0.9000	0.1000	0.0000
Stephan Lake, site 1, 1994	25	1.0000	0.0000	25	0.9000	0.1000	0.0000
Stephan Lake site 2, 94	25	1.0000	0.0000	25	0.9800	0.0200	0.0000
Stephan Lake pooled (not site 1)	124	1.0000	0.0000	125	0.9160	0.0840	0.0000
Larson Lake, 92	100	1.0000	0.0000	100	0.9450	0.0550	0.0000
Larson Lake, 93	96	1.0000	0.0000	99	0.9545	0.0455	0.0000
Larson Lake pooled	196	1.0000	0.0000	199	0.9497	0.0503	0.0000
Birch Creek, 93	63	1.0000	0.0000	67	0.9925	0.0075	0.0000
Red Shirt Lake, 93	33	1.0000	0.0000	34	1.0000	0.0000	0.0000
Western Cook Inlet Drainages							
Coal Creek West Fork, 92	100	1.0000	0.0000	100	0.9900	0.0100	0.0000
Coal Creek West Fork, 93	100	1.0000	0.0000	100	0.9650	0.0350	0.0000
Coal Creek West Fork pooled	200	1.0000	0.0000	200	0.9775	0.0225	0.0000
Chilligan River, 92	100	1.0000	0.0000	100	0.9600	0.0400	0.0000
Chilligan River, 94	50	0.9600	0.0400	50	0.9900	0.0100	0.0000
Chilligan River pooled	150	0.9867	0.0133	150	0.9700	0.0300	0.0000
McArthur River, 93	97	1.0000	0.0000	100	0.8600	0.1400	0.0000
Wolverine Creek 93	99	1.0000	0.0000	100	0.9800	0.0200	0.0000
Crescent River, 92	100	1.0000	0.0000	100	0.9400	0.0600	0.0000
Crescent River, 93	100	1.0000	0.0000	100	0.8950	0.1050	0.0000
Crescent River pooled	200	1.0000	0.0000	200	0.9175	0.0825	0.0000
Crescent Lake site 1, 94	50	1.0000	0.0000	50	0.8900	0.1100	0.0000
Crescent Lake site 2, 94	50	1.0000	0.0000	50	0.9900	0.0100	0.0000

Appendix A. Continued.

Population	N	*LDH-A2** 100	150	N	*LDH-B2** 100	110	85
Western Cook Inlet Drainages Continued							
Packers Lake, 92	99	1.0000	0.0000	99	1.0000	0.0000	0.0000
Packers Lake, 93	82	1.0000	0.0000	83	1.0000	0.0000	0.0000
Packers Lake pooled	181	1.0000	0.0000	182	1.0000	0.0000	0.0000
Kasilof River Drainage							
Bear Creek, 92	100	1.0000	0.0000	100	0.8800	0.1200	0.0000
Bear Creek, 93	100	1.0000	0.0000	100	0.8600	0.1400	0.0000
Bear Creek pooled	200	1.0000	0.0000	200	0.8700	0.1300	0.0000
Moose Creek, Tustumena, 92	100	1.0000	0.0000	100	0.8600	0.1400	0.0000
Moose Creek, Tustumena, 93	97	1.0000	0.0000	100	0.8800	0.1200	0.0000
Moose Creek, Tustumena pooled	197	1.0000	0.0000	200	0.8700	0.1300	0.0000
Glacier Flat Creek, 92	100	1.0000	0.0000	100	0.8800	0.1200	0.0000
Glacier Flat Creek, 93	100	1.0000	0.0000	100	0.8600	0.1400	0.0000
Glacier Flat Creek, 94	99	1.0000	0.0000	100	0.8800	0.1200	0.0000
Glacier Flat Creek pooled	299	1.0000	0.0000	300	0.8733	0.1267	0.0000
Nikolai Creek, 92	100	1.0000	0.0000	100	0.9000	0.1000	0.0000
Nikolai Creek, 93	100	0.9950	0.0050	100	0.8650	0.1350	0.0000
Nikolai Creek pooled	200	0.9975	0.0025	200	0.8825	0.1175	0.0000
Tustumena Lake site 1, 94	50	1.0000	0.0000	50	0.8500	0.1500	0.0000
Tustumena Lake site 2, 94	50	1.0000	0.0000	50	0.9600	0.0400	0.0000
Tustumena Lake pooled	100	1.0000	0.0000	100	0.9050	0.0950	0.0000
Seepage Creek, 94	100	1.0000	0.0000	100	0.8750	0.1250	0.0000
Northeastern Cook Inlet Drainages							
Bishop Creek, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Daniels Lake, 92	99	1.0000	0.0000	100	1.0000	0.0000	0.0000
Daniels Lake, 93	98	1.0000	0.0000	100	1.0000	0.0000	0.0000
Daniels Lake pooled	197	1.0000	0.0000	200	1.0000	0.0000	0.0000
Knik Arm (Little Susitna River Drainages)							
Nancy Lake, 93	100	1.0000	0.0000	100	0.9500	0.0500	0.0000
Cottonwood Creek, 93	99	1.0000	0.0000	100	0.6500	0.3500	0.0000
Fish Creek, 92	100	1.0000	0.0000	100	0.9400	0.0600	0.0000
Fish Creek, 93	97	1.0000	0.0000	100	0.8400	0.1600	0.0000
Fish Creek, 94	100	1.0000	0.0000	100	0.8700	0.1300	0.0000
Fish Creek 93/94 pooled	197	1.0000	0.0000	200	0.8550	0.1450	0.0000

Appendix A. Continued.

Population	N	sMDH-A1,2* 100	64	147	N	sMDH-B1,2* 100	65	120	116
Kenai River Drainage									
Russian River, above/early, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Russian River, above/late, 92	100	1.0000	0.0000	0.0000	100	0.9975	0.0025	0.0000	0.0000
Russian River, above/late, 93	100	1.0000	0.0000	0.0000	100	0.9975	0.0025	0.0000	0.0000
Russian River, above/late pooled	200	1.0000	0.0000	0.0000	200	0.9975	0.0025	0.0000	0.0000
Russian River, below, 93	100	0.9900	0.0025	0.0075	99	1.0000	0.0000	0.0000	0.0000
Ptarmigan Creek, 92	100	0.9950	0.0000	0.0050	100	1.0000	0.0000	0.0000	0.0000
Ptarmigan Creek, 93	98	0.9898	0.0000	0.0102	98	1.0000	0.0000	0.0000	0.0000
Ptarmigan Creek pooled	198	0.9924	0.0000	0.0076	198	1.0000	0.0000	0.0000	0.0000
Tern Lake, 92	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Tern Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Tern Lake pooled	150	1.0000	0.0000	0.0000	150	1.0000	0.0000	0.0000	0.0000
Quartz Creek, 92	100	0.9750	0.0000	0.0250	100	1.0000	0.0000	0.0000	0.0000
Quartz Creek, 93	100	0.9850	0.0000	0.0150	99	1.0000	0.0000	0.0000	0.0000
Quartz Creek pooled	200	0.9800	0.0000	0.0200	199	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, 92	100	0.9850	0.0025	0.0125	100	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, early, 93	99	0.9874	0.0000	0.0126	97	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, late, 93	100	0.9975	0.0000	0.0025	100	1.0000	0.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 6 pooled	299	0.9900	0.0008	0.0092	297	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, early, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, late, 94	50	0.9950	0.0000	0.0050	50	1.0000	0.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 1 pooled	100	0.9975	0.0000	0.0025	100	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, early, 94	50	0.9950	0.0000	0.0050	50	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, late, 94	50	0.9900	0.0050	0.0050	50	1.0000	0.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 2 pooled	100	0.9925	0.0025	0.0050	100	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, early, 94	100	0.9850	0.0000	0.0150	100	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, late, 94	50	0.9850	0.0000	0.0150	50	1.0000	0.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 3 pooled	150	0.9850	0.0000	0.0150	150	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 4, late, 94	50	0.9800	0.0000	0.0200	50	1.0000	0.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 5, late, 94	100	0.9950	0.0000	0.0050	100	1.0000	0.0000	0.0000	0.0000
Hidden Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Hidden Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Hidden Creek pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000
Skilak Lake Outlet, 92	100	0.9975	0.0000	0.0025	100	0.9925	0.0050	0.0025	0.0000
Skilak Lake Outlet, early, 93	100	1.0000	0.0000	0.0000	100	0.9975	0.0025	0.0000	0.0000
Skilak Lake Outlet, late, 93	100	0.9875	0.0000	0.0125	100	1.0000	0.0000	0.0000	0.0000
Skilak Lake Outlet, early, 94	200	0.9850	0.0000	0.0150	200	0.9988	0.0012	0.0000	0.0000
Skilak Lake Outlet, late, 94	200	0.9938	0.0000	0.0062	193	1.0000	0.0000	0.0000	0.0000
Skilak Lake Outlet pooled	700	0.9918	0.0000	0.0082	693	0.9982	0.0014	0.0004	0.0000
Moose Creek, Kenai, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000	0.0000
Moose Creek, Kenai, 94	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Moose Creek, Kenai pooled	200	1.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000	0.0000

Appendix A. Continued.

Population	N	sMDH-A1,2* 100	64	147	N	sMDH-B1,2* 100	65	120	116
Susitna River (Yentna Drainages)									
Chelatna Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Chelatna Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Chelatna Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000
Yentna River West Fork, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Yentna River West Fork, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Yentna River West Fork pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000
Hewitt Lake, 92	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Hewitt/Whiskey Lakes, 93	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Hewitt/Whiskey Lakes pooled	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Shell Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Shell Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Shell Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000
Trinity Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Trinity/Movie Lakes, 93	100	1.0000	0.0000	0.0000	97	1.0000	0.0000	0.0000	0.0000
Trinity/Movie Lakes pooled	200	1.0000	0.0000	0.0000	197	1.0000	0.0000	0.0000	0.0000
Judd Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Judd Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Judd Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000
Susitna River (Mainstem Drainages)									
Byers Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Stephan Lake, 93	100	1.0000	0.0000	0.0000	96	1.0000	0.0000	0.0000	0.0000
Stephan Lake, site 1, 1994	25	1.0000	0.0000	0.0000	25	1.0000	0.0000	0.0000	0.0000
Stephan Lake site 2, 94	25	1.0000	0.0000	0.0000	25	1.0000	0.0000	0.0000	0.0000
Stephan Lake pooled (not site 1)	125	1.0000	0.0000	0.0000	121	1.0000	0.0000	0.0000	0.0000
Larson Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Larson Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Larson Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000
Birch Creek, 93	67	1.0000	0.0000	0.0000	67	1.0000	0.0000	0.0000	0.0000
Red Shirt Lake, 93	34	1.0000	0.0000	0.0000	34	1.0000	0.0000	0.0000	0.0000
Western Cook Inlet Drainages									
Coal Creek West Fork, 92	100	1.0000	0.0000	0.0000	100	0.9600	0.0400	0.0000	0.0000
Coal Creek West Fork, 93	100	1.0000	0.0000	0.0000	100	0.9450	0.0550	0.0000	0.0000
Coal Creek West Fork pooled	200	1.0000	0.0000	0.0000	200	0.9525	0.0475	0.0000	0.0000
Chilligan River, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Chilligan River, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Chilligan River pooled	150	1.0000	0.0000	0.0000	150	1.0000	0.0000	0.0000	0.0000
McArthur River, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Wolverine Creek 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Crescent River, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Crescent River, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Crescent River pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000
Crescent Lake site 1, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Crescent Lake site 2, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000

Appendix A. Continued.

Population	N	*sMDH-A1,2** 100	64	147	N	*sMDH-B1,2** 100	65	120	116
Packers Lake, 92	100	1.0000	0.0000	0.0000	100	0.9800	0.0000	0.0000	0.0200
Packers Lake, 93	83	1.0000	0.0000	0.0000	83	0.9789	0.0060	0.0000	0.0151
Packers Lake pooled	183	1.0000	0.0000	0.0000	183	0.9795	0.0027	0.0000	0.0178
Kasilof River Drainage									
Bear Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Bear Creek, 93	100	0.9975	0.0000	0.0025	99	1.0000	0.0000	0.0000	0.0000
Bear Creek pooled	200	0.9988	0.0000	0.0012	199	1.0000	0.0000	0.0000	0.0000
Moose Creek, Tustumena, 92	100	0.9975	0.0000	0.0025	100	1.0000	0.0000	0.0000	0.0000
Moose Creek, Tustumena, 93	100	0.9975	0.0000	0.0025	100	1.0000	0.0000	0.0000	0.0000
Moose Creek, Tustumena pooled	200	0.9975	0.0000	0.0025	200	1.0000	0.0000	0.0000	0.0000
Glacier Flat Creek, 92	100	1.0000	0.0000	0.0000	100	0.9975	0.0025	0.0000	0.0000
Glacier Flat Creek, 93	100	0.9950	0.0000	0.0050	100	1.0000	0.0000	0.0000	0.0000
Glacier Flat Creek, 94	100	1.0000	0.0000	0.0000	100	0.9975	0.0025	0.0000	0.0000
Glacier Flat Creek pooled	300	0.9983	0.0000	0.0017	300	0.9983	0.0017	0.0000	0.0000
Nikolai Creek, 92	100	0.9925	0.0000	0.0075	100	1.0000	0.0000	0.0000	0.0000
Nikolai Creek, 93	100	0.9950	0.0000	0.0050	100	1.0000	0.0000	0.0000	0.0000
Nikolai Creek pooled	200	0.9938	0.0000	0.0062	200	1.0000	0.0000	0.0000	0.0000
Tustumena Lake site 1, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Tustumena Lake site 2, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000	0.0000
Tustumena Lake pooled	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Seepage Creek, 94	100	0.9975	0.0000	0.0025	100	1.0000	0.0000	0.0000	0.0000
Northeastern Cook Inlet Drainages									
Bishop Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Daniels Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Daniels Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Daniels Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000
Knik Arm (Little Susitna River Drainages)									
Nancy Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Cottonwood Creek, 93	100	1.0000	0.0000	0.0000	98	1.0000	0.0000	0.0000	0.0000
Fish Creek, 92	100	0.9825	0.0000	0.0175	100	1.0000	0.0000	0.0000	0.0000
Fish Creek, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000	0.0000
Fish Creek, 94	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000	0.0000
Fish Creek 93/94 pooled	200	1.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000	0.0000

Appendix A. Continued.

Population	N	*mMEP-1** 100	80	58	N	*MPI** 100	105
Kenai River Drainage							
Russian River, above/early, 92	92	1.0000	0.0000	0.0000	100	1.0000	0.0000
Russian River, above/late, 92	99	1.0000	0.0000	0.0000	100	1.0000	0.0000
Russian River, above/late, 93	99	1.0000	0.0000	0.0000	100	1.0000	0.0000
Russian River, above/late pooled	198	1.0000	0.0000	0.0000	200	1.0000	0.0000
Russian River, below, 93	99	1.0000	0.0000	0.0000	100	0.9950	0.0050
Ptarmigan Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Ptarmigan Creek, 93	98	1.0000	0.0000	0.0000	98	0.9949	0.0051
Ptarmigan Creek pooled	198	1.0000	0.0000	0.0000	198	0.9975	0.0025
Tern Lake, 92	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Tern Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Tern Lake pooled	150	1.0000	0.0000	0.0000	150	1.0000	0.0000
Quartz Creek, 92	99	1.0000	0.0000	0.0000	100	0.9900	0.0100
Quartz Creek, 93	99	1.0000	0.0000	0.0000	99	1.0000	0.0000
Quartz Creek pooled	198	1.0000	0.0000	0.0000	199	0.9950	0.0050
Btwn Kenai/Skilak Lakes, 92	86	1.0000	0.0000	0.0000	100	1.0000	0.0000
Btwn Kenai/Skilak Lakes, early, 93	97	1.0000	0.0000	0.0000	97	1.0000	0.0000
Btwn Kenai/Skilak Lakes, late, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000
Btwn Ken/Ski Lakes site 6 pooled	283	1.0000	0.0000	0.0000	296	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, early, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, late, 94	50	1.0000	0.0000	0.0000	50	0.9800	0.0200
Btwn Ken/Ski Lakes site 1 pooled	100	1.0000	0.0000	0.0000	100	0.9900	0.0100
Btwn Kenai/Skilak Lakes site 2, early, 94	50	1.0000	0.0000	0.0000	50	0.9700	0.0300
Btwn Kenai/Skilak Lakes site 2, late, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Btwn Ken/Ski Lakes site 2 pooled	100	1.0000	0.0000	0.0000	100	0.9850	0.0150
Btwn Kenai/Skilak Lakes site 3, early, 94	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, late, 94	50	1.0000	0.0000	0.0000	50	0.9900	0.0100
Btwn Ken/Ski Lakes site 3 pooled	150	1.0000	0.0000	0.0000	150	0.9967	0.0033
Btwn Kenai/Skilak Lakes site 4, late, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 5, late, 94	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Hidden Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Hidden Creek 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Hidden Creek pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Skilak Lake Outlet, 92	46	1.0000	0.0000	0.0000	100	0.9950	0.0050
Skilak Lake Outlet, early, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Skilak Lake Outlet, late, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Skilak Lake Outlet, early, 94	200	0.9975	0.0000	0.0025	199	0.9925	0.0075
Skilak Lake Outlet, late, 94	195	1.0000	0.0000	0.0000	188	0.9973	0.0027
Skilak Lake Outlet pooled	641	0.9992	0.0000	0.0008	687	0.9964	0.0036
Moose Creek, Kenai, 93	99	1.0000	0.0000	0.0000	100	1.0000	0.0000
Moose Creek, Kenai, 94	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Moose Creek, Kenai pooled	199	1.0000	0.0000	0.0000	200	1.0000	0.0000

Appendix A. Continued.

Population	N	*mMEP-1** 100	80	58	N	*MPI** 100	105
Susitna River (Yentna Drainages)							
Chelatna Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Chelatna Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Chelatna Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Yentna River West Fork, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Yentna River West Fork, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Yentna River West Fork pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Hewitt Lake, 92	49	1.0000	0.0000	0.0000	50	1.0000	0.0000
Hewitt/Whiskey Lakes, 93	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Hewitt/Whiskey Lakes pooled	99	1.0000	0.0000	0.0000	100	1.0000	0.0000
Shell Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Shell Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Shell Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Trinity Lake, 92	98	1.0000	0.0000	0.0000	100	1.0000	0.0000
Trinity/Movie Lakes, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Trinity/Movie Lakes pooled	198	1.0000	0.0000	0.0000	200	1.0000	0.0000
Judd Lake, 92	99	1.0000	0.0000	0.0000	100	1.0000	0.0000
Judd Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Judd Lake pooled	199	1.0000	0.0000	0.0000	200	1.0000	0.0000
Susitna River (Mainstem Drainages)							
Byers Lake, 93	94	1.0000	0.0000	0.0000	100	1.0000	0.0000
Stephan Lake, 93	98	1.0000	0.0000	0.0000	99	1.0000	0.0000
Stephan Lake, site 1, 1994	25	1.0000	0.0000	0.0000	25	1.0000	0.0000
Stephan Lake site 2, 94	25	1.0000	0.0000	0.0000	25	1.0000	0.0000
Stephan Lake pooled (not site 1)	123	1.0000	0.0000	0.0000	124	1.0000	0.0000
Larson Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Larson Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Larson Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Birch Creek, 93	67	1.0000	0.0000	0.0000	67	1.0000	0.0000
Red Shirt Lake, 93	33	1.0000	0.0000	0.0000	34	1.0000	0.0000
Western Cook Inlet Drainages							
Coal Creek West Fork, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Coal Creek West Fork, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Coal Creek West Fork pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Chilligan River, 92	98	1.0000	0.0000	0.0000	100	1.0000	0.0000
Chilligan River, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Chilligan River pooled	148	1.0000	0.0000	0.0000	150	1.0000	0.0000
McArthur River, 93	97	1.0000	0.0000	0.0000	100	1.0000	0.0000
Wolverine Creek 93	99	1.0000	0.0000	0.0000	100	1.0000	0.0000
Crescent River, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Crescent River, 93	100	1.0000	0.0000	0.0000	97	1.0000	0.0000
Crescent River pooled	200	1.0000	0.0000	0.0000	197	1.0000	0.0000
Crescent Lake site 1, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Crescent Lake site 2, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000

Appendix A. Continued.

Population	N	*mMEP-1** 100	80	58	N	*MPI** 100	105
Western Cook Inlet Drainages							
Packers Lake, 92	98	0.9490	0.0510	0.0000	99	1.0000	0.0000
Packers Lake, 93	81	0.9568	0.0432	0.0000	83	1.0000	0.0000
Packers Lake pooled	179	0.9525	0.0475	0.0000	182	1.0000	0.0000
Kasilof River Drainage							
Bear Creek, 92	100	0.9950	0.0050	0.0000	100	1.0000	0.0000
Bear Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Bear Creek pooled	200	0.9975	0.0025	0.0000	200	1.0000	0.0000
Moose Creek, Tustumena, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Moose Creek, Tustumena, 93	99	1.0000	0.0000	0.0000	99	1.0000	0.0000
Moose Creek, Tustumena pooled	199	1.0000	0.0000	0.0000	199	1.0000	0.0000
Glacier Flat Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Glacier Flat Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Glacier Flat Creek, 94	100	1.0000	0.0000	0.0000	98	1.0000	0.0000
Glacier Flat Creek pooled	300	1.0000	0.0000	0.0000	298	1.0000	0.0000
Nikolai Creek, 92	98	1.0000	0.0000	0.0000	100	1.0000	0.0000
Nikolai Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Nikolai Creek pooled	198	1.0000	0.0000	0.0000	200	1.0000	0.0000
Tustumena Lake site 1, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Tustumena Lake site 2, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Tustumena Lake pooled	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Seepage Creek, 94	100	1.0000	0.0000	0.0000	99	1.0000	0.0000
Northeastern Cook Inlet Drainages							
Bishop Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Daniels Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Daniels Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Daniels Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Knik Arm (Little Susitna River Drainages)							
Nancy Lake, 93	99	1.0000	0.0000	0.0000	98	1.0000	0.0000
Cottonwood Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Fish Creek, 92	98	1.0000	0.0000	0.0000	100	1.0000	0.0000
Fish Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Fish Creek, 94	94	1.0000	0.0000	0.0000	100	1.0000	0.0000
Fish Creek 93/94 pooled	194	1.0000	0.0000	0.0000	200	1.0000	0.0000

Population	N	*PEPA** 100	106	92	N	*PEPB-1** 100	130	163
Kenai River Drainage								
Russian River, above/early, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Russian River, above/late, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Russian River, above/late, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Russian River, above/late pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Russian River, below, 93	100	1.0000	0.0000	0.0000	100	0.9950	0.0050	0.0000
Ptarmigan Creek, 92	100	1.0000	0.0000	0.0000	100	0.9800	0.0200	0.0000
Ptarmigan Creek, 93	98	0.9898	0.0102	0.0000	98	0.9898	0.0102	0.0000
Ptarmigan Creek pooled	198	0.9949	0.0051	0.0000	198	0.9848	0.0152	0.0000
Tern Lake, 92	50	1.0000	0.0000	0.0000	50	0.9400	0.0600	0.0000
Tern Lake, 93	100	0.9950	0.0050	0.0000	99	0.9646	0.0354	0.0000
Tern Lake pooled	150	0.9967	0.0033	0.0000	149	0.9564	0.0436	0.0000
Quartz Creek, 92	100	0.9750	0.0100	0.0150	100	0.9850	0.0150	0.0000
Quartz Creek, 93	100	0.9900	0.0000	0.0100	95	0.9842	0.0158	0.0000
Quartz Creek pooled	200	0.9825	0.0050	0.0125	195	0.9846	0.0154	0.0000
Btwn Kenai/Skilak Lakes, 92	100	0.9900	0.0000	0.0100	98	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, early, 93	97	0.9794	0.0052	0.0155	97	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, late, 93	100	0.9900	0.0000	0.0100	100	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 6 pooled	297	0.9865	0.0017	0.0118	295	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, early, 94	50	0.9900	0.0000	0.0100	50	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, late, 94	50	0.9900	0.0000	0.0100	50	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 1 pooled	100	0.9900	0.0000	0.0100	100	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, early, 94	50	0.9900	0.0100	0.0000	49	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, late, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 2 pooled	100	0.9950	0.0050	0.0000	99	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, early, 94	100	0.9600	0.0150	0.0250	100	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, late, 94	50	0.9800	0.0000	0.0200	50	1.0000	0.0000	0.0000
Btwn Ken/Ski Lakes site 3 pooled	150	0.9667	0.0100	0.0233	150	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 4, late, 94	50	0.9800	0.0000	0.0200	49	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 5, late, 94	100	0.9950	0.0000	0.0050	100	1.0000	0.0000	0.0000
Hidden Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Hidden Creek, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Hidden Creek pooled	200	1.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000
Skilak Lake Outlet, 92	100	0.9850	0.0000	0.0150	99	1.0000	0.0000	0.0000
Skilak Lake Outlet, early, 93	100	0.9900	0.0000	0.0100	100	1.0000	0.0000	0.0000
Skilak Lake Outlet, late, 93	100	0.9950	0.0000	0.0050	100	1.0000	0.0000	0.0000
Skilak Lake Outlet, early, 94	200	0.9750	0.0025	0.0225	198	1.0000	0.0000	0.0000
Skilak Lake Outlet, late, 94	200	0.9900	0.0000	0.0100	200	1.0000	0.0000	0.0000
Skilak Lake Outlet pooled	700	0.9857	0.0007	0.0136	697	1.0000	0.0000	0.0000
Moose Creek, Kenai, 93	100	1.0000	0.0000	0.0000	100	0.9950	0.0000	0.0050
Moose Creek, Kenai, 94	100	1.0000	0.0000	0.0000	94	1.0000	0.0000	0.0000
Moose Creek, Kenai pooled	200	1.0000	0.0000	0.0000	194	0.9974	0.0000	0.0026

Appendix A. Continued.

Population	N	*PEPA** 100	106	92	N	*PEPB-1*• 100	130	163
Susitna River (Yentna Drainages)								
Chelatna Lake, 92	97	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Chelatna Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Chelatna Lake pooled	197	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Yentna River West Fork, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Yentna River West Fork, 93	100	1.0000	0.0000	0.0000	97	1.0000	0.0000	0.0000
Yentna River West Fork pooled	200	1.0000	0.0000	0.0000	197	1.0000	0.0000	0.0000
Hewitt Lake, 92	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Hewitt/Whiskey Lakes, 93	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Hewitt/Whiskey Lakes pooled	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Shell Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Shell Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Shell Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Trinity Lake, 92	100	1.0000	0.0000	0.0000	100	0.8600	0.1400	0.0000
Trinity/Movie Lakes, 93	99	1.0000	0.0000	0.0000	100	0.8350	0.1650	0.0000
Trinity/Movie Lakes pooled	199	1.0000	0.0000	0.0000	200	0.8475	0.1525	0.0000
Judd Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Judd Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Judd Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Susitna River (Mainstem Drainages)								
Byers Lake, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Stephan Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Stephan Lake, site 1, 1994	25	1.0000	0.0000	0.0000	25	1.0000	0.0000	0.0000
Stephan Lake site 2, 94	25	1.0000	0.0000	0.0000	23	1.0000	0.0000	0.0000
Stephan Lake pooled (not site 1)	125	1.0000	0.0000	0.0000	123	1.0000	0.0000	0.0000
Larson Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Larson Lake, 93	100	1.0000	0.0000	0.0000	96	1.0000	0.0000	0.0000
Larson Lake pooled	200	1.0000	0.0000	0.0000	196	1.0000	0.0000	0.0000
Birch Creek, 93	67	1.0000	0.0000	0.0000	67	1.0000	0.0000	0.0000
Red Shirt Lake, 93	34	1.0000	0.0000	0.0000	34	1.0000	0.0000	0.0000
Western Cook Inlet Drainages								
Coal Creek West Fork, 92	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Coal Creek West Fork, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Coal Creek West Fork pooled	200	1.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000
Chilligan River, 92	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Chilligan River, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Chilligan River pooled	150	1.0000	0.0000	0.0000	149	1.0000	0.0000	0.0000
McArthur River, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Wolverine Creek 93	100	0.9950	0.0050	0.0000	99	1.0000	0.0000	0.0000
Crescent River, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Crescent River, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Crescent River pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000
Crescent Lake site 1, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Crescent Lake site 2, 94	50	1.0000	0.0000	0.0000	47	1.0000	0.0000	0.0000

Appendix A. Continued.

Population	N	*PEPA** 100	106	92	N	*PEPB-1** 100	130	163
Western Cook Inlet Drainages Continued								
Packers Lake, 92	99	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Packers Lake, 93	83	1.0000	0.0000	0.0000	83	1.0000	0.0000	0.0000
Packers Lake pooled	182	1.0000	0.0000	0.0000	182	1.0000	0.0000	0.0000
Kasilof River Drainage								
Bear Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Bear Creek, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Bear Creek pooled	200	1.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000
Moose Creek, Tustumena, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Moose Creek, Tustumena, 93	97	1.0000	0.0000	0.0000	94	1.0000	0.0000	0.0000
Moose Creek, Tustumena pooled	197	1.0000	0.0000	0.0000	194	1.0000	0.0000	0.0000
Glacier Flat Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Glacier Flat Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Glacier Flat Creek, 94	98	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Glacier Flat Creek pooled	298	1.0000	0.0000	0.0000	299	1.0000	0.0000	0.0000
Nikolai Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Nikolai Creek, 93	100	0.9950	0.0000	0.0050	100	1.0000	0.0000	0.0000
Nikolai Creek pooled	200	0.9975	0.0000	0.0025	200	1.0000	0.0000	0.0000
Tustumena Lake site 1, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000	0.0000
Tustumena Lake site 2, 94	50	0.9900	0.0100	0.0000	50	1.0000	0.0000	0.0000
Tustumena Lake pooled	100	0.9950	0.0050	0.0000	100	1.0000	0.0000	0.0000
Seepage Creek, 94	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Northeastern Cook Inlet Drainages								
Bishop Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Daniels Lake, 92	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Daniels Lake, 93	100	1.0000	0.0000	0.0000	97	1.0000	0.0000	0.0000
Daniels Lake pooled	200	1.0000	0.0000	0.0000	196	1.0000	0.0000	0.0000
Knik Arm (Little Susitna River Drainages)								
Nancy Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Cottonwood Creek, 93	100	1.0000	0.0000	0.0000	99	1.0000	0.0000	0.0000
Fish Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Fish Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000	0.0000
Fish Creek, 94	100	1.0000	0.0000	0.0000	97	1.0000	0.0000	0.0000
Fish Creek 93/94 pooled	200	1.0000	0.0000	0.0000	197	1.0000	0.0000	0.0000

Appendix A. Continued.

Population	N	*PEPC** 100	105	N	*PEPD-1** 100	113	94
Kenai River Drainage							
Russian River, above/early, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Russian River, above/late, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Russian River, above/late, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Russian River, above/late pooled	200	1.0000	0.0000	200	1.0000	0.0000	0.0000
Russian River, below, 93	100	1.0000	0.0000	99	0.9747	0.0253	0.0000
Ptarmigan Creek, 92	100	0.9950	0.0050	100	0.9850	0.0150	0.0000
Ptarmigan Creek, 93	98	1.0000	0.0000	98	0.9847	0.0153	0.0000
Ptarmigan Creek pooled	198	0.9975	0.0025	198	0.9848	0.0152	0.0000
Tern Lake, 92	50	0.9900	0.0100	48	1.0000	0.0000	0.0000
Tern Lake, 93	99	1.0000	0.0000	99	1.0000	0.0000	0.0000
Tern Lake pooled	149	0.9966	0.0034	147	1.0000	0.0000	0.0000
Quartz Creek, 92	100	0.9950	0.0050	100	1.0000	0.0000	0.0000
Quartz Creek, 93	100	1.0000	0.0000	99	1.0000	0.0000	0.0000
Quartz Creek pooled	200	0.9975	0.0025	199	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, 92	100	0.9950	0.0050	100	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, early, 93	97	1.0000	0.0000	96	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes, late, 93	98	1.0000	0.0000	100	0.9950	0.0050	0.0000
Btwn Ken/Ski Lakes site 6 pooled	295	0.9983	0.0017	296	0.9983	0.0017	0.0000
Btwn Kenai/Skilak Lakes site 1, early, 94	50	0.9900	0.0100	50	1.0000	0.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, late, 94	50	0.9900	0.0100	50	0.9700	0.0300	0.0000
Btwn Ken/Ski Lakes site 1 pooled	100	0.9900	0.0100	100	0.9850	0.0150	0.0000
Btwn Kenai/Skilak Lakes site 2, early, 94	50	0.9900	0.0100	50	0.9800	0.0200	0.0000
Btwn Kenai/Skilak Lakes site 2, late, 94	50	1.0000	0.0000	50	0.9800	0.0200	0.0000
Btwn Ken/Ski Lakes site 2 pooled	100	0.9950	0.0050	100	0.9800	0.0200	0.0000
Btwn Kenai/Skilak Lakes site 3, early, 94	100	0.9900	0.0100	100	0.9900	0.0100	0.0000
Btwn Kenai/Skilak Lakes site 3, late, 94	50	0.9900	0.0100	50	0 9900	0.0100	0.0000
Btwn Ken/Ski Lakes site 3 pooled	150	0.9900	0.0100	150	0.9900	0.0100	0.0000
Btwn Kenai/Skilak Lakes site 4, late, 94	50	1.0000	0.0000	50	0.9700	0.0300	0.0000
Btwn Kenai/Skilak Lakes site 5, late, 94	100	1.0000	0.0000	100	0.9800	0.0200	0.0000
Hidden Creek, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Hidden Creek, 93	100	1.0000	0.0000	99	1.0000	0.0000	0.0000
Hidden Creek pooled	200	1.0000	0.0000	199	1.0000	0.0000	0.0000
Skilak Lake Outlet, 92	99	1.0000	0.0000	100	0.9900	0.0100	0.0000
Skilak Lake Outlet, early, 93	100	0.9850	0.0150	100	1.0000	0.0000	0.0000
Skilak Lake Outlet, late, 93	99	0.9899	0.0101	99	1.0000	0.0000	0.0000
Skilak Lake Outlet, early, 94	200	0.9975	0.0025	200	0.9950	0.0050	0.0000
Skilak Lake Outlet, late, 94	196	1.0000	0.0000	196	0.9949	0.0051	0.0000
Skilak Lake Outlet pooled	694	0.9957	0.0043	695	0.9957	0.0043	0.0000
Moose Creek, Kenai, 93	98	0.9847	0.0153	99	1.0000	0.0000	0.0000
Moose Creek, Kenai, 94	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Moose Creek, Kenai pooled	198	0.9924	0.0076	199	1.0000	0.0000	0.0000

Appendix A. Continued.

Population	*PEPC** N	100	105	*PEPD-1** N	100	113	94
Susitna River (Yentna Drainages)							
Chelatna Lake, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Chelatna Lake, 93	99	1.0000	0.0000	100	1.0000	0.0000	0.0000
Chelatna Lake pooled	199	1.0000	0.0000	200	1.0000	0.0000	0.0000
Yentna River West Fork, 92	99	1.0000	0.0000	100	0.9900	0.0100	0.0000
Yentna River West Fork, 93	100	0.9900	0.0100	100	1.0000	0.0000	0.0000
Yentna River West Fork pooled	199	0.9950	0.0050	200	0.9950	0.0050	0.0000
Hewitt Lake, 92	49	0.8571	0.1429	50	1.0000	0.0000	0.0000
Hewitt/Whiskey Lakes, 93	50	0.8900	0.1100	50	1.0000	0.0000	0.0000
Hewitt/Whiskey Lakes pooled	99	0.8737	0.1263	100	1.0000	0.0000	0.0000
Shell Lake, 92	98	0.6837	0.3163	100	1.0000	0.0000	0.0000
Shell Lake, 93	88	0.6875	0.3125	100	1.0000	0.0000	0.0000
Shell Lake pooled	186	0.6855	0.3145	200	1.0000	0.0000	0.0000
Trinity Lake, 92	99	1.0000	0.0000	100	1.0000	0.0000	0.0000
Trinity/Movie Lakes, 93	98	0.9643	0.0357	100	1.0000	0.0000	0.0000
Trinity/Movie Lakes pooled	197	0.9822	0.0178	200	1.0000	0.0000	0.0000
Judd Lake, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Judd Lake, 93	99	1.0000	0.0000	100	1.0000	0.0000	0.0000
Judd Lake pooled	199	1.0000	0.0000	200	1.0000	0.0000	0.0000
Susitna River (Mainstem Drainages)							
Byers Lake, 93	98	0.9949	0.0051	99	1.0000	0.0000	0.0000
Stephan Lake, 93	99	0.8333	0.1667	100	1.0000	0.0000	0.0000
Stephan Lake, site 1, 1994	25	0.8800	0.1200	25	1.0000	0.0000	0.0000
Stephan Lake site 2, 94	25	0.8200	0.1800	25	1.0000	0.0000	0.0000
Stephan Lake pooled (not site 1)	124	0.8306	0.1694	125	1.0000	0.0000	0.0000
Larson Lake, 92	100	0.9950	0.0050	100	1.0000	0.0000	0.0000
Larson Lake, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Larson Lake pooled	200	0.9975	0.0025	200	1.0000	0.0000	0.0000
Birch Creek, 93	67	0.9701	0.0299	67	1.0000	0.0000	0.0000
Red Shirt Lake, 93	34	0.8971	0.1029	33	1.0000	0.0000	0.0000
Western Cook Inlet Drainages							
Coal Creek West Fork, 92	100	1.0000	0.0000	100	0.9950	0.0000	0.0050
Coal Creek West Fork, 93	100	1.0000	0.0000	99	1.0000	0.0000	0.0000
Coal Creek West Fork pooled	200	1.0000	0.0000	199	0.9975	0.0000	0.0025
Chilligan River, 92	99	1.0000	0.0000	100	1.0000	0.0000	0.0000
Chilligan River, 94	50	0.9700	0.0300	50	1.0000	0.0000	0.0000
Chilligan River pooled	149	0.9899	0.0101	150	1.0000	0.0000	0.0000
McArthur River, 93	98	0.9541	0.0459	100	1.0000	0.0000	0.0000
Wolverine Creek 93	99	1.0000	0.0000	100	1.0000	0.0000	0.0000
Crescent River, 92	100	0.9650	0.0350	100	1.0000	0.0000	0.0000
Crescent River, 93	99	0.9545	0.0455	100	1.0000	0.0000	0.0000
Crescent River pooled	199	0.9598	0.0402	200	1.0000	0.0000	0.0000
Crescent Lake site 1, 94	50	0.9600	0.0400	50	1.0000	0.0000	0.0000
Crescent Lake site 2, 94	50	0.9000	0.1000	50	1.0000	0.0000	0.0000

Appendix A. Continued.

Population	N	*PEPC** 100	105	N	*PEPD-1** 100	113	94
Western Cook Inlet Drainages Continued							
Packers Lake, 92	99	1.0000	0.0000	100	1.0000	0.0000	0.0000
Packers Lake, 93	82	1.0000	0.0000	83	1.0000	0.0000	0.0000
Packers Lake pooled	181	1.0000	0.0000	183	1.0000	0.0000	0.0000
Kasilof River Drainage							
Bear Creek, 92	100	0.9900	0.0100	100	1.0000	0.0000	0.0000
Bear Creek, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Bear Creek pooled	200	0.9950	0.0050	200	1.0000	0.0000	0.0000
Moose Creek, Tustumena, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000
Moose Creek, Tustumena, 93	98	1.0000	0.0000	100	1.0000	0.0000	0.0000
Moose Creek, Tustumena pooled	198	1.0000	0.0000	200	1.0000	0.0000	0.0000
Glacier Flat Creek, 92	100	0.9600	0.0400	100	1.0000	0.0000	0.0000
Glacier Flat Creek, 93	100	0.9600	0.0400	100	1.0000	0.0000	0.0000
Glacier Flat Creek, 94	100	0.9900	0.0100	100	0.9950	0.0050	0.0000
Glacier Flat Creek pooled	300	0.9700	0.0300	300	0.9983	0.0017	0.0000
Nikolai Creek, 92	100	0.9800	0.0200	100	0.9950	0.0050	0.0000
Nikolai Creek, 93	100	0.9550	0.0450	100	0.9950	0.0050	0.0000
Nikolai Creek pooled	200	0.9675	0.0325	200	0.9950	0.0050	0.0000
Tustumena Lake site 1, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000
Tustumena Lake site 2, 94	49	0.9898	0.0102	50	1.0000	0.0000	0.0000
Tustumena Lake pooled	99	0.9949	0.0051	100	1.0000	0.0000	0.0000
Seepage Creek, 94	91	0.9890	0.0110	99	1.0000	0.0000	0.0000
Northeastern Cook Inlet Drainages							
Bishop Creek, 93	100	1.0000	0.0000	99	1.0000	0.0000	0.0000
Daniels Lake, 92	99	1.0000	0.0000	100	1.0000	0.0000	0.0000
Daniels Lake, 93	100	1.0000	0.0000	99	1.0000	0.0000	0.0000
Daniels Lake pooled	199	1.0000	0.0000	199	1.0000	0.0000	0.0000
Knik Arm (Little Susitna River Drainages)							
Nancy Lake, 93	99	0.9697	0.0303	100	1.0000	0.0000	0.0000
Cottonwood Creek, 93	97	0.8866	0.1134	99	1.0000	0.0000	0.0000
Fish Creek, 92	100	0.8950	0.1050	100	1.0000	0.0000	0.0000
Fish Creek, 93	100	0.9400	0.0600	100	0.9950	0.0000	0.0050
Fish Creek, 94	99	0.8687	0.1313	98	1.0000	0.0000	0.0000
Fish Creek 93/94 pooled	199	0.9045	0.0955	198	0.9975	0.0000	0.0025

Appendix A. Continued.

Population	N	*PEPLT** 100	88	114	N	*PGDH** 100	90
Kenai River Drainage							
Russian River, above/early, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Russian River, above/late, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Russian River, above/late, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Russian River, above/late pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Russian River, below, 93	100	0.9850	0.0050	0.0100	99	1.0000	0.0000
Ptarmigan Creek, 92	100	0.9750	0.0000	0.0250	100	1.0000	0.0000
Ptarmigan Creek, 93	98	0.9949	0.0051	0.0000	98	1.0000	0.0000
Ptarmigan Creek pooled	198	0.9848	0.0025	0.0126	198	1.0000	0.0000
Tern Lake, 92	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Tern Lake, 93	99	0.9646	0.0354	0.0000	100	1.0000	0.0000
Tern Lake pooled	149	0.9765	0.0235	0.0000	150	1.0000	0.0000
Quartz Creek, 92	98	0.9796	0.0051	0.0153	100	1.0000	0.0000
Quartz Creek, 93	98	0.9643	0.0255	0.0102	100	1.0000	0.0000
Quartz Creek pooled	196	0.9719	0.0153	0.0128	200	1.0000	0.0000
Btwn Kenai/Skilak Lakes, 92	100	0.9750	0.0150	0.0100	100	1.0000	0.0000
Btwn Kenai/Skilak Lakes, early, 93	97	0.9845	0.0052	0.0103	97	1.0000	0.0000
Btwn Kenai/Skilak Lakes, late, 93	100	0.9450	0.0100	0.0450	100	1.0000	0.0000
Btwn Ken/Ski Lakes site 6 pooled	297	0.9680	0.0101	0.0219	297	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, early, 94	50	0.9500	0.0200	0.0300	50	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, late, 94	50	0.9700	0.0100	0.0200	50	1.0000	0.0000
Btwn Ken/Ski Lakes site 1 pooled	100	0.9600	0.0150	0.0250	100	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, early, 94	50	0.9700	0.0300	0.0000	50	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, late, 94	50	0.9900	0.0100	0.0000	50	1.0000	0.0000
Btwn Ken/Ski Lakes site 2 pooled	100	0.9800	0.0200	0.0000	100	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, early, 94	100	0.9800	0.0050	0.0150	100	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, late, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Btwn Ken/Ski Lakes site 3 pooled	150	0.9867	0.0033	0.0100	150	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 4, late, 94	50	0.9900	0.0100	0.0000	50	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 5, late, 94	100	0.9800	0.0050	0.0150	100	1.0000	0.0000
Hidden Creek, 92	100	0.9150	0.0850	0.0000	100	1.0000	0.0000
Hidden Creek, 93	100	0.8900	0.1100	0.0000	100	1.0000	0.0000
Hidden Creek pooled	200	0.9025	0.0975	0.0000	200	1.0000	0.0000
Skilak Lake Outlet, 92	100	0.9950	0.0000	0.0050	100	1.0000	0.0000
Skilak Lake Outlet, early, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Skilak Lake Outlet, late, 93	100	0.9850	0.0100	0.0050	100	1.0000	0.0000
Skilak Lake Outlet, early, 94	199	0.9925	0.0025	0.0050	200	1.0000	0.0000
Skilak Lake Outlet, late, 94	197	0.9949	0.0025	0.0025	200	1.0000	0.0000
Skilak Lake Outlet pooled	696	0.9935	0.0029	0.0036	700	1.0000	0.0000
Moose Creek, Kenai, 93	99	0.9949	0.0051	0.0000	100	1.0000	0.0000
Moose Creek, Kenai, 94	95	1.0000	0.0000	0.0000	100	1.0000	0.0000
Moose Creek, Kenai pooled	194	0.9974	0.0026	0.0000	200	1.0000	0.0000

Appendix A. Continued.

Population	N	*PEPLT** 100	88	114	N	*PGDH** 100	90
Susitna River (Yentna Drainages)							
Chelatna Lake, 92	97	0.9948	0.0052	0.0000	100	1.0000	0.0000
Chelatna Lake, 93	98	0.9949	0.0051	0.0000	100	1.0000	0.0000
Chelatna Lake pooled	195	0.9949	0.0051	0.0000	200	1.0000	0.0000
Yentna River West Fork, 92	100	0.9850	0.0150	0.0000	100	1.0000	0.0000
Yentna River West Fork, 93	99	0.9596	0.0404	0.0000	100	1.0000	0.0000
Yentna River West Fork pooled	199	0.9724	0.0276	0.0000	200	1.0000	0.0000
Hewitt Lake, 92	49	1.0000	0.0000	0.0000	50	1.0000	0.0000
Hewitt/Whiskey Lakes, 93	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Hewitt/Whiskey Lakes pooled	99	1.0000	0.0000	0.0000	100	1.0000	0.0000
Shell Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Shell Lake, 93	99	1.0000	0.0000	0.0000	100	1.0000	0.0000
Shell Lake pooled	199	1.0000	0.0000	0.0000	200	1.0000	0.0000
Trinity Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Trinity/Movie Lakes, 93	98	1.0000	0.0000	0.0000	100	1.0000	0.0000
Trinity/Movie Lakes pooled	198	1.0000	0.0000	0.0000	200	1.0000	0.0000
Judd Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Judd Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Judd Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Susitna River (Mainstem Drainages)							
Byers Lake, 93	100	0.9800	0.0200	0.0000	99	1.0000	0.0000
Stephan Lake, 93	97	1.0000	0.0000	0.0000	100	1.0000	0.0000
Stephan Lake, site 1, 1994	23	1.0000	0.0000	0.0000	25	1.0000	0.0000
Stephan Lake site 2, 94	23	1.0000	0.0000	0.0000	25	1.0000	0.0000
Stephan Lake pooled (not site 1)	120	1.0000	0.0000	0.0000	125	1.0000	0.0000
Larson Lake, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Larson Lake, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Larson Lake pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Birch Creek, 93	67	0.9925	0.0075	0.0000	67	1.0000	0.0000
Red Shirt Lake, 93	34	1.0000	0.0000	0.0000	34	1.0000	0.0000
Western Cook Inlet Drainages							
Coal Creek West Fork, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Coal Creek West Fork, 93	100	0.9950	0.0050	0.0000	100	1.0000	0.0000
Coal Creek West Fork pooled	200	0.9975	0.0025	0.0000	200	1.0000	0.0000
Chilligan River, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Chilligan River, 94	45	1.0000	0.0000	0.0000	50	1.0000	0.0000
Chilligan River pooled	145	1.0000	0.0000	0.0000	150	1.0000	0.0000
McArthur River, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Wolverine Creek 93	98	1.0000	0.0000	0.0000	100	1.0000	0.0000
Crescent River, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Crescent River, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Crescent River pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Crescent Lake site 1, 94	42	1.0000	0.0000	0.0000	50	1.0000	0.0000
Crescent Lake site 2, 94	47	1.0000	0.0000	0.0000	50	1.0000	0.0000

Appendix A. Continued.

Population	N	*PEPLT** 100	88	114	N	*PGDH** 100	90
Western Cook Inlet Drainages Continued							
Packers Lake, 92	99	1.0000	0.0000	0.0000	100	0.9950	0.0050
Packers Lake, 93	83	1.0000	0.0000	0.0000	82	0.9939	0.0061
Packers Lake pooled	182	1.0000	0.0000	0.0000	182	0.9945	0.0055
Kasilof River Drainage							
Bear Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Bear Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Bear Creek pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Moose Creek, Tustumena, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Moose Creek, Tustumena, 93	98	1.0000	0.0000	0.0000	98	1.0000	0.0000
Moose Creek, Tustumena pooled	198	1.0000	0.0000	0.0000	198	1.0000	0.0000
Glacier Flat Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Glacier Flat Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Glacier Flat Creek, 94	99	1.0000	0.0000	0.0000	100	1.0000	0.0000
Glacier Flat Creek pooled	299	1.0000	0.0000	0.0000	300	1.0000	0.0000
Nikolai Creek, 92	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Nikolai Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Nikolai Creek pooled	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Tustumena Lake site 1, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Tustumena Lake site 2, 94	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Tustumena Lake pooled	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Seepage Creek, 94	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Northeastern Cook Inlet Drainages							
Bishop Creek, 93	99	0.7677	0.2323	0.0000	100	1.0000	0.0000
Daniels Lake, 92	100	0.7150	0.2850	0.0000	100	1.0000	0.0000
Daniels Lake, 93	98	0.7041	0.2959	0.0000	100	1.0000	0.0000
Daniels Lake pooled	198	0.7096	0.2904	0.0000	200	1.0000	0.0000
Knik Arm (Little Susitna River Drainages)							
Nancy Lake, 93	100	0.9850	0.0150	0.0000	100	1.0000	0.0000
Cottonwood Creek, 93	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Fish Creek, 92	100	0.8500	0.1500	0.0000	100	1.0000	0.0000
Fish Creek, 93	100	0.8250	0.1750	0.0000	100	1.0000	0.0000
Fish Creek, 94	100	0.8350	0.1650	0.0000	100	1.0000	0.0000
Fish Creek 93/94 pooled	200	0.8300	0.1700	0.0000	200	1.0000	0.0000

Appendix A. Continued.

Population	N	PGM-1* 100	null	-180	N	PGM-2* 100	136	57
Kenai River Drainage								
Russian River, above/early, 92	100	0.0000	1.0000	0.0000	100	0.8950	0.1050	0.0000
Russian River, above/late, 92	100	0.0050	0.9950	0.0000	100	0.8400	0.1600	0.0000
Russian River, above/late, 93	100	0.0050	0.9950	0.0000	100	0.9100	0.0900	0.0000
Russian River, above/late pooled	200	0.0050	0.9950	0.0000	200	0.8750	0.1250	0.0000
Russian River, below, 93	99	0.3786	0.6113	0.0101	100	0.8000	0.2000	0.0000
Ptarmigan Creek, 92	100	0.3597	0.6403	0.0000	100	0.8450	0.1550	0.0000
Ptarmigan Creek, 93	98	0.2857	0.7143	0.0000	98	0.8827	0.1173	0.0000
Ptarmigan Creek pooled	198	0.3231	0.6769	0.0000	198	0.8636	0.1364	0.0000
Tern Lake, 92	50	0.1754	0.8246	0.0000	50	0.7000	0.3000	0.0000
Tern Lake, 93	100	0.2450	0.7550	0.0000	100	0.6450	0.3550	0.0000
Tern Lake pooled	150	0.2218	0.7782	0.0000	150	0.6633	0.3367	0.0000
Quartz Creek, 92	100	0.2126	0.7874	0.0000	99	0.7980	0.2020	0.0000
Quartz Creek, 93	99	0.3410	0.6590	0.0000	100	0.8300	0.1700	0.0000
Quartz Creek pooled	199	0.2765	0.7235	0.0000	199	0.8141	0.1859	0.0000
Btwn Kenai/Skilak Lakes, 92	100	0.3443	0.6557	0.0000	100	0.8050	0.1950	0.0000
Btwn Kenai/Skilak Lakes, early, 93	97	0.3114	0.6886	0.0000	97	0.8247	0.1753	0.0000
Btwn Kenai/Skilak Lakes, late, 93	100	0.2652	0.7348	0.0000	100	0.7750	0.2250	0.0000
Btwn Ken/Ski Lakes site 6 pooled	297	0.3069	0.6931	0.0000	297	0.8013	0.1987	0.0000
Btwn Kenai/Skilak Lakes site 1, early, 94	50	0.2789	0.7211	0.0000	50	0.7300	0.2700	0.0000
Btwn Kenai/Skilak Lakes site 1, late, 94	50	0.2254	0.7746	0.0000	50	0.8300	0.1700	0.0000
Btwn Ken/Ski Lakes site 1 pooled	100	0.2521	0.7479	0.0000	100	0.7800	0.2200	0.0000
Btwn Kenai/Skilak Lakes site 2, early, 94	50	0.3519	0.6481	0.0000	50	0.7800	0.2200	0.0000
Btwn Kenai/Skilak Lakes site 2, late, 94	50	0.3367	0.6633	0.0000	50	0.7700	0.2300	0.0000
Btwn Ken/Ski Lakes site 2 pooled	100	0.3443	0.6557	0.0000	100	0.7750	0.2250	0.0000
Btwn Kenai/Skilak Lakes site 3, early, 94	100	0.3343	0.6557	0.0100	100	0.8000	0.2000	0.0000
Btwn Kenai/Skilak Lakes site 3, late, 94	50	0.3218	0.6782	0.0000	50	0.7700	0.2300	0.0000
Btwn Ken/Ski Lakes site 3 pooled	150	0.3301	0.6632	0.0067	150	0.7900	0.2100	0.0000
Btwn Kenai/Skilak Lakes site 4, late, 94	50	0.2972	0.6928	0.0100	50	0.7700	0.2300	0.0000
Btwn Kenai/Skilak Lakes site 5, late, 94	100	0.3675	0.6325	0.0000	100	0.7950	0.2050	0.0000
Hidden Creek, 92	100	0.0461	0.9539	0.0000	100	1.0000	0.0000	0.0000
Hidden Creek, 93	98	0.0687	0.9313	0.0000	100	0.9850	0.0150	0.0000
Hidden Creek pooled	198	0.0573	0.9427	0.0000	200	0.9925	0.0075	0.0000
Skilak Lake Outlet, 92	100	0.4255	0.5745	0.0000	100	0.7850	0.2150	0.0000
Skilak Lake Outlet, early, 93	100	0.2929	0.7071	0.0000	100	0.7150	0.2850	0.0000
Skilak Lake Outlet, late, 93	100	0.3072	0.6928	0.0000	100	0.7050	0.2950	0.0000
Skilak Lake Outlet, early, 94	200	0.3329	0.6671	0.0000	200	0.7650	0.2350	0.0000
Skilak Lake Outlet, late, 94	200	0.3036	0.6964	0.0000	200	0.7875	0.2125	0.0000
Skilak Lake Outlet pooled	700	0.3284	0.6716	0.0000	700	0.7586	0.2414	0.0000
Moose Creek, Kenai, 93	99	0.1354	0.8646	0.0000	100	0.7700	0.2300	0.0000
Moose Creek, Kenai, 94	99	0.0899	0.9101	0.0000	100	0.7100	0.2900	0.0000
Moose Creek, Kenai pooled	198	0.1127	0.8873	0.0000	200	0.7400	0.2600	0.0000

Appendix A. Continued.

Population	N	PGM-1* 100	null	-180	N	PGM-2* 100	136	57
Susitna River (Yentna Drainages)								
Chelatna Lake, 92	100	0.0461	0.9539	0.0000	100	0.8850	0.1150	0.0000
Chelatna Lake, 93	100	0.0305	0.9695	0.0000	100	0.8500	0.1450	0.0050
Chelatna Lake pooled	200	0.0383	0.9617	0.0000	200	0.8675	0.1300	0.0025
Yentna River West Fork, 92	100	0.0699	0.9301	0.0000	100	0.8000	0.2000	0.0000
Yentna River West Fork, 93	100	0.0726	0.9274	0.0000	97	0.8093	0.1907	0.0000
Yentna River West Fork pooled	200	0.0713	0.9287	0.0000	197	0.8046	0.1954	0.0000
Hewitt Lake, 92	50	0.0513	0.9487	0.0000	50	0.6300	0.3700	0.0000
Hewitt/Whiskey Lakes, 93	49	0.0853	0.9147	0.0000	50	0.6200	0.3800	0.0000
Hewitt/Whiskey Lakes pooled	99	0.0681	0.9319	0.0000	100	0.6250	0.3750	0.0000
Shell Lake, 92	100	0.0726	0.9274	0.0000	100	0.2300	0.7700	0.0000
Shell Lake, 93	100	0.1225	0.8775	0.0000	100	0.2700	0.7300	0.0000
Shell Lake pooled	200	0.0976	0.9024	0.0000	200	0.2500	0.7500	0.0000
Trinity Lake, 92	100	0.0513	0.9487	0.0000	100	0.2900	0.7100	0.0000
Trinity/Movie Lakes, 93	100	0.0461	0.9539	0.0000	100	0.2750	0.7250	0.0000
Trinity/Movie Lakes pooled	200	0.0487	0.9513	0.0000	200	0.2825	0.7175	0.0000
Judd Lake, 92	100	0.3755	0.6245	0.0000	100	0.8900	0.1100	0.0000
Judd Lake, 93	100	0.3443	0.6557	0.0000	100	0.8100	0.1900	0.0000
Judd Lake pooled	200	0.3599	0.6401	0.0000	200	0.8500	0.1500	0.0000
Susitna River (Mainstem Drainages)								
Byers Lake, 93	100	0.1876	0.8124	0.0000	100	0.8150	0.1850	0.0000
Stephan Lake, 93	100	0.0000	1.0000	0.0000	100	0.7300	0.2700	0.0000
Stephan Lake, site 1, 1994	25	0.1056	0.8944	0.0000	25	0.8200	0.1800	0.0000
Stephan Lake site 2, 94	25	0.0000	1.0000	0.0000	25	0.7600	0.2400	0.0000
Stephan Lake pooled (not site 1)	125	0.0000	1.0000	0.0000	125	0.7360	0.2640	0.0000
Larson Lake, 92	100	0.3367	0.6633	0.0000	100	0.6850	0.3150	0.0000
Larson Lake, 93	100	0.4523	0.5477	0.0000	100	0.6750	0.3250	0.0000
Larson Lake pooled	200	0.3945	0.6055	0.0000	200	0.6800	0.3200	0.0000
Birch Creek, 93	66	0.2823	0.7177	0.0000	67	0.8134	0.1866	0.0000
Red Shirt Lake, 93	34	0.0299	0.9701	0.0000	34	0.5882	0.4118	0.0000
Western Cook Inlet Drainages								
Coal Creek West Fork, 92	100	0.5101	0.4899	0.0000	100	0.8850	0.1150	0.0000
Coal Creek West Fork, 93	100	0.4169	0.5831	0.0000	100	0.8300	0.1700	0.0000
Coal Creek West Fork pooled	200	0.4635	0.5365	0.0000	200	0.8575	0.1425	0.0000
Chilligan River, 92	100	0.1693	0.8307	0.0000	100	0.9200	0.0800	0.0000
Chilligan River, 94	50	0.2652	0.7348	0.0000	50	0.9400	0.0600	0.0000
Chilligan River pooled	150	0.2013	0.7987	0.0000	150	0.9267	0.0733	0.0000
McArthur River, 93	100	0.2126	0.7874	0.0000	100	0.7800	0.2200	0.0000
Wolverine Creek 93	100	0.0619	0.9381	0.0000	100	0.9700	0.0300	0.0000
Crescent River, 92	100	0.1340	0.8660	0.0000	100	0.7200	0.2800	0.0000
Crescent River, 93	100	0.1168	0.8832	0.0000	100	0.6500	0.3500	0.0000
Crescent River pooled	200	0.1254	0.8746	0.0000	200	0.6850	0.3150	0.0000
Crescent Lake site 1, 94	50	0.1282	0.8718	0.0000	50	0.7200	0.2800	0.0000
Crescent Lake site 2, 94	50	0.1515	0.8485	0.0000	50	0.6300	0.3700	0.0000

Appendix A. Continued.

Population	N	*PGM-1** 100	null	-180	N	*PGM-2** 100	136	57
Western Cook Inlet Continued								
Packers Lake, 92	100	0.0000	1.0000	0.0000	99	0.7576	0.2424	0.0000
Packers Lake, 93	83	0.0060	0.9940	0.0000	83	0.7530	0.2470	0.0000
Packers Lake pooled	183	0.0027	0.9973	0.0000	182	0.7555	0.2445	0.0000
Kasilof River Drainage								
Bear Creek, 92	100	0.1112	0.8888	0.0000	100	0.6400	0.3600	0.0000
Bear Creek, 93	100	0.1282	0.8718	0.0000	100	0.6950	0.3050	0.0000
Bear Creek pooled	200	0.1197	0.8803	0.0000	200	0.6675	0.3325	0.0000
Moose Creek, Tustumena, 92	100	0.1340	0.8660	0.0000	100	0.7050	0.2950	0.0000
Moose Creek, Tustumena, 93	100	0.1000	0.9000	0.0000	100	0.6850	0.3150	0.0000
Moose Creek, Tustumena pooled	200	0.1170	0.8830	0.0000	200	0.6950	0.3050	0.0000
Glacier Flat Creek, 92	100	0.0835	0.9165	0.0000	100	0.7350	0.2650	0.0000
Glacier Flat Creek, 93	100	0.1112	0.8888	0.0000	100	0.6800	0.3200	0.0000
Glacier Flat Creek, 94	100	0.1574	0.8426	0.0000	100	0.6200	0.3800	0.0000
Glacier Flat Creek pooled	300	0.1174	0.8826	0.0000	300	0.6783	0.3217	0.0000
Nikolai Creek, 92	100	0.1000	0.9000	0.0000	100	0.6750	0.3250	0.0000
Nikolai Creek, 93	100	0.0780	0.9220	0.0000	100	0.7000	0.3000	0.0000
Nikolai Creek pooled	200	0.0890	0.9110	0.0000	200	0.6875	0.3125	0.0000
Tustumena Lake site 1, 94	50	0.1515	0.8485	0.0000	50	0.6700	0.3300	0.0000
Tustumena Lake site 2, 94	50	0.1168	0.8832	0.0000	50	0.6200	0.3800	0.0000
Tustumena Lake pooled	100	0.1341	0.8659	0.0000	100	0.6450	0.3550	0.0000
Seepage Creek, 94	100	0.1056	0.8944	0.0000	100	0.6600	0.3400	0.0000
Northeastern Cook Inlet Drainages								
Bishop Creek, 93	100	0.2000	0.8000	0.0000	100	0.3200	0.6800	0.0000
Daniels Lake, 92	100	0.2319	0.7681	0.0000	100	0.2300	0.7700	0.0000
Daniels Lake, 93	100	0.1938	0.8062	0.0000	100	0.3050	0.6950	0.0000
Daniels Lake pooled	200	0.2128	0.7872	0.0000	200	0.2675	0.7325	0.0000
Knik Arm (Little Susitna River Drainages)								
Nancy Lake, 93	100	0.1225	0.8775	0.0000	100	0.7700	0.2300	0.0000
Cottonwood Creek, 93	100	0.0566	0.9434	0.0000	100	0.7500	0.2500	0.0000
Fish Creek, 92	98	0.0051	0.9949	0.0000	100	0.5000	0.5000	0.0000
Fish Creek, 93	100	0.0202	0.9798	0.0000	100	0.5950	0.4050	0.0000
Fish Creek, 94	95	0.0106	0.9894	0.0000	100	0.6550	0.3450	0.0000
Fish Creek 93/94 pooled	195	0.0155	0.9845	0.0000	200	0.6250	0.3750	0.0000

Appendix A. Continued.

Population	N	*sSOD-1** 100	48	N	*TPI-1,2** -100	-173	-82	N	*TPI-3** 100	98
Kenai River Drainage										
Russian River, above/early, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Russian River, above/late, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Russian River, above/late, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Russian River, above/late pooled	200	1.0000	0.0000	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Russian River, below, 93	93	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Ptarmigan Creek, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	99	1.0000	0.0000
Ptarmigan Creek, 93	98	1.0000	0.0000	98	1.0000	0.0000	0.0000	98	1.0000	0.0000
Ptarmigan Creek pooled	198	1.0000	0.0000	198	1.0000	0.0000	0.0000	197	1.0000	0.0000
Tern Lake, 92	50	1.0000	0.0000	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Tern Lake, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Tern Lake pooled	150	1.0000	0.0000	150	1.0000	0.0000	0.0000	150	1.0000	0.0000
Quartz Creek, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Quartz Creek, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	0.9950	0.0050
Quartz Creek pooled	200	1.0000	0.0000	200	1.0000	0.0000	0.0000	200	0.9975	0.0025
Btwn Kenai/Skilak Lakes, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Btwn Kenai/Skilak Lakes, early, 93	97	1.0000	0.0000	97	1.0000	0.0000	0.0000	97	1.0000	0.0000
Btwn Kenai/Skilak Lakes, late, 93	100	1.0000	0.0000	99	1.0000	0.0000	0.0000	99	1.0000	0.0000
Btwn Ken/Ski Lakes site 6 pooled	297	1.0000	0.0000	296	1.0000	0.0000	0.0000	296	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, early, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 1, late, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Btwn Ken/Ski Lakes site 1 pooled	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 2, early, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000	50	0.9900	0.0100
Btwn Kenai/Skilak Lakes site 2, late, 94	50	1.0000	0.0000	49	1.0000	0.0000	0.0000	49	1.0000	0.0000
Btwn Ken/Ski Lakes site 2 pooled	100	1.0000	0.0000	99	1.0000	0.0000	0.0000	99	0.9949	0.0051
Btwn Kenai/Skilak Lakes site 3, early, 94	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 3, late, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Btwn Ken/Ski Lakes site 3 pooled	150	1.0000	0.0000	150	1.0000	0.0000	0.0000	150	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 4, late, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Btwn Kenai/Skilak Lakes site 5, late, 94	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Hidden Creek, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Hidden Creek, 93	99	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Hidden Creek pooled	199	1.0000	0.0000	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Skilak Lake Outlet, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Skilak Lake Outlet, early, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Skilak Lake Outlet, late, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Skilak Lake Outlet, early, 94	200	1.0000	0.0000	200	1.0000	0.0000	0.0000	200	0.9975	0.0025
Skilak Lake Outlet, late, 94	200	1.0000	0.0000	200	1.0000	0.0000	0.0000	193	1.0000	0.0000
Skilak Lake Outlet pooled	700	1.0000	0.0000	700	1.0000	0.0000	0.0000	693	0.9993	0.0007
Moose Creek, Kenai, 93	99	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Moose Creek, Kenai, 94	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Moose Creek, Kenai pooled	199	1.0000	0.0000	200	1.0000	0.0000	0.0000	200	1.0000	0.0000

Appendix A. Continued.

Population	N	*sSOD-1** 100	48	N	*TPI-1,2** -100	-173	-82	N	*TPI-3** 100	98
Susitna River (Yentna Drainages)										
Chelatna Lake, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	97	1.0000	0.0000
Chelatna Lake, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Chelatna Lake pooled	200	1.0000	0.0000	200	1.0000	0.0000	0.0000	197	1.0000	0.0000
Yentna River West Fork, 92	100	1.0000	0.0000	99	1.0000	0.0000	0.0000	99	1.0000	0.0000
Yentna River West Fork, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Yentna River West Fork pooled	200	1.0000	0.0000	199	1.0000	0.0000	0.0000	199	1.0000	0.0000
Hewitt Lake, 92	50	1.0000	0.0000	49	1.0000	0.0000	0.0000	49	1.0000	0.0000
Hewitt/Whiskey Lakes, 93	50	1.0000	0.0000	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Hewitt/Whiskey Lakes pooled	100	1.0000	0.0000	99	1.0000	0.0000	0.0000	99	1.0000	0.0000
Shell Lake, 92	100	1.0000	0.0000	99	1.0000	0.0000	0.0000	99	1.0000	0.0000
Shell Lake, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Shell Lake pooled	200	1.0000	0.0000	199	1.0000	0.0000	0.0000	199	1.0000	0.0000
Trinity Lake, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Trinity/Movie Lakes, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Trinity/Movie Lakes pooled	200	1.0000	0.0000	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Judd Lake, 92	100	1.0000	0.0000	60	1.0000	0.0000	0.0000	100	1.0000	0.0000
Judd Lake, 93	100	1.0000	0.0000	97	1.0000	0.0000	0.0000	97	1.0000	0.0000
Judd Lake pooled	200	1.0000	0.0000	157	1.0000	0.0000	0.0000	197	1.0000	0.0000
Susitna River (Mainstem Drainages)										
Byers Lake, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Stephan Lake, 93	99	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Stephan Lake, site 1, 1994	25	1.0000	0.0000	25	0.9900	0.0100	0.0000	25	1.0000	0.0000
Stephan Lake site 2, 94	25	1.0000	0.0000	24	1.0000	0.0000	0.0000	25	1.0000	0.0000
Stephan Lake pooled (not site 1)	124	1.0000	0.0000	124	1.0000	0.0000	0.0000	125	1.0000	0.0000
Larson Lake, 92	99	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Larson Lake, 93	99	1.0000	0.0000	99	1.0000	0.0000	0.0000	99	1.0000	0.0000
Larson Lake pooled	198	1.0000	0.0000	199	1.0000	0.0000	0.0000	199	1.0000	0.0000
Birch Creek, 93	67	1.0000	0.0000	67	1.0000	0.0000	0.0000	67	1.0000	0.0000
Red Shirt Lake, 93	34	1.0000	0.0000	34	1.0000	0.0000	0.0000	34	1.0000	0.0000
Western Cook Inlet Drainages										
Coal Creek West Fork, 92	100	1.0000	0.0000	100	0.9950	0.0000	0.0050	100	1.0000	0.0000
Coal Creek West Fork, 93	98	1.0000	0.0000	100	0.9875	0.0000	0.0125	100	1.0000	0.0000
Coal Creek West Fork pooled	198	1.0000	0.0000	200	0.9912	0.0000	0.0088	200	1.0000	0.0000
Chilligan River, 92	98	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Chilligan River, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000	50	1.0000	0.0000
Chilligan River pooled	148	1.0000	0.0000	150	1.0000	0.0000	0.0000	150	1.0000	0.0000
McArthur River, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Wolverine Creek 93	100	0.9950	0.0050	100	1.0000	0.0000	0.0000	99	1.0000	0.0000
Crescent River, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	0.9800	0.0200
Crescent River, 93	99	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	0.9750	0.0250
Crescent River pooled	199	1.0000	0.0000	200	1.0000	0.0000	0.0000	200	0.9775	0.0225
Crescent Lake site 1, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000	50	0.9100	0.0900
Crescent Lake site 2, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000	50	0.9900	0.0100

Appendix A. Continued.

Population	N	*sSOD-1** 100	48	N	*TPI-1,2** -100	-173	-82	N	*TPI-3** 100	98
Western Cook Inlet Drainages										
Packers Lake, 92	99	1.0000	0.0000	99	1.0000	0.0000	0.0000	99	1.0000	0.0000
Packers Lake, 93	81	1.0000	0.0000	83	1.0000	0.0000	0.0000	83	1.0000	0.0000
Packers Lake pooled	180	1.0000	0.0000	182	1.0000	0.0000	0.0000	182	1.0000	0.0000
Kasilof River Drainage										
Bear Creek, 92	100	1.0000	0.0000	100	0.9975	0.0025	0.0000	100	1.0000	0.0000
Bear Creek, 93	99	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Bear Creek pooled	199	1.0000	0.0000	200	0.9988	0.0012	0.0000	200	1.0000	0.0000
Moose Creek, Tustumena, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Moose Creek, Tustumena, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Moose Creek, Tustumena pooled	200	1.0000	0.0000	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Glacier Flat Creek, 92	100	1.0000	0.0000	95	1.0000	0.0000	0.0000	100	1.0000	0.0000
Glacier Flat Creek, 93	50	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Glacier Flat Creek, 94	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Glacier Flat Creek pooled	250	1.0000	0.0000	295	1.0000	0.0000	0.0000	300	1.0000	0.0000
Nikolai Creek, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Nikolai Creek, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Nikolai Creek pooled	200	1.0000	0.0000	200	1.0000	0.0000	0.0000	200	1.0000	0.0000
Tustumena Lake site 1, 94	50	1.0000	0.0000	49	1.0000	0.0000	0.0000	49	1.0000	0.0000
Tustumena Lake site 2, 94	50	1.0000	0.0000	50	1.0000	0.0000	0.0000	50	0.9900	0.0100
Tustumena Lake pooled	100	1.0000	0.0000	99	1.0000	0.0000	0.0000	99	0.9949	0.0051
Seepage Creek, 94	100	1.0000	0.0000	98	1.0000	0.0000	0.0000	97	0.9948	0.0052
Northeastern Cook Inlet Drainages										
Bishop Creek, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Daniels Lake, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Daniels Lake, 93	100	1.0000	0.0000	99	1.0000	0.0000	0.0000	99	1.0000	0.0000
Daniels Lake pooled	200	1.0000	0.0000	199	1.0000	0.0000	0.0000	199	1.0000	0.0000
Knik Arm (Little Susitna River Drainages)										
Nancy Lake, 93	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Cottonwood Creek, 93	100	1.0000	0.0000	98	1.0000	0.0000	0.0000	100	1.0000	0.0000
Fish Creek, 92	100	1.0000	0.0000	100	1.0000	0.0000	0.0000	100	1.0000	0.0000
Fish Creek, 93	95	1.0000	0.0000	98	1.0000	0.0000	0.0000	98	1.0000	0.0000
Fish Creek, 94	99	1.0000	0.0000	100	1.0000	0.0000	0.0000	99	1.0000	0.0000
Fish Creek 93/94 pooled	194	1.0000	0.0000	198	1.0000	0.0000	0.0000	197	1.0000	0.0000

Appendix A. Continued.

Population	N	*TPI-4** 100	106	97	Heterozygosities Observed	Expected
Kenai River Drainage						
Russian River, above/early, 92	100	1.0000	0.0000	0.0000	0.0505	0.0528
Russian River, above/late, 92	100	1.0000	0.0000	0.0000	0.0486	0.0492
Russian River, above/late, 93	100	1.0000	0.0000	0.0000	0.0434	0.0473
Russian River, above/late pooled	200	1.0000	0.0000	0.0000		
Russian River, below, 93	100	1.0000	0.0000	0.0000	0.0429	0.0419
Ptarmigan Creek, 92	100	1.0000	0.0000	0.0000	0.0422	0.0393
Ptarmigan Creek, 93	98	1.0000	0.0000	0.0000	0.0393	0.0392
Ptarmigan Creek pooled	198	1.0000	0.0000	0.0000		
Tern Lake, 92	49	1.0000	0.0000	0.0000	0.0395	0.0398
Tern Lake, 93	100	0.9900	0.0000	0.0100	0.0422	0.0422
Tern Lake pooled	149	0.9933	0.0000	0.0067		
Quartz Creek, 92	100	1.0000	0.0000	0.0000	0.0443	0.0414
Quartz Creek, 93	100	1.0000	0.0000	0.0000	0.0399	0.0434
Quartz Creek pooled	200	1.0000	0.0000	0.0000		
Btwn Kenai/Skilak Lakes, 92	100	1.0000	0.0000	0.0000	0.0420	0.0418
Btwn Kenai/Skilak Lakes, early, 93	97	1.0000	0.0000	0.0000	0.0422	0.0407
Btwn Kenai/Skilak Lakes, late, 93	99	1.0000	0.0000	0.0000	0.0481	0.0439
Btwn Ken/Ski Lakes site 6 pooled	296	1.0000	0.0000	0.0000		
Btwn Kenai/Skilak Lakes site 1, early, 94	50	1.0000	0.0000	0.0000	0.0519	0.0484
Btwn Kenai/Skilak Lakes site 1, late, 94	50	1.0000	0.0000	0.0000	0.0443	0.0454
Btwn Ken/Ski Lakes site 1 pooled	100	1.0000	0.0000	0.0000		
Btwn Kenai/Skilak Lakes site 2, early, 94	50	1.0000	0.0000	0.0000	0.0420	0.0462
Btwn Kenai/Skilak Lakes site 2, late, 94	49	1.0000	0.0000	0.0000	0.0449	0.0441
Btwn Ken/Ski Lakes site 2 pooled	99	1.0000	0.0000	0.0000		
Btwn Kenai/Skilak Lakes site 3, early, 94	100	1.0000	0.0000	0.0000	0.0403	0.0422
Btwn Kenai/Skilak Lakes site 3, late, 94	50	1.0000	0.0000	0.0000	0.0416	0.0425
Btwn Ken/Ski Lakes site 3 pooled	150	1.0000	0.0000	0.0000		
Btwn Kenai/Skilak Lakes site 4, late, 94	50	1.0000	0.0000	0.0000	0.0411	0.0426
Btwn Kenai/Skilak Lakes site 5, late, 94	100	1.0000	0.0000	0.0000	0.0327	0.0343
Hidden Creek, 92	100	1.0000	0.0000	0.0000	0.0328	0.0329
Hidden Creek, 93	100	1.0000	0.0000	0.0000	0.0362	0.0362
Hidden Creek pooled	200	1.0000	0.0000	0.0000		
Skilak Lake Outlet, 92	100	1.0000	0.0000	0.0000	0.0388	0.0378
Skilak Lake Outlet, early, 93	100	1.0000	0.0000	0.0000	0.0444	0.0424
Skilak Lake Outlet, late, 93	98	1.0000	0.0000	0.0000	0.0400	0.0419
Skilak Lake Outlet, early, 94	200	1.0000	0.0000	0.0000	0.0389	0.0392
Skilak Lake Outlet, late, 94	200	1.0000	0.0000	0.0000	0.0389	0.0382
Skilak Lake Outlet pooled	698	1.0000	0.0000	0.0000		
Moose Creek, Kenai, 93	100	0.9900	0.0000	0.0100	0.0415	0.0400
Moose Creek, Kenai, 94	100	1.0000	0.0000	0.0000	0.0374	0.0377
Moose Creek, Kenai pooled	200	0.9950	0.0000	0.0050		

Appendix A. Continued.

Population	N	*TPI-4** 100	106	97	Heterozygosities Observed	Expected
Susitna River (Yentna Drainages)						
Chelatna Lake, 92	97	1.0000	0.0000	0.0000	0.0338	0.0340
Chelatna Lake, 93	96	1.0000	0.0000	0.0000	0.0311	0.0353
Chelatna Lake pooled	193	1.0000	0.0000	0.0000		
Yentna River West Fork, 92	98	1.0000	0.0000	0.0000	0.0381	0.0387
Yentna River West Fork, 93	100	1.0000	0.0000	0.0000	0.0382	0.0383
Yentna River West Fork pooled	198	1.0000	0.0000	0.0000		
Hewitt Lake, 92	49	1.0000	0.0000	0.0000	0.0376	0.0367
Hewitt/Whiskey Lakes, 93	50	1.0000	0.0000	0.0000	0.0368	0.0380
Hewitt/Whiskey Lakes pooled	99	1.0000	0.0000	0.0000		
Shell Lake, 92	99	1.0000	0.0000	0.0000	0.0423	0.0448
Shell Lake, 93	100	1.0000	0.0000	0.0000	0.0410	0.0425
Shell Lake pooled	199	1.0000	0.0000	0.0000		
Trinity Lake, 92	100	1.0000	0.0000	0.0000	0.0374	0.0375
Trinity/Movie Lakes, 93	98	1.0000	0.0000	0.0000	0.0390	0.0376
Trinity/Movie Lakes pooled	198	1.0000	0.0000	0.0000		
Judd Lake, 92	100	1.0000	0.0000	0.0000	0.0389	0.0392
Judd Lake, 93	97	1.0000	0.0000	0.0000	0.0480	0.0456
Judd Lake pooled	197	1.0000	0.0000	0.0000		
Susitna River (Mainstem Drainages)						
Byers Lake, 93	100	1.0000	0.0000	0.0000	0.0408	0.0407
Stephan Lake, 93	100	1.0000	0.0000	0.0000	0.0591	0.0584
Stephan Lake, site 1, 1994	25	1.0000	0.0000	0.0000	0.0404	0.0481
Stephan Lake site 2, 94	25	1.0000	0.0000	0.0000	0.0519	0.0553
Stephan Lake pooled (not site 1)	125	1.0000	0.0000	0.0000		
Larson Lake, 92	100	1.0000	0.0000	0.0000	0.0432	0.0395
Larson Lake, 93	99	1.0000	0.0000	0.0000	0.0437	0.0369
Larson Lake pooled	199	1.0000	0.0000	0.0000		
Birch Creek, 93	67	1.0000	0.0000	0.0000	0.0260	0.0286
Red Shirt Lake, 93	34	1.0000	0.0000	0.0000	0.0382	0.0376
Western Cook Inlet Drainages						
Coal Creek West Fork, 92	93	0.9946	0.0054	0.0000	0.0401	0.0397
Coal Creek West Fork, 93	100	1.0000	0.0000	0.0000	0.0454	0.0423
Coal Creek West Fork pooled	193	0.9974	0.0026	0.0000		
Chilligan River, 92	100	1.0000	0.0000	0.0000	0.0200	0.0208
Chilligan River, 94	50	1.0000	0.0000	0.0000	0.0222	0.0230
Chilligan River pooled	150	1.0000	0.0000	0.0000		
McArthur River, 93	100	1.0000	0.0000	0.0000	0.0452	0.0435
Wolverine Creek 93	99	1.0000	0.0000	0.0000	0.0294	0.0273
Crescent River, 92	100	1.0000	0.0000	0.0000	0.0411	0.0421
Crescent River, 93	100	1.0000	0.0000	0.0000	0.0430	0.0421
Crescent River pooled	200	1.0000	0.0000	0.0000		
Crescent Lake site 1, 94	50	1.0000	0.0000	0.0000	0.0395	0.0424
Crescent Lake site 2, 94	50	1.0000	0.0000	0.0000	0.0357	0.0350

Appendix A. Continued.

Population	N	*TPI-4** 100	106	97	Heterozygosities Observed	Expected
Western Cook Inlet Drainages Continued						
Packers Lake, 92	99	1.0000	0.0000	0.0000	0.0309	0.0316
Packers Lake, 93	83	1.0000	0.0000	0.0000	0.0300	0.0282
Packers Lake pooled	182	1.0000	0.0000	0.0000		
Kasilof River Drainage						
Bear Creek, 92	100	1.0000	0.0000	0.0000	0.0444	0.0475
Bear Creek, 93	100	1.0000	0.0000	0.0000	0.0460	0.0451
Bear Creek pooled	200	1.0000	0.0000	0.0000		
Moose Creek, Tustumena, 92	100	1.0000	0.0000	0.0000	0.0444	0.0452
Moose Creek, Tustumena, 93	100	1.0000	0.0000	0.0000	0.0423	0.0451
Moose Creek, Tustumena pooled	200	1.0000	0.0000	0.0000		
Glacier Flat Creek, 92	100	1.0000	0.0000	0.0000	0.0452	0.0466
Glacier Flat Creek, 93	100	1.0000	0.0000	0.0000	0.0472	0.0499
Glacier Flat Creek, 94	100	1.0000	0.0000	0.0000	0.0475	0.0468
Glacier Flat Creek pooled	300	1.0000	0.0000	0.0000		
Nikolai Creek, 92	100	1.0000	0.0000	0.0000	0.0520	0.0511
Nikolai Creek, 93	100	1.0000	0.0000	0.0000	0.0539	0.0526
Nikolai Creek pooled	200	1.0000	0.0000	0.0000		
Tustumena Lake site 1, 94	49	1.0000	0.0000	0.0000	0.0422	0.0452
Tustumena Lake site 2, 94	50	1.0000	0.0000	0.0000	0.0378	0.0403
Tustumena Lake pooled	99	1.0000	0.0000	0.0000		
Seepage Creek, 94	98	1.0000	0.0000	0.0000	0.0460	0.0485
Northeastern Cook Inlet Drainages						
Bishop Creek, 93	100	1.0000	0.0000	0.0000	0.0395	0.0425
Daniels Lake, 92	100	1.0000	0.0000	0.0000	0.0403	0.0406
Daniels Lake, 93	99	1.0000	0.0000	0.0000	0.0451	0.0436
Daniels Lake pooled	199	1.0000	0.0000	0.0000		
Knik Arm (Little Susitna River Drainages)						
Nancy Lake, 93	100	1.0000	0.0000	0.0000	0.0355	0.0333
Cottonwood Creek, 93	100	1.0000	0.0000	0.0000	0.0439	0.0413
Fish Creek, 92	100	1.0000	0.0000	0.0000	0.0436	0.0453
Fish Creek, 93	98	1.0000	0.0000	0.0000	0.0481	0.0474
Fish Creek, 94	100	1.0000	0.0000	0.0000	0.0474	0.0465
Fish Creek 93/94 pooled	198	1.0000	0.0000	0.0000		

Appendix B. Allele frequency estimates for mixed-stock samples of Cook Inlet sockeye salmon.

Population		*mAAT-1**			*mAAT-2**		
	N	-100	-83	N	-100	-73	-129
Cook Inlet Commercial Fishery							
Central District Drift Fishery #1, 92	158	0.9082	0.0918				
Central District Drift Fishery #2, 92	200	0.8500	0.1500				
Central District Drift Fishery #1, 93	394	0.9277	0.0723				
Central District Drift Fishery #2, 93	281	0.9039	0.0961				
Central District Drift Fishery, 94	347	0.9049	0.0951	346	0.9971	0.0029	0.0000
Cook Inlet Drift Fishery #1, 95	298	0.8960	0.1040	300	0.9933	0.0067	0.0000
Cook Inlet Drift Fishery #2, 95	398	0.8894	0.1106	399	0.9937	0.0063	0.0000
Cook Inlet Drift Fishery #3, 95	397	0.9156	0.0844	392	0.9923	0.0077	0.0000
Cook Inlet Drift Fishery #4, 95	399	0.8772	0.1228	400	0.9838	0.0162	0.0000
Cook Inlet Drift Fishery #5, 95	300	0.9150	0.0850	300	0.9783	0.0217	0.0000
So. Central Cook Inlet Setnet #1 95	398	0.8857	0.1143	397	0.9912	0.0088	0.0000
So. Central Cook Inlet Setnet #2 95	398	0.9045	0.0955	397	0.9887	0.0113	0.0000
Kasilof River In-river Fishery							
Kasilof River Mixed Fishery #1, 92	200	0.8850	0.1150	200	0.9975	0.0025	0.0000
Kasilof River Mixed Fishery #2, 92	200	0.9175	0.0825	197	0.9949	0.0051	0.0000
Kasilof Fish Wheel #1, 94	197	0.8934	0.1066	199	0.9925	0.0075	0.0000
Kasilof Fish Wheel #2, 94	199	0.8869	0.1131	198	0.9975	0.0025	0.0000
Kasilof Fish Wheel #3, 94	97	0.9021	0.0979	98	1.0000	0.0000	0.0000
Kenai River In-river Fishery							
Kenai River Mixed Fishery, 92	200	0.9125	0.0875	197	0.9898	0.0102	0.0000
Kenai Fish Wheel #1, 94	88	0.9318	0.0682	88	0.9886	0.0114	0.0000
Kenai Fish Wheel #2, 94	200	0.9350	0.0650	198	0.9823	0.0177	0.0000
Kenai Fish Wheel #3, 94	199	0.8995	0.1005	167	0.9641	0.0359	0.0000
Kenai Fish Wheel #4, 94	198	0.9192	0.0808	190	0.9605	0.0395	0.0000
Kenai Fish Wheel #1, 95	298	0.8960	0.1040	296	0.9730	0.0270	0.0000
Kenai Fish Wheel #2, 95	298	0.9245	0.0755	298	0.9664	0.0319	0.0017
Kenai Fish Wheel #3, 95	300	0.9167	0.0833	287	0.9634	0.0366	0.0000
Susitna River In-river Fishery							
Sunshine Fish Wheel #1, 92	199	0.8291	0.1709	200	1.0000	0.0000	0.0000
Sunshine Fish Wheel #2, 92	114	0.8114	0.1886	113	1.0000	0.0000	0.0000
Yentna River In-river Fishery							
Yentna River Fish Wheel #1, 92	199	0.8241	0.1759	196	1.0000	0.0000	0.0000
Yentna River Fish Wheel #2, 92	200	0.7550	0.2450	191	1.0000	0.0000	0.0000
Yentna River Mixed Fishery, 94	199	0.8116	0.1884	199	1.0000	0.0000	0.0000

Appendix B. Continued.

Population	N	mAH-1,2* 100	75	133	N	mAH-4* 100	81	114
Cook Inlet Commercial Fishery								
Central District Drift Fishery #1, 92	149	0.9530	0.0470	0.0000	158	1.0000	0.0000	0.0000
Central District Drift Fishery #2, 92	199	0.9334	0.0666	0.0000	198	0.9975	0.0000	0.0025
Central District Drift Fishery #1, 93	340	0.9654	0.0331	0.0015	356	0.9902	0.0000	0.0098
Central District Drift Fishery #2, 93	271	0.9686	0.0295	0.0018	274	0.9964	0.0018	0.0018
Commercial Drift Fishery, 94	344	0.9724	0.0276	0.0000	346	1.0000	0.0000	0.0000
Cook Inlet Drift Fishery #1, 95	297	0.9604	0.0396	0.0000	299	0.9983	0.0000	0.0017
Cook Inlet Drift Fishery #2, 95	392	0.9605	0.0395	0.0000	399	0.9975	0.0000	0.0025
Cook Inlet Drift Fishery #3, 95	396	0.9766	0.0234	0.0000	398	0.9987	0.0000	0.0013
Cook Inlet Drift Fishery #4, 95	393	0.9663	0.0337	0.0000	398	1.0000	0.0000	0.0000
Cook Inlet Drift Fishery #5, 95	300	0.9608	0.0392	0.0000	300	1.0000	0.0000	0.0000
So. Central Cook Inlet Setnet #1, 95	394	0.9549	0.0451	0.0000	399	1.0000	0.0000	0.0000
So. Central Cook Inlet Setnet #2, 95	389	0.9614	0.0386	0.0000	398	1.0000	0.0000	0.0000
Kasilof River In-river Fishery								
Kasilof River Mixed Fishery #1, 92	169	0.9615	0.0385	0.0000	194	1.0000	0.0000	0.0000
Kasilof River Mixed Fishery #2, 92	198	0.9508	0.0492	0.0000	200	1.0000	0.0000	0.0000
Kasilof Fish Wheel #1, 94	189	0.9656	0.0344	0.0000	200	1.0000	0.0000	0.0000
Kasilof Fish Wheel #2, 94	177	0.9689	0.0311	0.0000	182	1.0000	0.0000	0.0000
Kasilof Fish Wheel #3, 94	98	0.9592	0.0408	0.0000	98	1.0000	0.0000	0.0000
Kenai River In-river Fishery								
Kenai River Mixed Fishery, 92	200	0.9400	0.0600	0.0000	200	1.0000	0.0000	0.0000
Kenai Fish Wheel #1, 94	88	0.9545	0.0455	0.0000	88	1.0000	0.0000	0.0000
Kenai Fish Wheel #2, 94	195	0.9590	0.0410	0.0000	194	0.9974	0.0000	0.0026
Kenai Fish Wheel #3, 94	185	0.9757	0.0243	0.0000	189	1.0000	0.0000	0.0000
Kenai Fish Wheel #4, 94	196	0.9770	0.0230	0.0000	190	1.0000	0.0000	0.0000
Kenai Fish Wheel #1, 95	250	0.9710	0.0290	0.0000	298	1.0000	0.0000	0.0000
Kenai Fish Wheel #2, 95	293	0.9642	0.0358	0.0000	298	1.0000	0.0000	0.0000
Kenai Fish Wheel #3, 95	290	0.9672	0.0328	0.0000	300	1.0000	0.0000	0.0000
Susitna River In-river Fishery								
Sunshine Fish Wheel #1, 92	199	0.9824	0.0176	0.0000	199	1.0000	0.0000	0.0000
Sunshine Fish Wheel #2, 92	113	0.9823	0.0177	0.0000	113	1.0000	0.0000	0.0000
Yentna River In-river Fishery								
Yentna River Fish Wheel #1, 92	194	0.9781	0.0168	0.0052	193	1.0000	0.0000	0.0000
Yentna River Fish Wheel #2, 92	199	0.9799	0.0201	0.0000	200	1.0000	0.0000	0.0000
Yentna River Mixed Fishery, 94	195	0.9808	0.0192	0.0000	199	1.0000	0.0000	0.0000

Appendix B. Continued.

Population	N	*sAH** 100	117	83	75	N	*ALAT** 100	91	108	95
Cook Inlet Commercial Fishery										
Central District Drift Fishery #1, 92	159	0.9811	0.0189	0.0000	0.0000	160	0.6000	0.3250	0.0094	0.0656
Central District Drift Fishery #2, 92	200	0.9800	0.0200	0.0000	0.0000	200	0.6150	0.3425	0.0000	0.0425
Central District Drift Fishery #1, 93	398	0.9736	0.0264	0.0000	0.0000	397	0.6259	0.3476	0.0013	0.0252
Central District Drift Fishery #2, 93	278	0.9658	0.0342	0.0000	0.0000	281	0.6210	0.3149	0.0018	0.0623
Commercial Drift Fishery, 94	346	0.9610	0.0332	0.0058	0.0000	349	0.6218	0.3209	0.0000	0.0573
Cook Inlet Drift Fishery #1, 95	300	0.9800	0.0200	0.0000	0.0000	297	0.5758	0.3535	0.0000	0.0707
Cook Inlet Drift Fishery #2, 95	399	0.9724	0.0276	0.0000	0.0000	399	0.5902	0.3496	0.0013	0.0589
Cook Inlet Drift Fishery #3, 95	396	0.9596	0.0404	0.0000	0.0000	397	0.5932	0.3312	0.0000	0.0756
Cook Inlet Drift Fishery #4, 95	400	0.9588	0.0412	0.0000	0.0000	399	0.6266	0.3283	0.0013	0.0439
Cook Inlet Drift Fishery #5, 95	300	0.9467	0.0533	0.0000	0.0000	299	0.6338	0.3010	0.0050	0.0602
So. Central Cook Inlet Setnet #1, 95	397	0.9635	0.0365	0.0000	0.0000	395	0.5570	0.3278	0.0000	0.1152
So. Central Cook Inlet Setnet #2, 95	397	0.9295	0.0693	0.0013	0.0000	399	0.6917	0.2406	0.0050	0.0627
Kasilof River In-river Fishery										
Kasilof River Mixed Fishery #1, 92	199	1.0000	0.0000	0.0000	0.0000	200	0.5325	0.3325	0.0000	0.1350
Kasilof River Mixed Fishery #2, 92	198	1.0000	0.0000	0.0000	0.0000	200	0.5725	0.3025	0.0000	0.1250
Kasilof Fish Wheel #1, 94	200	1.0000	0.0000	0.0000	0.0000	200	0.5500	0.3350	0.0000	0.1150
Kasilof Fish Wheel #2, 94	200	1.0000	0.0000	0.0000	0.0000	199	0.5352	0.3342	0.0000	0.1307
Kasilof Fish Wheel #3, 94	97	1.0000	0.0000	0.0000	0.0000	96	0.5885	0.3229	0.0000	0.0885
Kenai River In-river Fishery										
Kenai River Mixed Fishery, 92	200	0.9625	0.0375	0.0000	0.0000	200	0.5700	0.3850	0.0000	0.0450
Kenai Fish Wheel #1, 94	88	0.9148	0.0852	0.0000	0.0000	88	0.5852	0.3750	0.0000	0.0398
Kenai Fish Wheel #2, 94	199	0.9472	0.0477	0.0000	0.0050	199	0.6683	0.2839	0.0025	0.0452
Kenai Fish Wheel #3, 94	189	0.8571	0.1376	0.0053	0.0000	192	0.7240	0.2552	0.0000	0.0208
Kenai Fish Wheel #4, 94	200	0.7850	0.2000	0.0050	0.0100	198	0.7601	0.1944	0.0000	0.0455
Kenai Fish Wheel #1, 95	294	0.9099	0.0901	0.0000	0.0000	300	0.7067	0.2417	0.0050	0.0467
Kenai Fish Wheel #2, 95	299	0.9214	0.0786	0.0000	0.0000	300	0.7200	0.2367	0.0017	0.0417
Kenai Fish Wheel #3, 95	300	0.8867	0.1133	0.0000	0.0000	294	0.6735	0.2721	0.0034	0.0510
Susitna River In-river Fishery										
Sunshine Fish Wheel #1, 92	200	0.9950	0.0050	0.0000	0.0000	198	0.7121	0.2677	0.0025	0.0177
Sunshine Fish Wheel #2, 92	114	0.9912	0.0088	0.0000	0.0000	114	0.7325	0.2412	0.0000	0.0263
Yentna River In-river Fishery										
Yentna River Fish Wheel #1, 92	199	1.0000	0.0000	0.0000	0.0000	196	0.5536	0.4260	0.0000	0.0204
Yentna River Fish Wheel #2, 92	200	1.0000	0.0000	0.0000	0.0000	200	0.5275	0.4575	0.0000	0.0150
Yentna River Mixed Fishery, 94	199	1.0000	0.0000	0.0000	0.0000	198	0.5657	0.4040	0.0000	0.0303

Appendix B. Continued.

Population	N	*GAPDH-2** 100	50	208	N	*G3PDH-4** 100	108	N	*GPI-B1,2** 100	132	143
Cook Inlet Commercial Fishery											
Central District Drift Fishery #1, 92	154	0.9935	0.0065	0.0000				160	1.0000	0.0000	0.0000
Central District Drift Fishery #2, 92	195	0.9949	0.0051	0.0000				200	0.9975	0.0012	0.0012
Central District Drift Fishery #1, 93	250	1.0000	0.0000	0.0000				393	0.9987	0.0013	0.0000
Central District Drift Fishery #2, 93	278	0.9910	0.0054	0.0036				282	1.0000	0.0000	0.0000
Commercial Drift Fishery, 94	347	0.9986	0.0014	0.0000	346	1.0000	0.0000	349	1.0000	0.0000	0.0000
Cook Inlet Drift Fishery #1, 95	300	1.0000	0.0000	0.0000	297	0.9882	0.0118				
Cook Inlet Drift Fishery #2, 95	400	0.9900	0.0038	0.0062	397	0.9950	0.0050				
Cook Inlet Drift Fishery #3, 95	398	0.9975	0.0025	0.0000	397	0.9962	0.0038				
Cook Inlet Drift Fishery #4, 95	400	0.9962	0.0038	0.0000	400	0.9988	0.0012				
Cook Inlet Drift Fishery #5, 95	300	0.9917	0.0083	0.0000	300	1.0000	0.0000				
So. Central Cook Inlet Setnet #1, 95	399	0.9987	0.0013	0.0000	398	0.9925	0.0075				
So. Central Cook Inlet Setnet #2, 95	400	0.9975	0.0025	0.0000	394	1.0000	0.0000	50	1.0000	0.0000	0.0000
Kasilof River In-river Fishery											
Kasilof River Mixed Fishery #1, 92	196	1.0000	0.0000	0.0000	200	0.9950	0.0050	199	0.9661	0.0339	0.0000
Kasilof River Mixed Fishery #2, 92	198	1.0000	0.0000	0.0000	184	1.0000	0.0000	200	0.9738	0.0262	0.0000
Kasilof Fish Wheel #1, 94	200	0.9975	0.0025	0.0000	200	1.0000	0.0000	200	1.0000	0.0000	0.0000
Kasilof Fish Wheel #2, 94	194	1.0000	0.0000	0.0000	200	0.9900	0.0100	200	1.0000	0.0000	0.0000
Kasilof Fish Wheel #3, 94	94	1.0000	0.0000	0.0000	95	0.9947	0.0053	98	0.9923	0.0077	0.0000
Kenai River In-river Fishery											
Kenai River Mixed Fishery, 92	198	0.9975	0.0025	0.0000	200	1.0000	0.0000	200	0.9988	0.0012	0.0000
Kenai Fish Wheel #1, 94	88	0.9943	0.0057	0.0000	88	1.0000	0.0000	88	0.9972	0.0028	0.0000
Kenai Fish Wheel #2, 94	200	0.9950	0.0050	0.0000	200	1.0000	0.0000	199	1.0000	0.0000	0.0000
Kenai Fish Wheel #3, 94	197	0.9975	0.0025	0.0000	194	1.0000	0.0000	193	1.0000	0.0000	0.0000
Kenai Fish Wheel #4, 94	196	1.0000	0.0000	0.0000	200	1.0000	0.0000	199	1.0000	0.0000	0.0000
Kenai Fish Wheel #1, 95	299	0.9967	0.0033	0.0000	299	1.0000	0.0000	299	1.0000	0.0000	0.0000
Kenai Fish Wheel #2, 95	300	0.9917	0.0083	0.0000	298	1.0000	0.0000	299	0.9983	0.0017	0.0000
Kenai Fish Wheel #3, 95	293	0.9966	0.0034	0.0000	290	1.0000	0.0000	300	1.0000	0.0000	0.0000
Susitna River In-river Fishery											
Sunshine Fish Wheel #1, 92	199	1.0000	0.0000	0.0000				200	1.0000	0.0000	0.0000
Sunshine Fish Wheel #2, 92	114	1.0000	0.0000	0.0000				114	0.9978	0.0000	0.0022
Yentna River In-river Fishery											
Yentna River Fish Wheel #1, 92	197	0.9975	0.0000	0.0025	197	1.0000	0.0000	188	1.0000	0.0000	0.0000
Yentna River Fish Wheel #2, 92	199	1.0000	0.0000	0.0000				200	1.0000	0.0000	0.0000
Yentna River Mixed Fishery, 94	199	1.0000	0.0000	0.0000	198	1.0000	0.0000	199	1.0000	0.0000	0.0000

Appendix B. Continued.

Population	N	*GPI-A** 100	94	107	N	*sIDHP-1** 100	72	84	61	118	94
Cook Inlet Commercial Fishery											
Central District Drift Fishery #1, 92	160	1.0000	0.0000	0.0000	158	0.9968	0.0000	0.0032	0.0000	0.0000	0.0000
Central District Drift Fishery #2, 92	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Central District Drift Fishery #1, 93	395	0.9987	0.0000	0.0013	385	0.9935	0.0039	0.0026	0.0000	0.0000	0.0000
Central District Drift Fishery #2, 93	282	1.0000	0.0000	0.0000	280	0.9821	0.0054	0.0107	0.0018	0.0000	0.0000
Commercial Drift Fishery, 94	349	0.9986	0.0000	0.0014	347	0.9942	0.0029	0.0029	0.0000	0.0000	0.0000
Cook Inlet Drift Fishery #1, 95	300	1.0000	0.0000	0.0000	300	0.9933	0.0050	0.0000	0.0017	0.0000	0.0000
Cook Inlet Drift Fishery #2, 95	399	1.0000	0.0000	0.0000	399	0.9887	0.0050	0.0038	0.0025	0.0000	0.0000
Cook Inlet Drift Fishery #3, 95	386	1.0000	0.0000	0.0000	397	0.9861	0.0013	0.0050	0.0076	0.0000	0.0000
Cook Inlet Drift Fishery #4, 95	397	1.0000	0.0000	0.0000	399	0.9950	0.0025	0.0013	0.0013	0.0000	0.0000
Cook Inlet Drift Fishery #5, 95	298	1.0000	0.0000	0.0000	300	0.9867	0.0017	0.0067	0.0050	0.0000	0.0000
So. Central Cook Inlet Setnet #1, 95	397	0.9987	0.0000	0.0013	397	0.9987	0.0013	0.0000	0.0000	0.0000	0.0000
So. Central Cook Inlet Setnet #2, 95	396	1.0000	0.0000	0.0000	398	0.9899	0.0013	0.0075	0.0013	0.0000	0.0000
Kasilof River In-river Fishery											
Kasilof River Mixed Fishery #1, 92	200	1.0000	0.0000	0.0000	199	0.9950	0.0050	0.0000	0.0000	0.0000	0.0000
Kasilof River Mixed Fishery #2, 92	200	1.0000	0.0000	0.0000	200	0.9975	0.0000	0.0000	0.0000	0.0000	0.0025
Kasilof Fish Wheel #1, 94	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Kasilof Fish Wheel #2, 94	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Kasilof Fish Wheel #3, 94	98	1.0000	0.0000	0.0000	98	0.9949	0.0051	0.0000	0.0000	0.0000	0.0000
Kenai River In-river Fishery											
Kenai River Mixed Fishery, 92	200	1.0000	0.0000	0.0000	200	0.9925	0.0025	0.0050	0.0000	0.0000	0.0000
Kenai Fish Wheel #1, 94	88	1.0000	0.0000	0.0000	88	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Kenai Fish Wheel #2, 94	199	0.9975	0.0000	0.0025	199	0.9824	0.0126	0.0050	0.0000	0.0000	0.0000
Kenai Fish Wheel #3, 94	193	1.0000	0.0000	0.0000	199	0.9899	0.0050	0.0050	0.0000	0.0000	0.0000
Kenai Fish Wheel #4, 94	196	1.0000	0.0000	0.0000	191	0.9895	0.0026	0.0052	0.0026	0.0000	0.0000
Kenai Fish Wheel #1, 95	299	0.9983	0.0017	0.0000	297	0.9882	0.0000	0.0084	0.0034	0.0000	0.0000
Kenai Fish Wheel #2, 95	299	1.0000	0.0000	0.0000	299	0.9916	0.0000	0.0067	0.0017	0.0000	0.0000
Kenai Fish Wheel #3, 95	300	1.0000	0.0000	0.0000	299	0.9900	0.0033	0.0067	0.0000	0.0000	0.0000
Susitna River In-river Fishery											
Sunshine Fish Wheel #1, 92	200	1.0000	0.0000	0.0000	199	0.9975	0.0000	0.0000	0.0000	0.0025	0.0000
Sunshine Fish Wheel #2, 92	114	1.0000	0.0000	0.0000	114	0.9737	0.0000	0.0000	0.0000	0.0132	0.0132
Yentna River In-river Fishery											
Yentna River Fish Wheel #1, 92	198	1.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Yentna River Fish Wheel #2, 92	200	1.0000	0.0000	0.0000	200	0.9975	0.0000	0.0000	0.0000	0.0025	0.0000
Yentna River Mixed Fishery, 94	199	1.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Appendix B. Continued.

Population	N	*LDH-B2** 100	110	85	N	*sMDH-A1,2** 100	64	46	147
Cook Inlet Commercial Fishery									
Central District Drift Fishery #1, 92	159	0.9088	0.0912	0.0000	160	0.9812	0.0000	0.0000	0.0188
Central District Drift Fishery #2, 92	200	0.8900	0.1100	0.0000	199	0.9937	0.0000	0.0000	0.0063
Central District Drift Fishery #1, 93	394	0.8858	0.1129	0.0013	399	0.9937	0.0000	0.0013	0.0050
Central District Drift Fishery #2, 93	283	0.9028	0.0972	0.0000	279	0.9928	0.0009	0.0000	0.0063
Commercial Drift Fishery, 94	349	0.8825	0.1175	0.0000	347	0.9928	0.0000	0.0000	0.0072
Cook Inlet Drift Fishery #1, 95	300	0.8850	0.1150	0.0000	300	0.9992	0.0000	0.0000	0.0008
Cook Inlet Drift Fishery #2, 95	400	0.8788	0.1212	0.0000	399	0.9981	0.0006	0.0000	0.0013
Cook Inlet Drift Fishery #3, 95	400	0.8775	0.1225	0.0000	398	0.9962	0.0000	0.0000	0.0038
Cook Inlet Drift Fishery #4, 95	399	0.9035	0.0965	0.0000	397	0.9962	0.0000	0.0000	0.0038
Cook Inlet Drift Fishery #5, 95	299	0.8997	0.1003	0.0000	300	0.9917	0.0000	0.0000	0.0083
So. Central Cook Inlet Setnet #1, 95	400	0.8775	0.1225	0.0000	399	0.9994	0.0000	0.0000	0.0006
So. Central Cook Inlet Setnet #2, 95	400	0.8638	0.1362	0.0000	400	0.9906	0.0000	0.0000	0.0094
Kasilof River In-river Fishery									
Kasilof River Mixed Fishery #1, 92	199	0.8769	0.1231	0.0000	200	0.9975	0.0000	0.0000	0.0025
Kasilof River Mixed Fishery #2, 92	200	0.8575	0.1425	0.0000	200	0.9988	0.0000	0.0000	0.0012
Kasilof Fish Wheel #1, 94	200	0.8750	0.1250	0.0000	200	0.9975	0.0000	0.0000	0.0025
Kasilof Fish Wheel #2, 94	200	0.8775	0.1225	0.0000	200	0.9975	0.0000	0.0000	0.0025
Kasilof Fish Wheel #3, 94	97	0.8299	0.1701	0.0000	98	0.9949	0.0000	0.0000	0.0051
Kenai River In-river Fishery									
Kenai River Mixed Fishery, 92	200	0.9175	0.0825	0.0000	200	0.9775	0.0012	0.0000	0.0213
Kenai Fish Wheel #1, 94	88	0.8864	0.1136	0.0000	88	0.9972	0.0000	0.0000	0.0028
Kenai Fish Wheel #2, 94	200	0.8725	0.1275	0.0000	200	0.9888	0.0000	0.0000	0.0112
Kenai Fish Wheel #3, 94	200	0.8475	0.1525	0.0000	199	0.9925	0.0000	0.0000	0.0075
Kenai Fish Wheel #4, 94	200	0.7925	0.2075	0.0000	197	0.9949	0.0000	0.0000	0.0051
Kenai Fish Wheel #1, 95	299	0.8712	0.1288	0.0000	300	0.9933	0.0000	0.0000	0.0067
Kenai Fish Wheel #2, 95	300	0.8600	0.1400	0.0000	300	0.9883	0.0033	0.0000	0.0083
Kenai Fish Wheel #3, 95	300	0.8517	0.1483	0.0000	200	0.9925	0.0000	0.0000	0.0075
Susitna River In-river Fishery									
Sunshine Fish Wheel #1, 92	200	0.9400	0.0600	0.0000	199	1.0000	0.0000	0.0000	0.0000
Sunshine Fish Wheel #2, 92	114	0.9518	0.0482	0.0000	114	1.0000	0.0000	0.0000	0.0000
Yentna River In-river Fishery									
Yentna River Fish Wheel #1, 92	199	0.9121	0.0879	0.0000	199	0.9987	0.0013	0.0000	0.0000
Yentna River Fish Wheel #2, 92	200	0.8925	0.1075	0.0000	200	1.0000	0.0000	0.0000	0.0000
Yentna River Mixed Fishery, 94	199	0.9171	0.0829	0.0000	199	1.0000	0.0000	0.0000	0.0000

Appendix B. Continued.

Population	N	sMDH-B1,2* 100	65	120	116	N	mMEP-1* 100	80
Cook Inlet Commercial Fishery								
Central District Drift Fishery #1, 92	150	1.0000	0.0000	0.0000	0.0000	158	1.0000	0.0000
Central District Drift Fishery #2, 92	200	0.9988	0.0012	0.0000	0.0000	200	1.0000	0.0000
Central District Drift Fishery #1, 93	399	0.9987	0.0006	0.0006	0.0000	396	1.0000	0.0000
Central District Drift Fishery #2, 93	282	0.9973	0.0027	0.0000	0.0000	283	1.0000	0.0000
Commercial Drift Fishery, 94	350	0.9964	0.0029	0.0000	0.0007	347	1.0000	0.0000
Cook Inlet Drift Fishery #1, 95	300	0.9992	0.0008	0.0000	0.0000	299	1.0000	0.0000
Cook Inlet Drift Fishery #2, 95	399	0.9994	0.0006	0.0000	0.0000	398	1.0000	0.0000
Cook Inlet Drift Fishery #3, 95	400	0.9988	0.0012	0.0000	0.0000	397	0.9987	0.0013
Cook Inlet Drift Fishery #4, 95	397	0.9981	0.0019	0.0000	0.0000	399	1.0000	0.0000
Cook Inlet Drift Fishery #5, 95	300	0.9983	0.0017	0.0000	0.0000	300	1.0000	0.0000
So. Central Cook Inlet Setnet #1, 95	399	0.9994	0.0006	0.0000	0.0000	399	1.0000	0.0000
So. Central Cook Inlet Setnet #2, 95	400	1.0000	0.0000	0.0000	0.0000	399	1.0000	0.0000
Kasilof River In-river Fishery								
Kasilof River Mixed Fishery #1, 92	200	1.0000	0.0000	0.0000	0.0000	198	1.0000	0.0000
Kasilof River Mixed Fishery #2, 92	199	1.0000	0.0000	0.0000	0.0000	200	1.0000	0.0000
Kasilof Fish Wheel #1, 94	200	1.0000	0.0000	0.0000	0.0000	197	1.0000	0.0000
Kasilof Fish Wheel #2, 94	99	1.0000	0.0000	0.0000	0.0000	200	1.0000	0.0000
Kasilof Fish Wheel #3, 94	98	1.0000	0.0000	0.0000	0.0000	98	1.0000	0.0000
Kenai River In-river Fishery								
Kenai River Mixed Fishery, 92	198	0.9937	0.0051	0.0000	0.0013	200	1.0000	0.0000
Kenai Fish Wheel #1, 94	88	1.0000	0.0000	0.0000	0.0000	88	1.0000	0.0000
Kenai Fish Wheel #2, 94	200	1.0000	0.0000	0.0000	0.0000	200	1.0000	0.0000
Kenai Fish Wheel #3, 94	199	1.0000	0.0000	0.0000	0.0000	190	1.0000	0.0000
Kenai Fish Wheel #4, 94	196	0.9987	0.0013	0.0000	0.0000	196	1.0000	0.0000
Kenai Fish Wheel #1, 95	300	0.9992	0.0008	0.0000	0.0000	299	1.0000	0.0000
Kenai Fish Wheel #2, 95	300	0.9992	0.0008	0.0000	0.0000	300	1.0000	0.0000
Kenai Fish Wheel #3, 95	199	1.0000	0.0000	0.0000	0.0000	300	1.0000	0.0000
Susitna River In-river Fishery								
Sunshine Fish Wheel #1, 92	199	1.0000	0.0000	0.0000	0.0000	199	1.0000	0.0000
Sunshine Fish Wheel #2, 92	114	1.0000	0.0000	0.0000	0.0000	112	1.0000	0.0000
Yentna River In-river Fishery								
Yentna River Fish Wheel #1, 92	199	1.0000	0.0000	0.0000	0.0000	199	1.0000	0.0000
Yentna River Fish Wheel #2, 92	200	1.0000	0.0000	0.0000	0.0000	200	1.0000	0.0000
Yentna River Mixed Fishery, 94	199	1.0000	0.0000	0.0000	0.0000	199	1.0000	0.0000

Appendix B. Continued.

Population	N	*PEPA** 100	106	92	N	*PEPB-1** 100	130	163	N	*PEPC** 100	105
Cook Inlet Commercial Fishery											
Central District Drift Fishery #1, 92	160	1.0000	0.0000	0.0000	156	0.9968	0.0032	0.0000	160	1.0000	0.0000
Central District Drift Fishery #2, 92	200	0.9925	0.0050	0.0025	200	1.0000	0.0000	0.0000	200	0.9900	0.0100
Central District Drift Fishery #1, 93	399	0.9962	0.0025	0.0013	390	0.9987	0.0013	0.0000	394	0.9835	0.0165
Central District Drift Fishery #2, 93	282	0.9840	0.0000	0.0160	280	1.0000	0.0000	0.0000	278	0.9946	0.0054
Commercial Drift Fishery, 94	346	0.9971	0.0000	0.0029	347	0.9986	0.0014	0.0000	346	0.9827	0.0173
Cook Inlet Drift Fishery #1, 95	300	1.0000	0.0000	0.0000	300	1.0000	0.0000	0.0000	300	0.9583	0.0417
Cook Inlet Drift Fishery #2, 95	399	1.0000	0.0000	0.0000	399	0.9975	0.0025	0.0000	396	0.9381	0.0619
Cook Inlet Drift Fishery #3, 95	398	0.9975	0.0000	0.0025	399	0.9962	0.0038	0.0000	398	0.9648	0.0352
Cook Inlet Drift Fishery #4, 95	399	0.9962	0.0013	0.0025	399	0.9950	0.0038	0.0013	398	0.9573	0.0427
Cook Inlet Drift Fishery #5, 95	300	0.9883	0.0067	0.0050	300	0.9950	0.0050	0.0000	299	0.9816	0.0184
So. Central Cook Inlet Setnet #1, 95	400	1.0000	0.0000	0.0000	396	0.9987	0.0013	0.0000	397	0.9773	0.0227
So. Central Cook Inlet Setnet #2, 95	399	0.9900	0.0013	0.0088	400	0.9988	0.0012	0.0000	397	0.9950	0.0050
Kasilof River In-river Fishery											
Kasilof River Mixed Fishery #1, 92	198	1.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000	200	0.9800	0.0200
Kasilof River Mixed Fishery #2, 92	199	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	198	0.9848	0.0152
Kasilof Fish Wheel #1, 94	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	200	0.9700	0.0300
Kasilof Fish Wheel #2, 94	200	1.0000	0.0000	0.0000	198	1.0000	0.0000	0.0000	200	0.9900	0.0100
Kasilof Fish Wheel #3, 94	98	1.0000	0.0000	0.0000	98	1.0000	0.0000	0.0000	98	0.9949	0.0051
Kenai River In-river Fishery											
Kenai River Mixed Fishery, 92	200	0.9825	0.0000	0.0175	200	0.9975	0.0025	0.0000	200	0.9950	0.0050
Kenai Fish Wheel #1, 94	88	0.9943	0.0057	0.0000	87	1.0000	0.0000	0.0000	88	0.9943	0.0057
Kenai Fish Wheel #2, 94	200	0.9875	0.0050	0.0075	200	0.9950	0.0050	0.0000	199	1.0000	0.0000
Kenai Fish Wheel #3, 94	199	0.9824	0.0025	0.0151	168	1.0000	0.0000	0.0000	176	0.9972	0.0028
Kenai Fish Wheel #4, 94	199	0.9849	0.0000	0.0151	200	0.9975	0.0025	0.0000	199	1.0000	0.0000
Kenai Fish Wheel #1, 95	299	0.9900	0.0017	0.0084	299	0.9967	0.0033	0.0000	299	0.9933	0.0067
Kenai Fish Wheel #2, 95	300	0.9900	0.0000	0.0100	300	0.9983	0.0017	0.0000	298	0.9950	0.0050
Kenai Fish Wheel #3, 95	300	0.9933	0.0017	0.0050	300	0.9950	0.0050	0.0000	195	0.9923	0.0077
Susitna River In-river Fishery											
Sunshine Fish Wheel #1, 92	200	1.0000	0.0000	0.0000	199	1.0000	0.0000	0.0000	197	0.9264	0.0736
Sunshine Fish Wheel #2, 92	114	1.0000	0.0000	0.0000	114	1.0000	0.0000	0.0000	114	0.9386	0.0614
Yentna River In-river Fishery											
Yentna River Fish Wheel #1, 92	199	1.0000	0.0000	0.0000	200	0.9925	0.0075	0.0000	199	0.9698	0.0302
Yentna River Fish Wheel #2, 92	200	1.0000	0.0000	0.0000	200	1.0000	0.0000	0.0000	200	0.9475	0.0525
Yentna River Mixed Fishery, 94	199	1.0000	0.0000	0.0000	199	0.9975	0.0025	0.0000	199	0.9271	0.0729

Appendix B. Continued.

Population	N	*PEPLT** 100	88	114	N	*PGM-1** 100	null	N	*PGM-2** 100	136
Cook Inlet Commercial Fishery										
Central District Drift Fishery #1, 92	158	0.9778	0.0127	0.0095	160	0.3529	0.6471	157	0.8217	0.1783
Central District Drift Fishery #2, 92	200	0.9800	0.0100	0.0100	200	0.2618	0.7382	200	0.7400	0.2600
Central District Drift Fishery #1, 93	395	0.9709	0.0228	0.0063	398	0.2027	0.7973	393	0.7646	0.2354
Central District Drift Fishery #2, 93	281	0.9715	0.0160	0.0125	282	0.2397	0.7603	283	0.7703	0.2297
Commercial Drift Fishery, 94	346	0.9624	0.0332	0.0043	347	0.2001	0.7999	347	0.7522	0.2478
Cook Inlet Drift Fishery #1, 95	293	0.9676	0.0324	0.0000	300	0.0908	0.9092	300	0.6950	0.3050
Cook Inlet Drift Fishery #2, 95	383	0.9634	0.0352	0.0013	400	0.1500	0.8500	400	0.7250	0.2750
Cook Inlet Drift Fishery #3, 95	392	0.9694	0.0242	0.0064	400	0.1678	0.8322	400	0.7338	0.2662
Cook Inlet Drift Fishery #4, 95	384	0.9648	0.0208	0.0143	399	0.2084	0.7916	399	0.7556	0.2444
Cook Inlet Drift Fishery #5, 95	287	0.9721	0.0157	0.0122	300	0.2561	0.7439	300	0.7867	0.2133
So. Central Cook Inlet Setnet #1, 95	373	0.9946	0.0054	0.0000	399	0.1228	0.8772	398	0.6696	0.3304
So. Central Cook Inlet Setnet #2, 95	379	0.9855	0.0066	0.0079	399	0.3136	0.6864	400	0.7712	0.2288
Kasilof River In-river Fishery										
Kasilof River Mixed Fishery #1, 92	200	1.0000	0.0000	0.0000	200	0.1340	0.8660	200	0.6850	0.3150
Kasilof River Mixed Fishery #2, 92	200	1.0000	0.0000	0.0000	200	0.1000	0.9000	200	0.6775	0.3225
Kasilof Fish Wheel #1, 94	200	1.0000	0.0000	0.0000	197	0.1391	0.8609	200	0.6525	0.3475
Kasilof Fish Wheel #2, 94	200	1.0000	0.0000	0.0000	199	0.1886	0.8114	200	0.6650	0.3350
Kasilof Fish Wheel #3, 94	97	1.0000	0.0000	0.0000	98	0.1252	0.8748	98	0.6276	0.3724
Kenai River In-river Fishery										
Kenai River Mixed Fishery, 92	200	0.9800	0.0100	0.0100	200	0.3181	0.6819	198	0.7778	0.2222
Kenai Fish Wheel #1, 94	88	0.9943	0.0057	0.0000	86	0.1578	0.8422	88	0.7670	0.2330
Kenai Fish Wheel #2, 94	199	0.9799	0.0075	0.0126	200	0.2286	0.7714	200	0.8075	0.1925
Kenai Fish Wheel #3, 94	198	0.9798	0.0101	0.0101	200	0.2158	0.7842	200	0.8125	0.1875
Kenai Fish Wheel #4, 94	199	0.9899	0.0075	0.0025	200	0.1633	0.8367	200	0.8050	0.1950
Kenai Fish Wheel #1, 95	299	0.9666	0.0067	0.0268	299	0.2571	0.7429	299	0.8227	0.1773
Kenai Fish Wheel #2, 95	300	0.9817	0.0100	0.0083	300	0.2606	0.7394	300	0.7850	0.2150
Kenai Fish Wheel #3, 95	300	0.9750	0.0167	0.0083	300	0.2428	0.7572	300	0.8417	0.1583
Susitna River In-river Fishery										
Sunshine Fish Wheel #1, 92	198	0.9899	0.0101	0.0000	199	0.2300	0.7700	200	0.7500	0.2500
Sunshine Fish Wheel #2, 92	112	0.9955	0.0045	0.0000	114	0.2164	0.7836	114	0.7368	0.2632
Yentna River In-river Fishery										
Yentna River Fish Wheel #1, 92	197	0.9746	0.0203	0.0051	199	0.0812	0.9188	198	0.7222	0.2778
Yentna River Fish Wheel #2, 92	200	0.9750	0.0250	0.0000	199	0.1061	0.8939	200	0.7225	0.2775
Yentna River Mixed Fishery, 94	199	0.9799	0.0201	0.0000	199	0.0922	0.9078	199	0.7136	0.2864

Appendix B. Continued.

Population	N	TPI-1,2* -100	54	-82
Cook Inlet Commercial Fishery				
Central District Drift Fishery #1, 92	155	1.0000	0.0000	0.0000
Central District Drift Fishery #2, 92	200	1.0000	0.0000	0.0000
Central District Drift Fishery #1, 93	395	0.9994	0.0006	0.0000
Central District Drift Fishery #2, 93	283	1.0000	0.0000	0.0000
Commercial Drift Fishery, 94	346	0.9993	0.0000	0.0007
Cook Inlet Drift Fishery #1, 95	300	1.0000	0.0000	0.0000
Cook Inlet Drift Fishery #2, 95	396	1.0000	0.0000	0.0000
Cook Inlet Drift Fishery #3, 95	398	1.0000	0.0000	0.0000
Cook Inlet Drift Fishery #4, 95	399	1.0000	0.0000	0.0000
Cook Inlet Drift Fishery #5, 95	300	1.0000	0.0000	0.0000
So. Central Cook Inlet Setnet #1, 95	400	1.0000	0.0000	0.0000
So. Central Cook Inlet Setnet #2, 95	398	1.0000	0.0000	0.0000
Kasilof River In-river Fishery				
Kasilof River Mixed Fishery #1, 92	198	1.0000	0.0000	0.0000
Kasilof River Mixed Fishery #2, 92	200	1.0000	0.0000	0.0000
Kasilof Fish Wheel #1, 94	200	1.0000	0.0000	0.0000
Kasilof Fish Wheel #2, 94	200	1.0000	0.0000	0.0000
Kasilof Fish Wheel #3, 94	98	1.0000	0.0000	0.0000
Kenai River In-river Fishery				
Kenai River Mixed Fishery, 92	200	1.0000	0.0000	0.0000
Kenai Fish Wheel #1, 94	87	1.0000	0.0000	0.0000
Kenai Fish Wheel #2, 94	199	1.0000	0.0000	0.0000
Kenai Fish Wheel #3, 94	190	1.0000	0.0000	0.0000
Kenai Fish Wheel #4, 94	198	1.0000	0.0000	0.0000
Kenai Fish Wheel #1, 95	299	1.0000	0.0000	0.0000
Kenai Fish Wheel #2, 95	298	0.9992	0.0000	0.0008
Kenai Fish Wheel #3, 95	300	1.0000	0.0000	0.0000
Susitna River In-river Fishery				
Sunshine Fish Wheel #1, 92	200	1.0000	0.0000	0.0000
Sunshine Fish Wheel #2, 92	114	1.0000	0.0000	0.0000
Yentna River In-river Fishery				
Yentna River Fish Wheel #1, 92	199	1.0000	0.0000	0.0000
Yentna River Fish Wheel #2, 92	199	1.0000	0.0000	0.0000
Yentna River Mixed Fishery, 94	199	1.0000	0.0000	0.0000

Appendix C. Heterogeneity analysis within Kenai River.

Populations	DF	*mAAT-1*	DF	*mAAT-2*	DF	*mAH-1,2*	DF	*mAH-4*	DF	*sAH*	DF	*ALAT*	DF	*CK-A2*	DF	*CK-B*
Among heterogeneity groups	4	58.98	4	532.81	4	44.70	4	17.59	12	1888.40	12	447.64	4	4.95	4	4.49
Within heterogeneity groups	25	59.40	25	58.06	25	78.92	25	6.71	75	54.43	73	135.66	25	30.90	25	2.19
Russian River Above Falls	2	15.25	2	9.27	2	37.73	2	0.00	6	0.91	5	2.88	2	0.00	2	2.19
Among years[1]	1	14.92	1	9.03	1	37.73	1	0.00	3	0.76	3	0.70	1	0.00	1	0.81
Between years	1	0.33	1	0.24	1	0.00	1	0.00	3	0.15	2	2.18	1	0.00	1	1.38
Late run	1	0.33	1	0.24	1	0.00	1	0.00	3	0.15	3	2.18	1	0.00	1	1.38
Kenai Mainstem	20	42.83	20	43.38	20	38.71	20	4.27	60	50.83	59	127.06	20	30.90	20	0.00
Among streams[2]	9	33.57	9	34.04	9	25.71	9	0.00	27	34.66	27	98.79	9	25.74	9	0.00
Within streams	11	9.26	11	9.34	11	13.00	11	4.27	33	16.17	32	28.27	11	5.16	11	0.00
Ptarmigan Creek	1	0.97	1	0.00	1	0.41	1	0.00	3	1.09	3	0.30	1	0.00	1	0.00
Quartz Creek	1	0.48	1	2.86	1	1.57	1	0.00	3	0.00	3	5.36	1	2.99	1	0.00
Skilak Lake Outlet	4	3.60	4	2.85	4	2.31	4	0.00	12	7.73	12	11.4	4	0.00	4	0.00
Among years[3]	2	2.44	2	1.84	2	0.20	2	0.00	6	2.21	6	10.71	2	0.00	2	0.00
Within run time	2	1.16	2	1.01	2	2.11	2	0.00	6	5.52	6	0.69	2	0.00	2	0.00
1993	1	0.00	1	0.00	1	0.04	1	0.00	3	4.07	3	0.55	1	0.00	1	0.00
1994	1	1.16	1	1.01	1	2.07	1	0.00	3	1.45	3	0.14	1	0.00	1	0.00
Btwn Ken/Ski Lakes Site 1	1	0.19	1	1.37	1	1.43	1	0.00	3	2.79	3	2.43	1	0.00	1	0.00
Btwn Ken/Ski Lakes Site 2	1	1.72	1	0.34	1	7.06	1	0.00	3	0.20	3	3.36	1	0.00	1	0.00
Btwn Ken/Ski Lakes Site 3	1	0.95	1	1.92	1	0.02	1	0.00	3	0.90	3	2.05	1	0.00	1	0.00
Btwn Ken/Ski Lakes Site 6	2	1.35	2	0.00	2	0.20	2	4.27	6	3.46	5	3.37	2	2.17	2	0.00
Among years	1	0.24	1	0.00	1	0.17	1	0.00	3	2.52	3	2.08	1	0.82	1	0.00
Within run time	1	1.11	1	0.00	1	0.03	1	4.27	3	0.94	2	1.29	1	1.35	1	0.00
1993	1	1.11	1	0.00	1	0.03	1	0.00	3	0.94	3	2.63	1	1.35	1	0.00
Tern Lake	1	0.55	1	3.27	1	2.35	1	2.44	3	2.20	3	0.35	1	0.00	1	0.00
Hidden Creek	1	0.41	1	0.25	1	0.02	1	0.00	3	0.00	3	3.05	1	0.00	1	0.00
Moose Creek	1	0.36	1	1.89	1	0.11	1	0.00	3	0.49	3	2.32	1	0.00	1	0.00

[1]Includes early run, 92

[2]Includes Russian River below falls 93 and Between Kenai and Skilak Lakes, sites 4 and 5, 94

[3]Includes Skilak Lake Outlet, 92

Appendix C. Continued.

Populations	DF	*FDH*	DF	*GAPDH-2*	DF	*G3PDH-1,2*	DF	*GPI-B1,2*	DF	*GPI-A*	DF	*mIDHP-1*	DF	*sIDHP-1*	DF	*sIDHP-2*
Among heterogeneity groups	4	1.35	8	50.34	12	12.97	4	7.53	8	23.99	4	0.71	16	17.91	8	506.77
Within heterogeneity groups	25	9.17	50	39.62	73	27.45	25	25.57	50	24.23	25	4.58	100	59.29	48	95.01
Russian River Above Falls	2	0.00	4	0.81	5	1.40	2	0.00	4	0.00	2	0.00	8	0.00	3	0.00
Among years	1	0.00	2	0.81	3	0.00	1	0.00	2	0.00	1	0.00	4	0.00	2	0.00
Between years	1	0.00	2	0.00	2	1.40	1	0.00	2	0.00	1	0.00	4	0.00	1	0.00
Late run	1	0.00	2	1.40	3	0.00	1	0.00	2	0.00	1	0.00	4	0.00	2	0.00
Kenai Mainstem	20	9.17	40	37.46	59	25.24	20	23.83	40	24.03	20	4.58	80	56.52	39	89.59
Among streams	9	5.65	18	20.98	27	16.47	9	19.74	18	21.85	9	2.09	36	33.27	18	69.08
Within streams	11	3.52	22	16.48	32	8.77	11	4.09	22	2.18	11	2.49	44	23.25	21	20.51
Ptarmigan Creek	1	1.34	2	0.00	3	0.00	1	0.00	2	0.00	1	0.00	4	1.09	2	0.00
Quartz Creek	1	0.00	2	0.00	3	0.00	1	0.21	2	0.00	1	0.00	4	2.77	2	20.51
Skilak Lake Outlet	4	0.00	8	4.37	12	3.59	4	3.88	8	0.00	4	2.49	16	12.9	8	0.00
Among years	2	0.00	4	3.68	6	2.21	2	2.50	4	0.00	2	1.11	8	8.42	4	0.00
Within run time	2	0.00	4	0.69	6	1.38	2	1.38	4	0.00	2	1.38	8	4.48	4	0.00
1993	1	0.00	2	0.69	3	0.00	1	1.38	2	0.00	1	0.00	4	2.76	2	0.00
1994	1	0.00	2	0.00	3	1.38	1	0.00	2	0.00	1	1.38	4	1.72	2	0.00
Btwn Ken/Ski Lakes Site 1	1	0.00	2	2.79	3	0.00	1	0.00	2	0.00	1	0.00	4	0.00	2	0.00
Btwn Ken/Ski Lakes Site 2	1	0.00	2	0.00	3	1.38	1	0.00	2	0.00	1	0.00	4	1.06	2	0.00
Btwn Ken/Ski Lakes Site 3	1	0.00	2	0.23	3	0.81	1	0.00	2	0.00	1	0.00	4	1.62	2	0.00
Btwn Ken/Ski Lakes Site 6	2	2.18	4	9.09	5	2.99	2	0.00	4	2.18	2	0.00	8	3.81	3	0.00
Among years	1	0.82	2	4.95	3	2.99	1	0.00	2	0.82	1	0.00	4	3.81	2	0.00
Within run time	1	1.36	2	4.14	2	0.00	1	0.00	2	1.36	1	0.00	4	0.00	1	0.00
1993	1	1.36	2	0.00	3	4.14	1	0.00	2	1.36	1	0.00	4	0.00	2	0.00
Tern Lake	1	0.00	2	0.00	3	0.81	1	0.00	2	0.00	1	0.00	4	0.00	2	0.00
Hidden Creek	1	0.00	2	1.35	3	0.00	1	0.34	2	0.20	1	0.00	4	0.00	2	0.96
Moose Creek	1	0.00	2	0.00	3	0.00	1	1.40	2	0.00	1	0.00	4	2.77	2	4.46

Appendix C. Continued.

Populations	DF	*LDH-A2*	DF	*LDH-B2*	DF	*sMDH-A1,2*	DF	*sMDH-B1,2*	DF	*mMEP-1*	DF	*MPI*	DF	*PEPA*	DF	*PEPB-1*
Among heterogeneity groups	4	0.71	4	304.18	8	56.98	8	4.90	4	0.72	4	10.73	8	37.00	8	55.50
Within heterogeneity groups	25	6.06	25	58.03	50	48.43	50	21.81	25	4.51	25	31.48	50	58.24	50	43.77
Russian River Above Falls	2	0.00	2	26.14	4	0.00	4	1.62	2	0.00	2	0.00	4	0.00	4	0.00
Among years	1	0.00	1	24.86	2	0.00	2	1.62	1	0.00	1	0.00	2	0.00	2	0.00
Between years	1	0.00	1	1.28	2	0.00	2	0.00	1	0.00	1	0.00	2	0.00	2	0.00
Late run	1	0.00	1	1.28	2	0.00	2	0.00	1	0.00	1	0.00	2	0.00	2	0.00
Kenai Mainstem	20	6.06	20	30.62	40	48.43	40	20.19	20	4.51	20	31.48	40	57.43	40	41.53
Among streams	9	3.82	9	22.83	18	25.76	18	10.53	9	2.19	9	12.41	18	35.12	18	37.92
Within streams	11	2.24	11	7.79	22	22.67	22	9.66	11	2.32	11	19.07	22	22.31	22	3.61
Ptarmigan Creek	1	0.00	1	0.15	2	0.72	2	0.00	1	0.00	1	1.40	2	2.82	2	0.64
Quartz Creek	1	0.00	1	3.05	2	1.03	2	0.00	1	0.00	1	2.76	2	2.99	2	0.00
Skilak Lake Outlet	4	0	4	2.54	8	13.62	8	9.66	4	2.32	4	4.38	8	6.61	8	0
Among years	2	0.00	2	1.85	4	3.66	4	6.93	2	0.96	2	3.44	4	2.87	4	0.00
Within run time	2	0	2	0.69	4	9.96	4	2.73	2	1.36	2	0.94	4	3.74	4	0
1993	1	0.00	1	0.44	2	6.96	2	1.38	1	0.00	1	0.00	2	0.34	2	0.00
1994	1	0.00	1	0.25	2	3.00	2	1.35	1	1.36	1	0.94	2	3.40	2	0.00
Btwn Ken/Ski Lakes Site 1	1	0.00	1	0.14	2	1.38	2	0.00	1	0.00	1	2.79	2	0.00	2	0.00
Btwn Ken/Ski Lakes Site 2	1	0.00	1	0.19	2	1.38	2	0.00	1	0.00	1	4.20	2	1.39	2	0.00
Btwn Ken/Ski Lakes Site 3	1	0.00	1	0.16	2	0.00	2	0.00	1	0.00	1	2.20	2	2.53	2	0.00
Btwn Ken/Ski Lakes Site 6	2	2.24	2	1.56	4	4.54	4	0	2	0	2	1.34	4	5.97	4	2.97
Among years	1	0.83	1	0.60	2	2.88	2	0.00	1	0.00	1	0.00	2	0.90	2	0.00
Within run time	1	1.41	1	0.96	2	1.66	2	0.00	1	0.00	1	1.34	2	5.07	2	2.97
1993	1	1.41	1	0.96	2	2.97	2	0.00	1	0.00	1	0.00	2	1.66	2	0.00
Tern Lake	1	0.00	1	0.30	2	0.00	2	0.00	1	0.00	1	0.00	2	0.81	2	0.92
Hidden Creek	1	0.00	1	0.85	2	0.00	2	0.00	1	0.00	1	0.00	2	0.00	2	0.00
Moose Creek	1	0.00	1	0.12	2	0.00	2	0.00	1	0.00	1	0.00	2	0.00	2	1.32

Appendix C. Continued.

Populations	DF	*PEPC*	DF	*PEPD-1*	DF	*PEPLT*	DF	*PGM-1*	DF	*PGM-2*	DF	*TPI-3*	DF	*TPI-4*	DF	Overall
Among heterogeneity groups	4	8.47	4	24.89	8	156.95	8	578.80	4	221.27	4	2.13	4	16.87	196	5101.30
Within heterogeneity groups	27	31.24	25	39.53	48	73.02	48	68.86	25	51.48	25	11.33	25	4.38	1217	1264.45
Russian River Above Falls	3	0.00	2	0.00	3	0.00	3	1.62	2	5.05	2	0.00	2	0.00	94	104.94
Among years	1	0.00	1	0.00	2	0.00	2	1.62	1	0.52	1	0.00	1	0.00	49	93.41
Between years	2	0.00	1	0.00	1	0.00	1	0.00	1	4.53	1	0.00	1	0.00	45	11.53
Late run	1	0.00	1	0.00	2	0.00	2	0.00	1	4.53	1	0.00	1	0.00	49	11.53
Kenai Mainstem	21	24.81	20	39.53	39	65.17	39	62.32	20	39.47	20	11.33	20	0.00	976	1092.13
Among streams	9	8.73	9	29.88	18	39.51	18	34.48	9	25.04	9	6.10	9	0.00	441	736.00
Within streams	12	16.08	11	9.65	21	25.66	21	27.84	11	14.43	11	5.23	11	0.00	535	356.13
Ptarmigan Creek	1	1.36	1	0.00	2	8.27	2	2.48	1	1.19	1	0.00	1	0.00	49	24.32
Quartz Creek	1	1.38	1	0.00	2	3.13	2	8.24	1	0.67	1	1.38	1	0.00	49	61.46
Skilak Lake Outlet	4	9.79	4	4.63	8	6.46	8	10.95	4	7.73	4	2.48	4	0	196	136.53
Among years	2	8.24	2	4.63	4	1.95	4	10.07	2	7.11	2	1.13	2	0.00	98	88.26
Within run time	2	1.55	2	0	4	4.51	4	0.88	2	0.62	2	1.35	2	0	98	48.27
1993	1	0.19	1	0.00	2	4.18	2	0.09	1	0.04	1	0.00	1	0.00	49	23.17
1994	1	1.36	1	0.00	2	0.33	2	0.79	1	0.58	1	1.35	1	0.00	49	25.10
Btwn Ken/Ski Lakes Site 1	1	0.00	1	4.20	2	0.56	2	0.76	1	2.93	1	0.00	1	0.00	49	23.81
Btwn Ken/Ski Lakes Site 2	1	1.39	1	0.00	2	1.06	2	0.05	1	0.02	1	1.37	1	0.00	49	26.24
Btwn Ken/Ski Lakes Site 3	1	0.00	1	0.00	2	3.27	2	1.70	1	0.35	1	0.00	1	0.00	49	18.79
Btwn Ken/Ski Lakes Site 6	3	2.16	2	0.82	3	2.91	3	3.66	2	1.54	2	0	2	0	94	64.98
Among years	1	2.16	1	0.82	2	2.91	2	1.96	1	0.02	1	0.00	1	0.00	49	32.41
Within run time	2	0.00	1	0.00	1	0.00	1	1.70	1	1.52	1	0.00	1	0.00	45	32.57
1993	1	0.00	1	1.34	2	5.07	2	1.02	1	1.52	1	0.00	1	0.00	49	28.96
Tern Lake	1	2.19	1	0.00	2	5.80	2	1.92	1	0.91	1	0.00	1	1.60	49	26.47
Hidden Creek	1	0.00	1	0.00	2	0.71	2	0.94	1	4.18	1	0.00	1	0.00	49	13.31
Moose Creek	1	4.24	1	0.00	2	1.34	2	2.06	1	1.87	1	0.00	1	2.78	49	27.60

Appendix D. Heterogeneity analysis within Kasilof River.

Populations	DF	*sAAT-3*	DF	*mAAT-1*	DF	*mAAT-2*	DF	*mAH-1,2*	DF	*sAH*	DF	*ALAT*	DF	*CK-A2*
Among heterogeneity groups	3	2.54	3	6.99	3	2.61	3	6.36	3	4.63	6	5.65	3	2.58
Within heterogeneity groups	8	2.22	8	7.62	8	2.22	8	9.37	8	3.57	16	12.61	8	2.16
NE Tustumena Lake	4	0	4	4.41	4	0	4	0.52	4	0	8	5.03	4	0
Among drainages[1]	2	0	2	1.95	2	0	2	0.15	2	0	4	2.77	2	0
Within years	2	0	2	2.46	2	0	2	0.37	2	0	4	2.26	2	0
Bear Creek	1	0	1	2.32	1	0	1	0	1	0	2	1.75	1	0
Moose Creek	1	0	1	0.14	1	0	1	0.37	1	0	2	0.51	1	0
Glacier Flat Creek[2]	2	2.22	2	1.26	2	2.22	2	3.9	2	2.18	4	5.53	2	2.16
Nikolai Creek[3]	1	0	1	1.71	1	0	1	1.01	1	0	2	1.83	1	0
Tustumena Lake[4]	1	0	1	0.24	1	0	1	3.94	1	1.39	2	0.22	1	0

Populations	DF	*CK-B*	DF	*GAPDH-2*	DF	*G3PDH-4*	DF	*GPI-B1,2*	DF	*mIDHP-1*	DF	*sIDHP-1*	DF	*LDH-A2*
Among heterogeneity groups	3	10.19	3	2.62	3	7.06	3	20.16	3	9.78	3	3.18	3	3.40
Within heterogeneity groups	8	0.34	8	2.16	8	4.34	8	20.8	8	16.19	8	5.99	8	1.38
NE Tustumena Lake	4	0	4	0	4	2.78	4	1.39	4	7.32	4	3.22	4	0
Among drainages	2	0	2	0	2	2.44	2	0.99	2	4.54	2	3.22	2	0
Within years	2	0	2	0	2	0.34	2	0.4	2	2.78	2	0	2	0
Bear Creek	1	0	1	0	1	0.34	1	0.4	1	0	1	0	1	0
Moose Creek	1	0	1	0	1	0	1	0	1	2.78	1	0	1	0
Glacier Flat Creek	2	0	2	2.16	2	0.19	2	11.82	2	7.48	2	0	2	0
Nikolai Creek	1	0.34	1	0	1	0	1	3.41	1	1.39	1	1.38	1	1.38
Tustumena Lake	1	0	1	0	1	1.37	1	4.18	1	0	1	1.39	1	0

Appendix D. Continued.

Populations	DF	*LDH-B2*	DF	*sMDH-A1,2*	DF	*sMDH-B1,2*	DF	*mMEP-1*	DF	*PEPA*	DF	*PEPC*	DF	*PEPD-1*
Among heterogeneity groups	3	2.08	3	5.77	3	5.20	3	1.58	6	8.19	3	25.82	3	5.60
Within heterogeneity groups	8	9.83	8	6.38	8	1.62	8	3.21	16	2.77	8	15.92	8	2.2
NE Tustumena Lake	4	0.73	4	1.78	4	0	4	3.21	8	0	4	7.55	4	0
Among drainages	2	0.03	2	0.4	2	0	2	1.83	4	0	2	4.77	2	0
Within years	2	0.7	2	1.38	2	0	2	1.38	4	0	2	2.78	2	0
Bear Creek	1	0.35	1	1.38	1	0	1	1.38	2	0	1	2.78	1	0
Moose Creek	1	0.35	1	0	1	0	1	0	2	0	1	0	1	0
Glacier Flat Creek	2	0.47	2	4.4	2	1.62	2	0	4	0	2	4.93	2	2.2
Nikolai Creek	1	1.18	1	0.2	1	0	1	0	2	1.38	1	2.03	1	0
Tustumena Lake	1	7.45	1	0	1	0	1	0	2	1.39	1	1.41	1	0

Populations	DF	*PGM-1*	DF	*PGM-2*	DF	*TPI-1,2*	DF	*TPI-3*	DF	Overall
Among heterogeneity groups	3	3.49	3	1.13	3	1.57	3	3.62	81	151.79
Within heterogeneity groups	8	8.1	8	9.47	8	3.2	8	4.64	216	158.61
NE Tustumena Lake	4	1.66	4	2.56	4	3.2	4	3.27	108	48.74
Among drainages	2	0.27	2	1.02	2	1.82	2	3.27	54	29.51
Within years	2	1.39	2	1.54	2	1.38	2	0	54	19.23
Bear Creek	1	0.27	1	1.36	1	1.38	1	0	27	13.76
Moose Creek	1	1.12	1	0.18	1	0	1	0	27	5.47
Glacier Flat Creek	2	5.34	2	6.08	2	0	2	0	54	66.23
Nikolai Creek	1	0.59	1	0.29	1	0	1	0	27	18.2
Tustumena Lake	1	0.51	1	0.54	1	0	1	1.37	27	25.44

[1]Includes Seepage Creek 1994
[2]Includes Glacier Flat Creek 1992, 1993, 1994
[3]Includes Nikolai Creek 1992, 1993
[4]Includes Tustumena Lake sites 1 and 2

Appendix E. Cavalli-Sforza and Edwards (1967) chord distances among sockeye salmon populations in Cook Inlet.

Population	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Russian River, above/early	0.0000														
2. Russian River, above/late	0.0407	0.0000													
3. Russian River, below	0.1325	0.1219	0.0000												
4. Ptarmigan Creek	0.1356	0.1277	0.0343	0.0000											
5. Tern Lake	0.1318	0.1214	0.0554	0.0474	0.0000										
6. Quartz Creek	0.1401	0.1305	0.0516	0.0411	0.0504	0.0000									
7. Btwn Ken/Ski Lakes site 6	0.1302	0.1214	0.0369	0.0324	0.0503	0.0429	0.0000								
8. Btwn Ken/Ski Lakes site 1	0.1212	0.1143	0.0414	0.0401	0.0496	0.0488	0.0288	0.0000							
9. Btwn Ken/Ski Lakes site 2	0.1289	0.1198	0.0356	0.0370	0.0488	0.0492	0.0381	0.0352	0.0000						
10. Btwn Ken/Ski Lakes site 3	0.1335	0.1213	0.0372	0.0361	0.0500	0.0441	0.0308	0.0350	0.0343	0.0000					
11. Btwn Ken/Ski Lakes site 4	0.1397	0.1281	0.0444	0.0450	0.0490	0.0497	0.0392	0.0429	0.0435	0.0306	0.0000				
12. Btwn Ken/Ski Lakes site 5	0.1344	0.1219	0.0308	0.0346	0.0494	0.0470	0.0304	0.0347	0.0337	0.0303	0.0365	0.0000			
13. Hidden Creek	0.1484	0.1343	0.1064	0.1059	0.1048	0.1013	0.1058	0.1050	0.1052	0.1014	0.0991	0.1020	0.0000		
14. Skilak Lake Outlet	0.1314	0.1208	0.0327	0.0358	0.0481	0.0449	0.0228	0.0283	0.0311	0.0262	0.0347	0.0256	0.1044	0.0000	
15. Moose Creek, Kenai	0.1373	0.1282	0.0806	0.0712	0.0696	0.0551	0.0745	0.0745	0.0739	0.0739	0.0770	0.0749	0.1038	0.0746	0.0000
16. Chelatna Lake	0.1320	0.1263	0.0761	0.0644	0.0654	0.0628	0.0664	0.0645	0.0673	0.0722	0.0709	0.0670	0.1078	0.0674	0.0638
17. Yentna River West Fork	0.1245	0.1181	0.0632	0.0538	0.0515	0.0542	0.0532	0.0479	0.0514	0.0596	0.0583	0.0541	0.1045	0.0538	0.0602
18. Hewitt/Whiskey Lakes	0.1438	0.1337	0.0820	0.0754	0.0665	0.0779	0.0740	0.0697	0.0731	0.0741	0.0784	0.0709	0.1177	0.0676	0.0769
19. Shell Lake	0.1758	0.1652	0.1107	0.1082	0.0971	0.1040	0.1053	0.1030	0.1035	0.1029	0.1078	0.1044	0.1537	0.0992	0.0982
20. Trinity/Movie Lakes	0.1500	0.1412	0.0962	0.0929	0.0660	0.0923	0.0928	0.0888	0.0920	0.0946	0.0932	0.0911	0.1385	0.0871	0.0968
21. Judd Lake	0.1417	0.1380	0.0595	0.0594	0.0695	0.0649	0.0563	0.0564	0.0534	0.0643	0.0643	0.0547	0.1173	0.0524	0.0880
22. Byers Lake	0.1373	0.1317	0.0555	0.0552	0.0599	0.0617	0.0498	0.0494	0.0504	0.0586	0.0581	0.0501	0.0984	0.0457	0.0815
23. Stephan Lake	0.1353	0.1289	0.1026	0.0995	0.0946	0.0991	0.0926	0.0879	0.0970	0.0960	0.0988	0.1005	0.1263	0.0896	0.0990
24. Larson Lake	0.1463	0.1387	0.0593	0.0623	0.0628	0.0672	0.0561	0.0560	0.0516	0.0623	0.0627	0.0488	0.1216	0.0473	0.0873
25. Birch Creek	0.1502	0.1377	0.0616	0.0515	0.0567	0.0551	0.0554	0.0586	0.0543	0.0559	0.0605	0.0466	0.1104	0.0514	0.0667
26. Red Shirt Lake	0.1601	0.1467	0.0945	0.0850	0.0788	0.0831	0.0875	0.0894	0.0911	0.0849	0.0881	0.0863	0.1257	0.0850	0.0732
27. Coal Creek West Fork	0.1618	0.1524	0.0660	0.0570	0.0744	0.0615	0.0641	0.0717	0.0650	0.0659	0.0682	0.0594	0.1225	0.0620	0.0772
28. Chilligan River	0.1439	0.1310	0.0669	0.0527	0.0620	0.0581	0.0590	0.0640	0.0624	0.0606	0.0634	0.0532	0.1054	0.0590	0.0684
29. McArthur River	0.1375	0.1290	0.0565	0.0504	0.0518	0.0595	0.0506	0.0528	0.0556	0.0492	0.0501	0.0545	0.0984	0.0469	0.0768
30. Wolverine Creek	0.1510	0.1456	0.1012	0.0878	0.1016	0.0838	0.0955	0.0970	0.0960	0.0966	0.1000	0.0958	0.1278	0.0980	0.0770
31. Crescent Lake site 1	0.1417	0.1319	0.0680	0.0597	0.0559	0.0605	0.0607	0.0632	0.0627	0.0614	0.0617	0.0638	0.1107	0.0574	0.0724
32. Crescent Lake site 2	0.1529	0.1398	0.0779	0.0688	0.0626	0.0671	0.0705	0.0707	0.0690	0.0683	0.0730	0.0659	0.1233	0.0653	0.0667
33. Crescent River	0.1380	0.1304	0.0657	0.0546	0.0506	0.0543	0.0557	0.0541	0.0547	0.0576	0.0594	0.0570	0.1139	0.0522	0.0591
34. Packers Lake	0.1516	0.1394	0.0980	0.0887	0.0877	0.0852	0.0917	0.0941	0.0954	0.0930	0.0932	0.0897	0.1236	0.0915	0.0734
35. Bear Creek	0.1347	0.1278	0.0604	0.0555	0.0506	0.0548	0.0518	0.0529	0.0562	0.0568	0.0539	0.0563	0.1093	0.0490	0.0690
36. Moose Creek, Tustumena	0.1337	0.1265	0.0594	0.0539	0.0501	0.0540	0.0510	0.0535	0.0567	0.0565	0.0522	0.0548	0.1065	0.0489	0.0692
37. Seepage Creek	0.1365	0.1297	0.0634	0.0592	0.0556	0.0567	0.0555	0.0570	0.0595	0.0606	0.0581	0.0611	0.1112	0.0521	0.0711
38. Glacier Flat Creek	0.1329	0.1251	0.0611	0.0584	0.0547	0.0586	0.0532	0.0525	0.0570	0.0562	0.0553	0.0585	0.1084	0.0494	0.0730
39. Nikolai Creek	0.1355	0.1298	0.0650	0.0608	0.0605	0.0611	0.0566	0.0555	0.0610	0.0606	0.0589	0.0625	0.1103	0.0531	0.0753
40. Tustumena Lake	0.1340	0.1250	0.0559	0.0542	0.0503	0.0547	0.0492	0.0531	0.0534	0.0543	0.0548	0.0539	0.1098	0.0453	0.0698
41. Bishop Creek	0.1774	0.1648	0.0988	0.1028	0.0883	0.0920	0.0954	0.0969	0.0916	0.0990	0.0960	0.0920	0.1417	0.0928	0.0987
42. Daniels Lake	0.1728	0.1569	0.0971	0.1047	0.0880	0.0982	0.0954	0.0998	0.0956	0.0982	0.0966	0.0935	0.1336	0.0940	0.1062
43. Nancy Lake	0.1424	0.1323	0.0700	0.0552	0.0526	0.0537	0.0595	0.0597	0.0603	0.0607	0.0623	0.0584	0.1111	0.0596	0.0541
44. Cottonwood Creek	0.1349	0.1266	0.0939	0.0790	0.0660	0.0788	0.0816	0.0780	0.0838	0.0806	0.0809	0.0859	0.1269	0.0830	0.0778
46. Fish Creek, 92	0.1560	0.1430	0.1044	0.0972	0.0787	0.0905	0.0947	0.0937	0.0965	0.0953	0.0938	0.0975	0.1268	0.0945	0.0882
46. Fish Creek 93/94	0.1405	0.1318	0.0920	0.0845	0.0652	0.0812	0.0808	0.0765	0.0820	0.0844	0.0824	0.0862	0.1122	0.0814	0.0839

Appendix E. Continued.

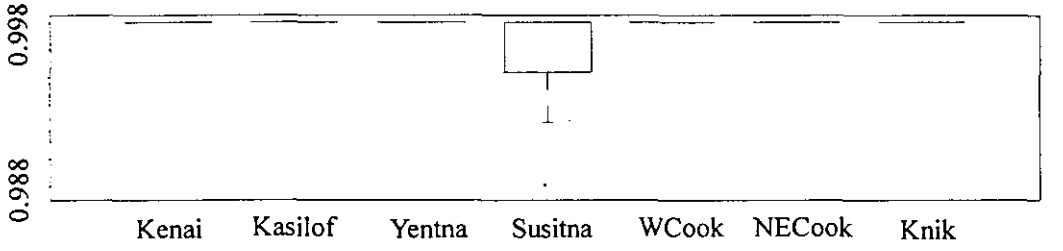
Population	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
16. Chelatna Lake	0.0000														
17. Yentna River West Fork	0.0263	0.0000													
18. Hewitt/Whiskey Lakes	0.0618	0.0539	0.0000												
19. Shell Lake	0.0994	0.0919	0.0600	0.0000											
20. Trinity/Movie Lakes	0.0885	0.0793	0.0643	0.0800	0.0000										
21. Judd Lake	0.0619	0.0579	0.0812	0.1115	0.1003	0.0000									
22. Byers Lake	0.0537	0.0449	0.0622	0.0976	0.0869	0.0378	0.0000								
23. Stephan Lake	0.0815	0.0758	0.0739	0.0921	0.0968	0.0978	0.0816	0.0000							
24. Larson Lake	0.0686	0.0597	0.0649	0.0960	0.0822	0.0347	0.0425	0.0989	0.0000						
25. Birch Creek	0.0525	0.0463	0.0484	0.0842	0.0863	0.0627	0.0541	0.0944	0.0521	0.0000					
26. Red Shirt Lake	0.0721	0.0695	0.0510	0.0595	0.0823	0.1053	0.0863	0.0856	0.0958	0.0623	0.0000				
27. Coal Creek West Fork	0.0702	0.0692	0.0869	0.1085	0.1124	0.0645	0.0683	0.1161	0.0686	0.0521	0.0885	0.0000			
28. Chilligan River	0.0490	0.0482	0.0609	0.1020	0.0956	0.0688	0.0632	0.0961	0.0663	0.0302	0.0696	0.0603	0.0000		
29. McArthur River	0.0720	0.0610	0.0675	0.0950	0.0904	0.0664	0.0524	0.0771	0.0687	0.0632	0.0763	0.0722	0.0657	0.0000	
30. Wolverine Creek	0.0578	0.0714	0.0991	0.1207	0.1277	0.0933	0.0925	0.1114	0.1052	0.0792	0.0904	0.0754	0.0741	0.1007	0.0000
31. Crescent Lake site 1	0.0670	0.0577	0.0622	0.0876	0.0836	0.0785	0.0647	0.0828	0.0758	0.0605	0.0632	0.0776	0.0618	0.0460	0.0968
32. Crescent Lake site 2	0.0614	0.0545	0.0339	0.0582	0.0730	0.0823	0.0702	0.0849	0.0679	0.0357	0.0395	0.0727	0.0501	0.0674	0.0881
33. Crescent River	0.0457	0.0371	0.0431	0.0723	0.0720	0.0635	0.0524	0.0760	0.0586	0.0426	0.0539	0.0650	0.0507	0.0502	0.0790
34. Packers Lake	0.0569	0.0645	0.0730	0.0950	0.0961	0.1022	0.0880	0.0953	0.0999	0.0706	0.0545	0.0866	0.0688	0.0919	0.0692
35. Bear Creek	0.0548	0.0452	0.0613	0.0870	0.0750	0.0583	0.0465	0.0764	0.0579	0.0606	0.0711	0.0726	0.0644	0.0433	0.0905
36. Moose Creek, Tustumena	0.0545	0.0462	0.0650	0.0939	0.0773	0.0603	0.0485	0.0813	0.0601	0.0615	0.0735	0.0724	0.0630	0.0453	0.0903
37. Seepage Creek	0.0579	0.0489	0.0631	0.0856	0.0770	0.0617	0.0496	0.0745	0.0621	0.0645	0.0715	0.0763	0.0686	0.0458	0.0920
38. Glacier Flat Creek	0.0616	0.0501	0.0605	0.0843	0.0781	0.0623	0.0489	0.0704	0.0624	0.0643	0.0721	0.0764	0.0688	0.0405	0.0952
39. Nikolai Creek	0.0600	0.0501	0.0606	0.0847	0.0790	0.0627	0.0479	0.0705	0.0637	0.0670	0.0734	0.0806	0.0709	0.0466	0.0944
40. Tustumena Lake	0.0587	0.0481	0.0619	0.0844	0.0749	0.0592	0.0460	0.0753	0.0580	0.0606	0.0697	0.0727	0.0657	0.0425	0.0924
41. Bishop Creek	0.0910	0.0817	0.0909	0.0858	0.0927	0.0983	0.0865	0.1156	0.0871	0.0829	0.0907	0.0961	0.1009	0.1048	0.1155
42. Daniels Lake	0.1093	0.0958	0.1006	0.0967	0.0987	0.1154	0.0969	0.1223	0.1029	0.0950	0.0939	0.1077	0.1105	0.1018	0.1339
43. Nancy Lake	0.0401	0.0335	0.0473	0.0796	0.0809	0.0731	0.0609	0.0853	0.0682	0.0308	0.0484	0.0605	0.0375	0.0611	0.0682
44. Cottonwood Creek	0.0754	0.0652	0.0703	0.0989	0.0896	0.1003	0.0932	0.0895	0.0961	0.0748	0.0743	0.1007	0.0680	0.0720	0.1057
45. Fish Creek, 92	0.0857	0.0737	0.0690	0.0818	0.0830	0.1186	0.0970	0.0925	0.1075	0.0823	0.0618	0.1132	0.0885	0.0915	0.1177
46. Fish Creek 93/94	0.0750	0.0589	0.0636	0.0890	0.0805	0.1014	0.0784	0.0820	0.0938	0.0762	0.0716	0.1054	0.0815	0.0755	0.1137

Appendix E. Continued.

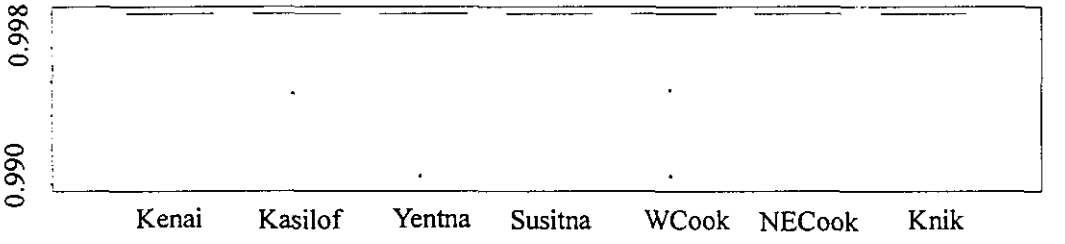
Population	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
31. Crescent Lake site 1	0.0000															
32. Crescent Lake site 2	0.0512	0.0000														
33. Crescent River	0.0347	0.0337	0.0000													
34. Packers Lake	0.0791	0.0648	0.0660	0.0000												
35. Bear Creek	0.0485	0.0612	0.0399	0.0759	0.0000											
36. Moose Creek, Tustumena	0.0499	0.0645	0.0436	0.0767	0.0142	0.0000										
37. Seepage Creek	0.0461	0.0620	0.0404	0.0790	0.0198	0.0201	0.0000									
38. Glacier Flat Creek	0.0501	0.0628	0.0440	0.0826	0.0233	0.0261	0.0241	0.0000								
39. Nikolai Creek	0.0540	0.0654	0.0454	0.0830	0.0237	0.0281	0.0236	0.0222	0.0000							
40. Tustumena Lake	0.0433	0.0594	0.0395	0.0773	0.0213	0.0256	0.0224	0.0267	0.0303	0.0000						
41. Bishop Creek	0.0988	0.0824	0.0850	0.0956	0.0871	0.0901	0.0878	0.0914	0.0934	0.0832	0.0000					
42. Daniels Lake	0.0987	0.0931	0.0961	0.1064	0.0935	0.0948	0.0944	0.0956	0.1001	0.0868	0.0480	0.0000				
43. Nancy Lake	0.0523	0.0330	0.0311	0.0560	0.0532	0.0543	0.0567	0.0581	0.0601	0.0557	0.0815	0.0934	0.0000			
44. Cottonwood Creek	0.0625	0.0639	0.0599	0.0890	0.0710	0.0722	0.0732	0.0721	0.0760	0.0751	0.1177	0.1214	0.0573	0.0000		
45. Fish Creek, 92	0.0783	0.0665	0.0738	0.0826	0.0832	0.0850	0.0820	0.0839	0.0844	0.0823	0.0844	0.0835	0.0653	0.0701	0.0000	
46. Fish Creek 93/94	0.0688	0.0683	0.0646	0.0878	0.0684	0.0707	0.0690	0.0682	0.0687	0.0692	0.0875	0.0873	0.0603	0.0626	0.0355	0.0000

Appendix F. Box plots (ranges, and 95% confidence intervals for the median) from allele frequency distributions among populations of sockeye salmon from seven regions of Cook Inlet, Alaska.

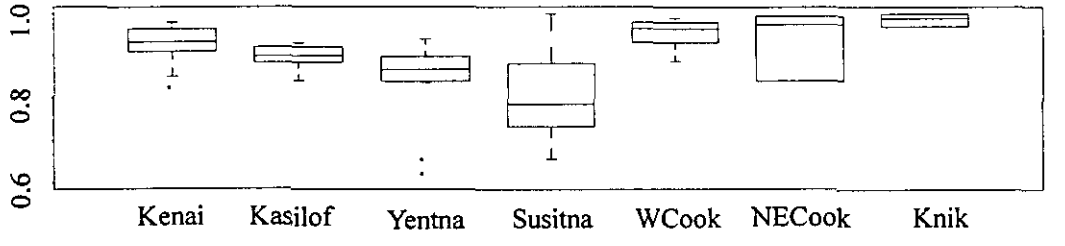
*sAAT-1,2*100*



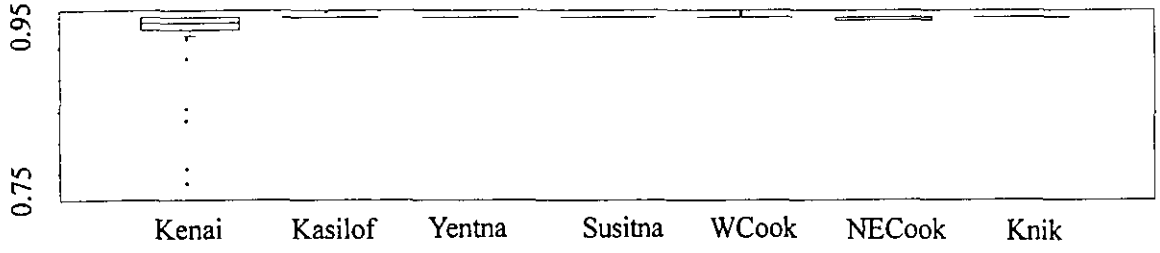
*sAAT-3*100*



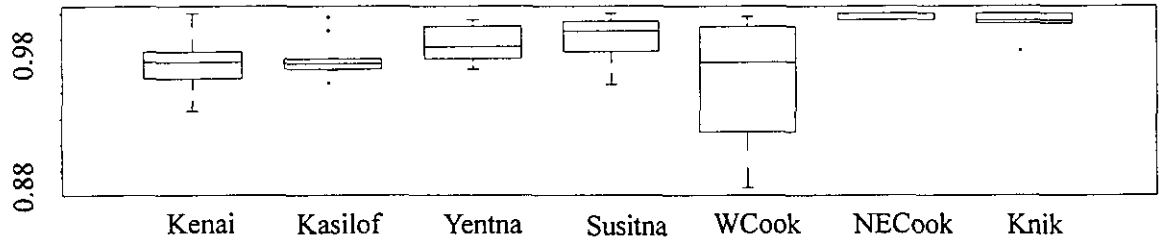
mAAT-1-100*



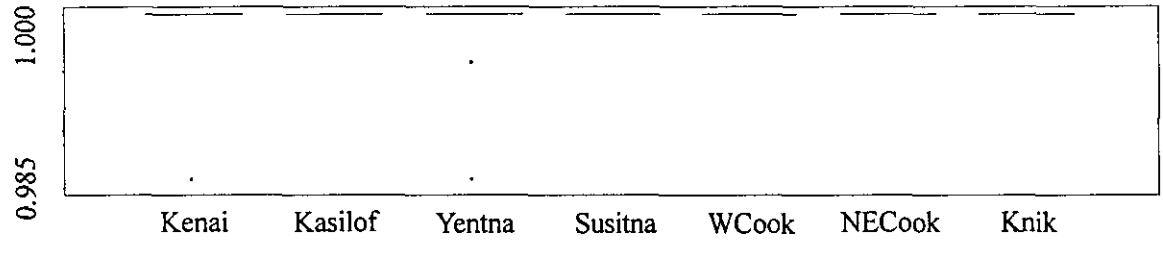
mAAT-2-100*



*mAH-1,2*100*

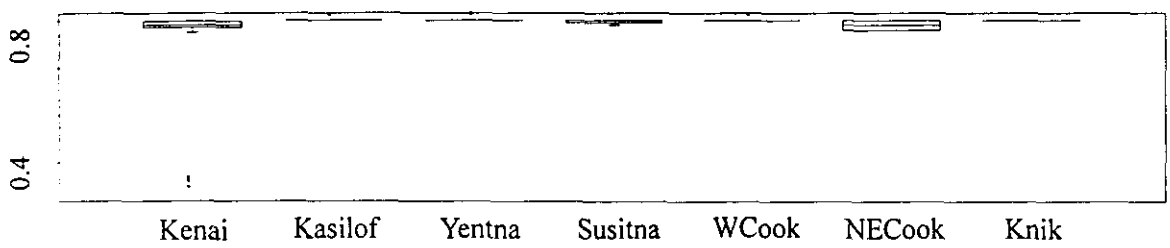


*mAH-4*100*

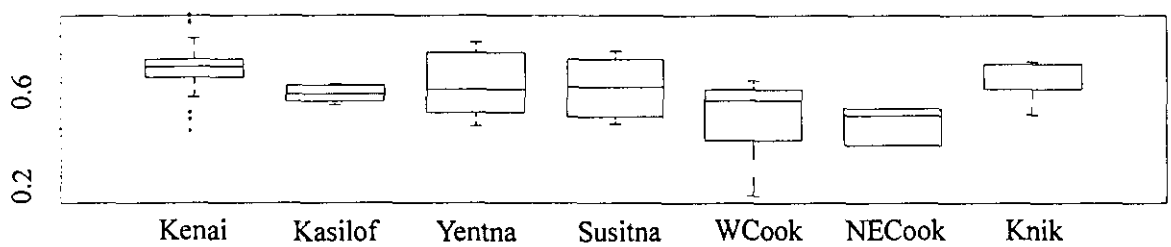


Appendix F. Continued.

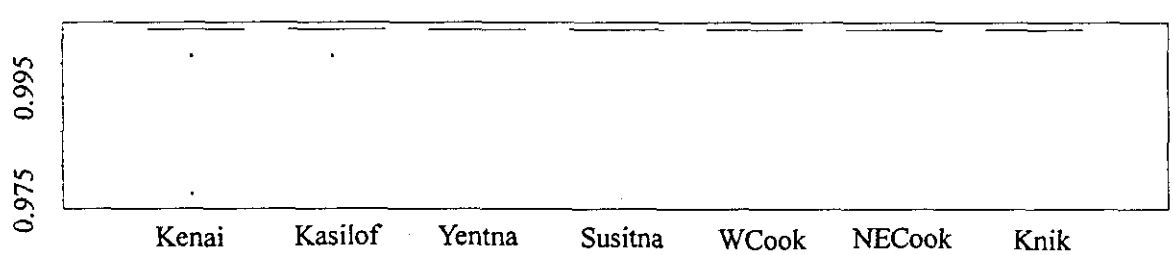
*sAH*100*



*ALAT*100*

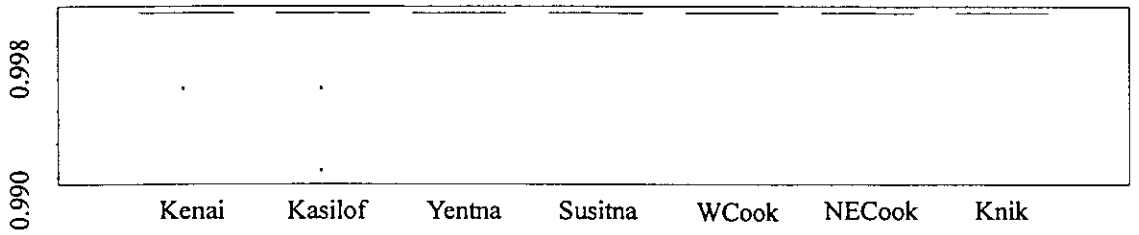


*CK-A2*100*

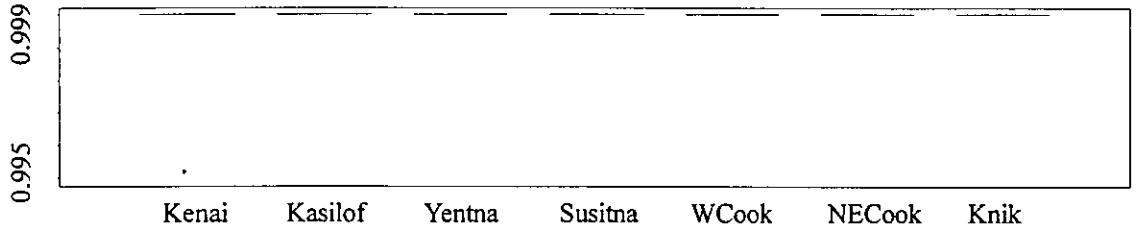


Appendix F. Continued.

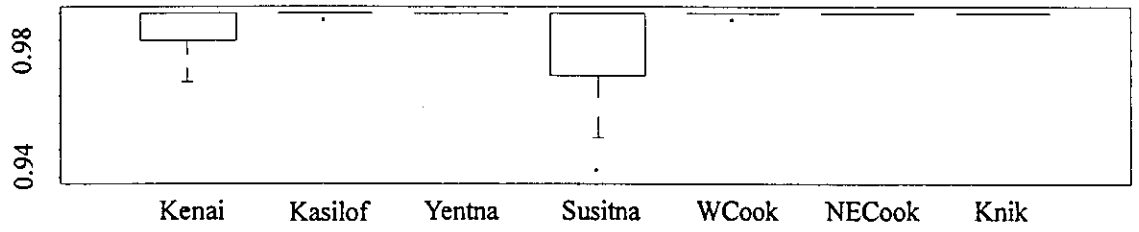
*CK-B*100*



*FDH*100*

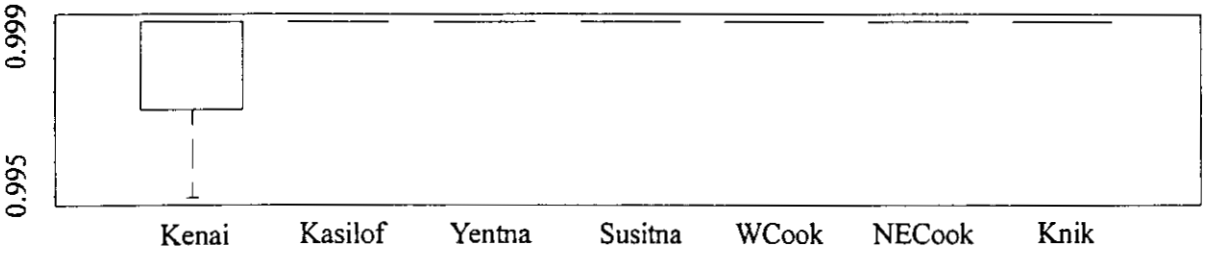


*GAPDH-2*100*

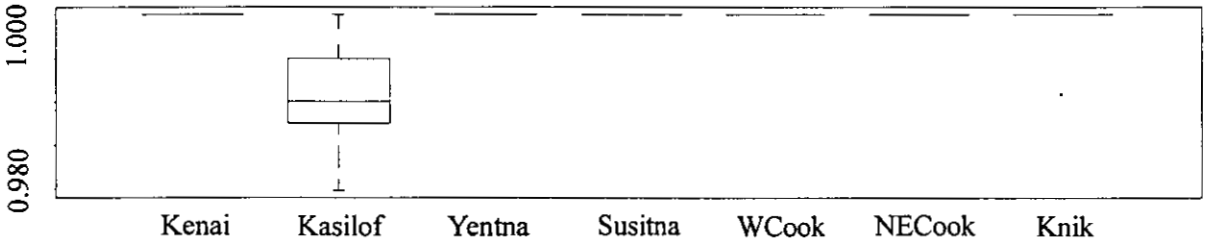


Appendix F. Continued.

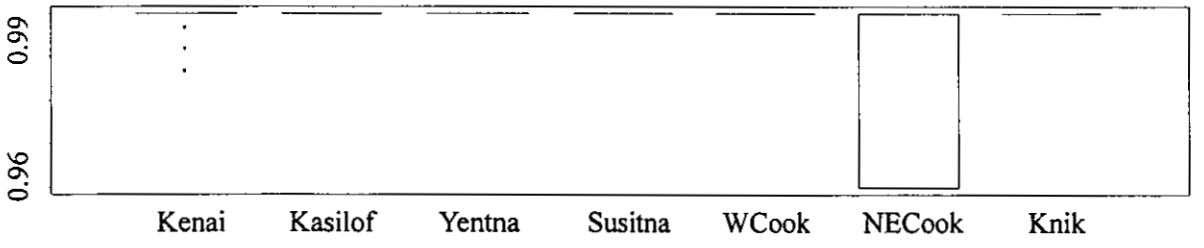
G3PDH-1,2-100*



*G3PDH-4*100*

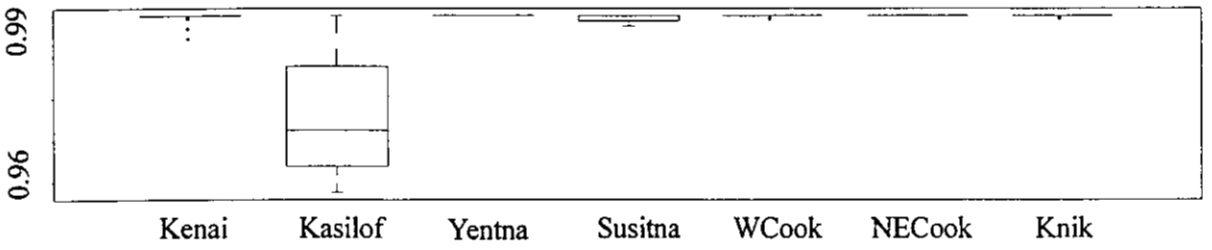


*GPI-A*100*

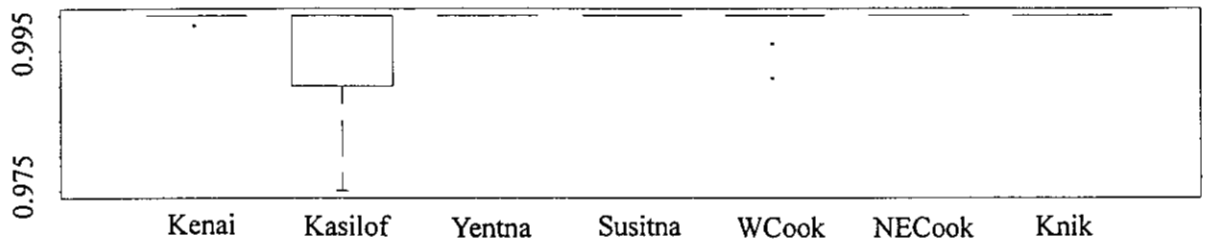


Appendix F. Continued.

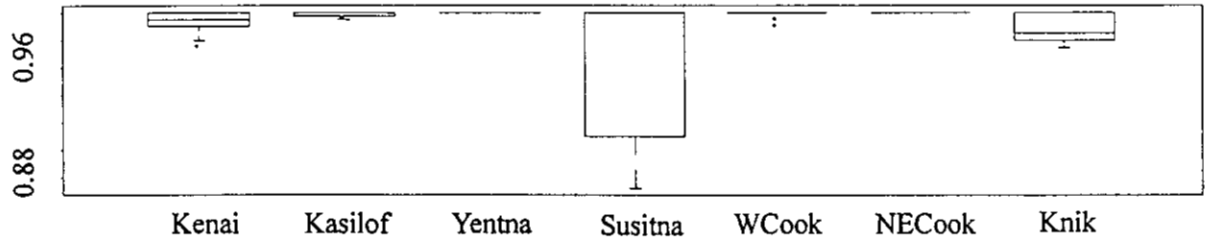
*GPI-B1,2*100*



*mIDHP-1*100*

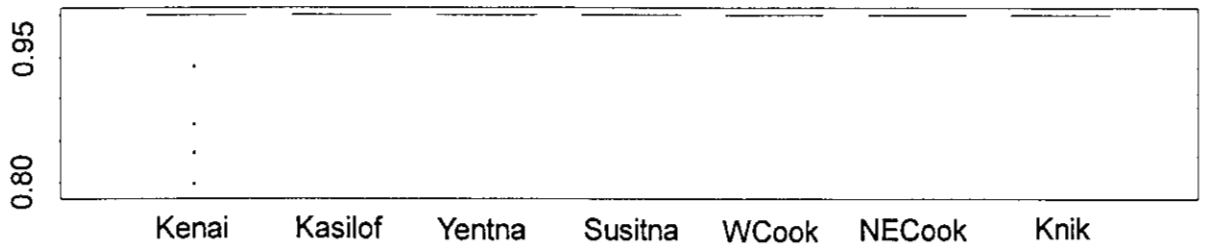


*sIDHP-1*100*

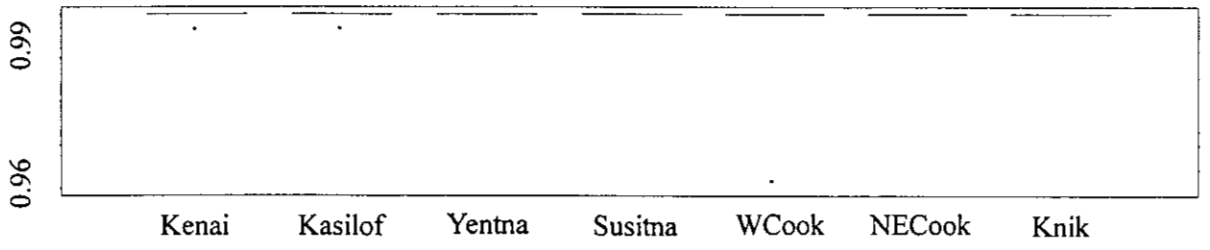


Appendix F. Continued.

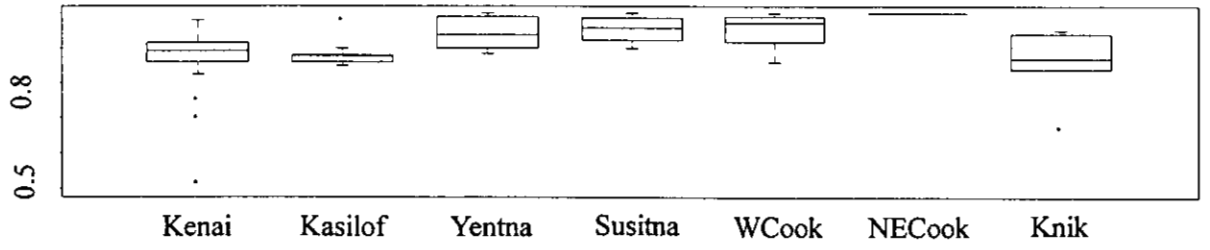
*sIDHP-2*100*



*LDH-A2*100*

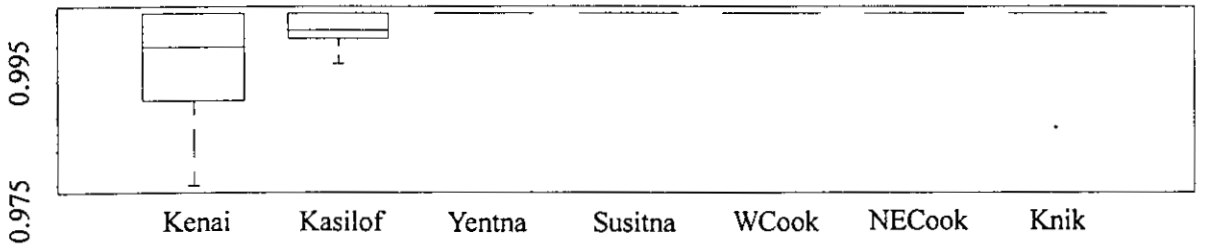


*LDH-B2*100*

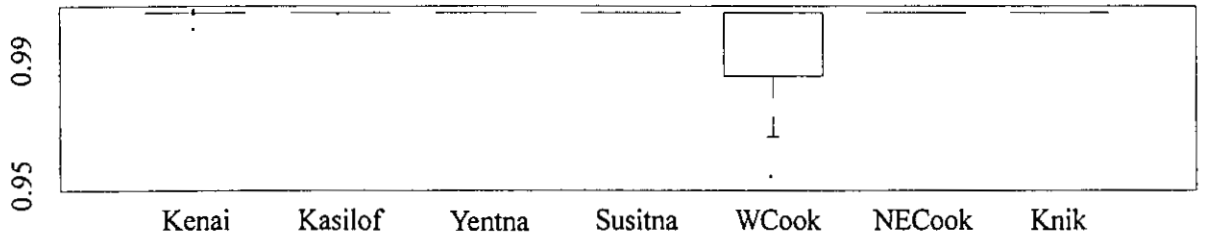


Appendix F. Continued.

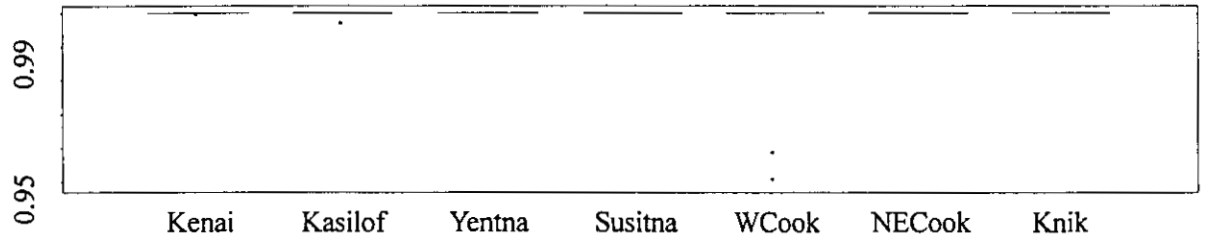
*sMDH-A1,2*100*



*sMDH-B1,2*100*

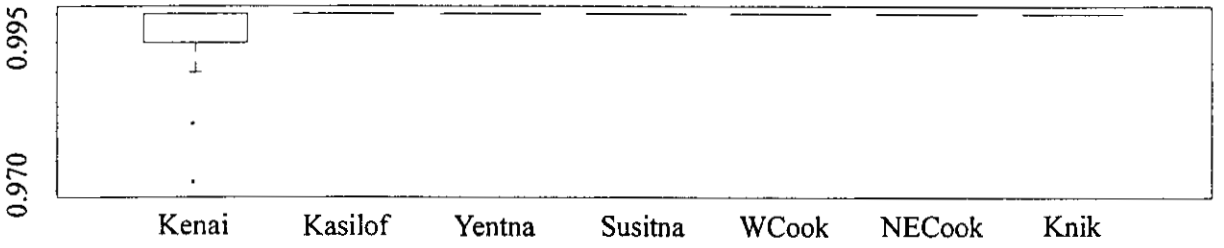


*mMEP-1*100*

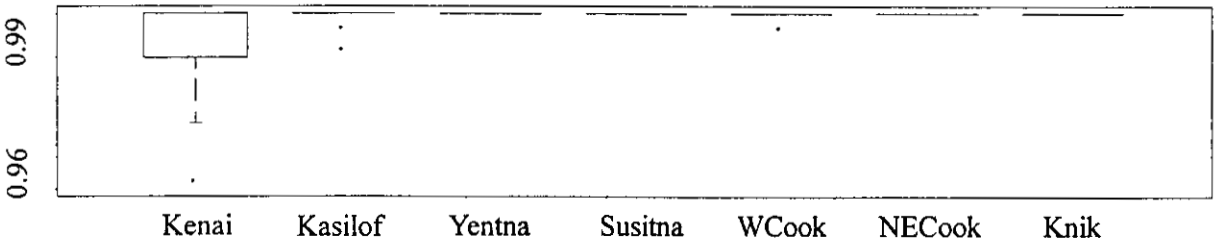


Appendix F. Continued.

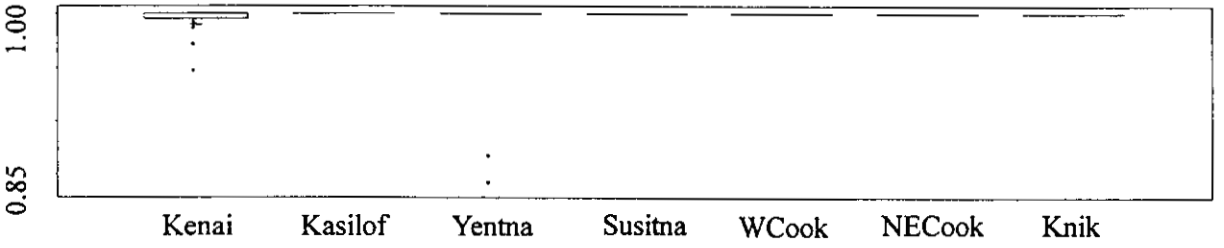
*MPI*100*



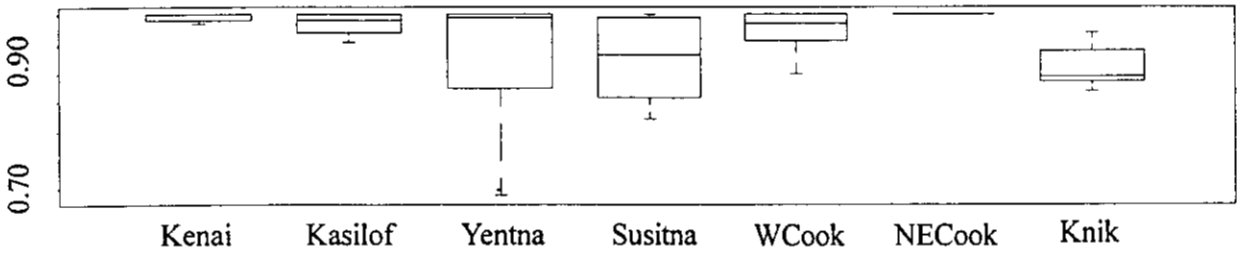
*PEPA*100*



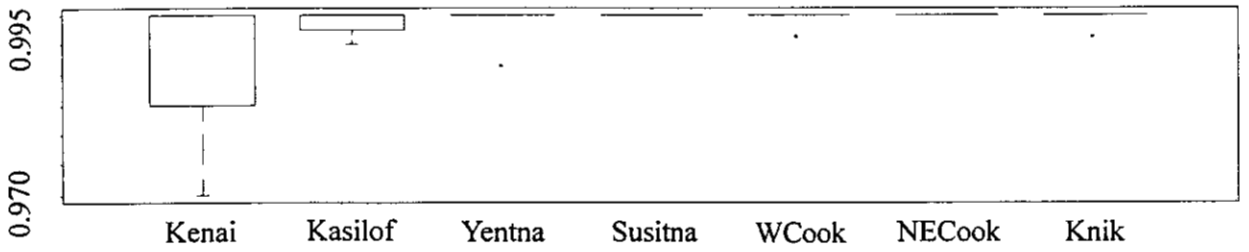
*PEPB-1*100*



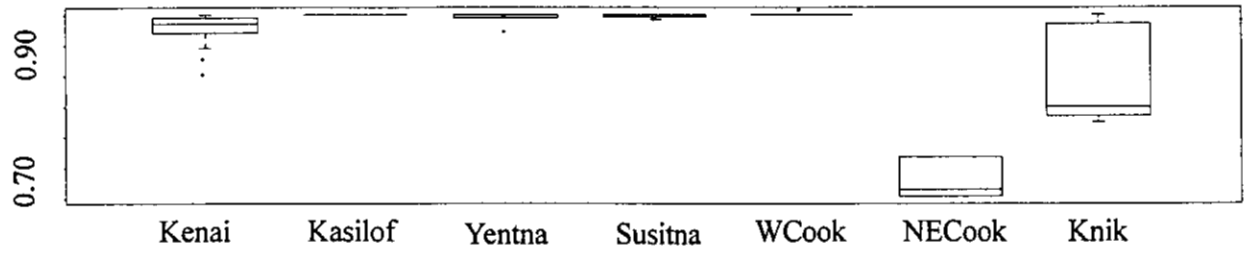
*PEPC*100*



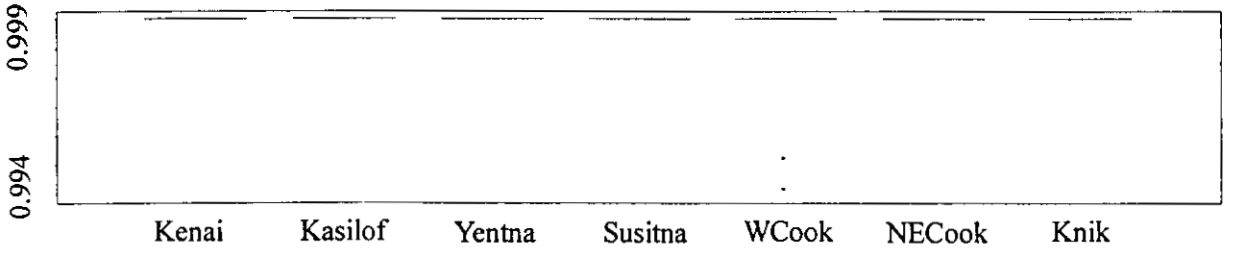
*PEPD-1*100*



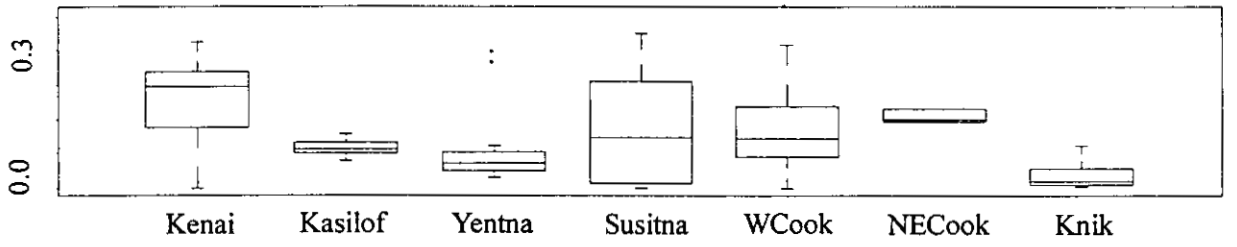
*PEPLT*100*



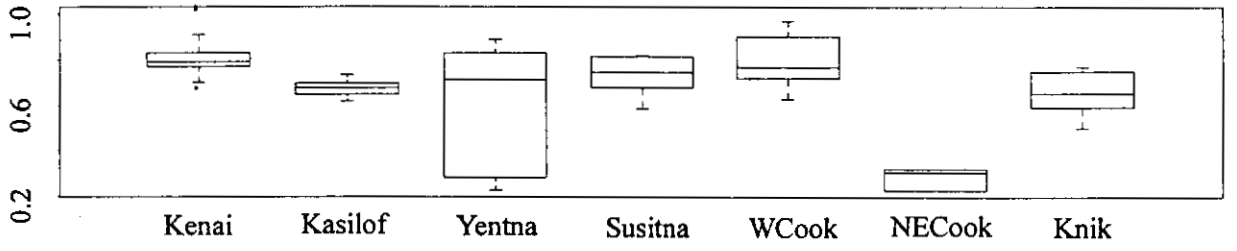
*PGDH*100*



*PGM-1*100*

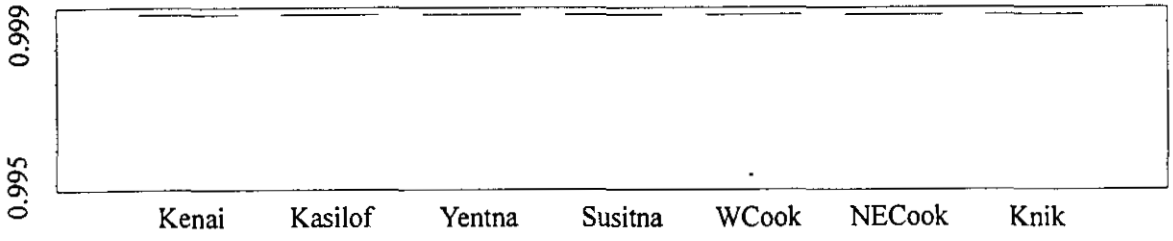


*PGM-2*100*

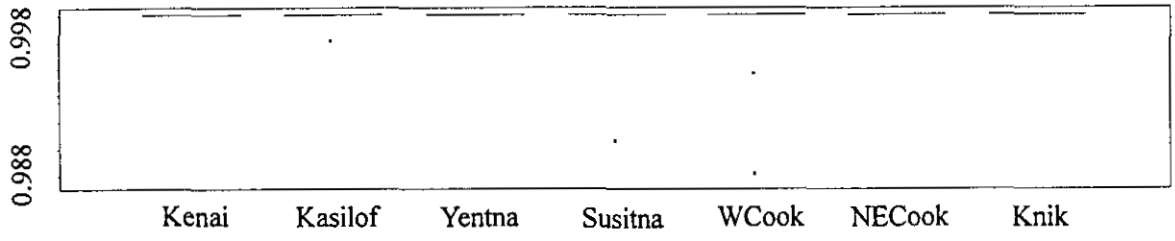


Appendix F. Continued.

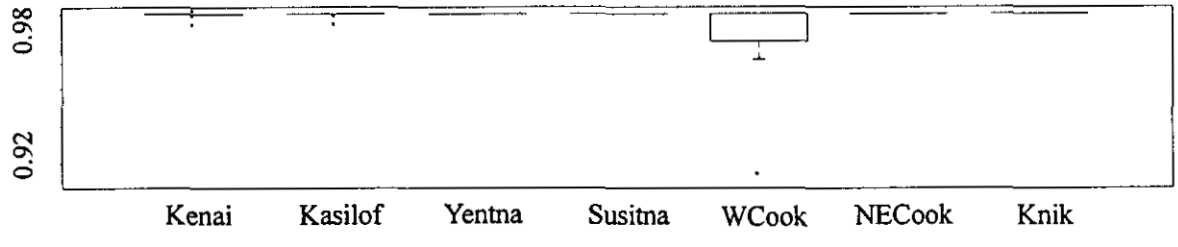
*sSOD-1*100*



TPI-1,2-100*

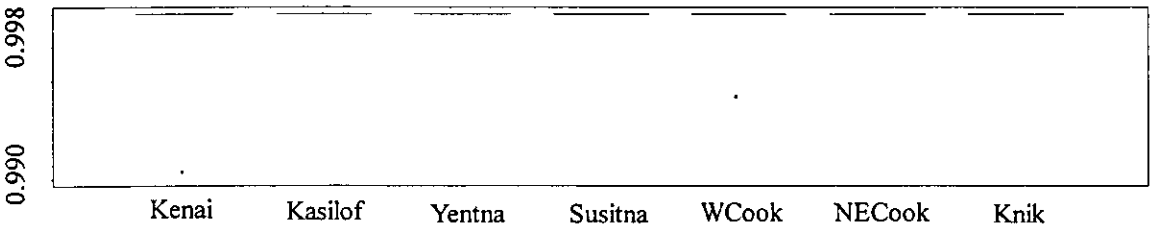


*TPI-3*100*



Appendix F. Continued.

*TPI-4*100*



Appendix F. Continued.

Appendix G. Final report, University of Montana

GENETIC IDENTIFICATION OF ALASKA SOCKEYE SALMON STOCKS

Initial Report

Kathy L. Knudsen

and

Fred W. Allendorf

Division of Biological Sciences
University of Montana
Missoula, MT 59812

15 April 1995

INTRODUCTION

We examined nuclear DNA variation in populations of Alaska sockeye salmon (Oncorhynchus nerka) for the purpose of stock identification. We employed three different approaches to look for genetic markers that would augment the extensive allozyme/protein electrophoresis data set collected by the ADF&G Genetics Lab.

The first approach involves the use of arbitrary primers in polymerase chain reaction (PCR) amplification of genomic DNA (AP-PCR). Prior sequence knowledge is not required as the method relies on the chance homology of the primer with the genomic DNA. These primers are quite short (10 DNA bases) and the stringency of the annealing temperature is low enough that typically products from several loci are produced with each primer. Polymorphisms are identified when some individuals fail to produce a product presumably due to a sequence difference which prevents the primer from annealing.

AP-PCR or RAPD (random amplified polymorphic DNA) analysis has been used for a variety of studies due to its ability to detect a virtually unlimited number of single copy nuclear DNA (scnDNA) polymorphisms. We have verified the Mendelian inheritance of these polymorphisms in full-sib families of rainbow and westslope cutthroat trout. The weakness of this technique is that the simple absence or presence of a particular PCR product results in a dominant/recessive genetic system so that heterozygotes cannot be distinguished from homozygotes.

Our second approach involves looking for sequence variation in an intron in the two growth hormone genes (GH1 and GH2) present in salmonids. By designing primers from published DNA sequences we are able to preferentially produce growth hormone intron C from each of the two genes. We proposed to screen for variation using restriction enzyme analysis of introns.

The third approach is to use PCR primers designed to amplify nuclear loci consisting of di- or tri- nucleotide repeats known as variable number of tandem repeat (VNTR) polymorphisms. These microsatellite loci are highly variable and extremely common in the nuclear genome. Though most of these primers have been developed for a specific species, many of them will also work on other closely related taxa. We are acquiring a collection of these primers now and screening sockeye salmon.

METHODS

We obtained ten liver tissue samples from each of four 1992 sockeye runs out of the Cook Inlet from ADF&G: Russian River (late) and Skilak Lake outlet (Kenai River drainage), Moose Creek (Kaselof River drainage), and the Yentna River (Susitna River drainage). We extracted genomic DNA using a phenol-chloroform method.

RESULTS

We have screened 16 RAPD primers. Of 52 loci scored, 21 were polymorphic over all four collection sites. The mean expected heterozygosity was quite high for all sites, ranging

from 14% to 31% (Table 1). The Yentna River fish have the largest number of alleles and the highest mean heterozygosity as well as being polymorphic at 95% of scored loci. Since our Yentna sample came from a sonar site it undoubtedly is made up of more than one spawning population. Contingency chi-square analysis over all loci is highly significant even removing the Yentna River fish from the analysis. Cluster analysis based on Nei's genetic distance places Moose Creek and Skilak Lake outlet closest (Fig. 1).

Intron C from GH1 is about 820 basepairs and from GH2 about 550 basepairs. We found no restriction site variation in either intron using ten enzymes with four-base recognition sites in a survey of 10 fish from each sample.

To date, we have successfully amplified nine and scored three microsatellite loci in sockeye. All four samples exhibit a high level of variation at all three loci (Table 2). The Russian River is much less variable than the other samples. Contingency chi-square analysis is significant. The cluster analysis based on Nei's genetic distance is the same as that based on the RAPD data except that the Yentna sample clusters very closely with Skilak Lake outlet (Fig. 2). This is probably not correct, however, since, as stated above, this sample is not necessarily from a single population.

We are continuing to collect data on RAPD and microsatellite polymorphisms. The growth hormone introns however, do not have sufficient variation to warrant continued effort. All three approaches rely on PCR technology making them quite rapid and amenable to non-lethal sampling.

TABLE 1. Genetic variability at 52 RAPD loci in Alaska sockeye salmon.

Population	Mean sample size per Locus	Mean no alleles per locus	Percentage loci polymorphic*	Heterozygosity (expected)
Moose Creek	9.4 (0.1)	1.5	47.6	0.182 (0.049)
Russian River (late)	9.5 (0.1)	1.4	38.1	0.141 (0.046)
Skilak Lake (Outlet)	9.2 (0.1)	1.5	47.6	0.170 (0.046)
Yentna River	8.9 (0.0)	2.0	95.2	0.310 (0.039)

TABLE 2. Genetic variability measures at three microsatellite loci in Alaska sockeye salmon.

Population	Mean sample size per Locus	Mean no. alleles per locus	Percentage loci polymorphic*	Heterozygosity observed	Heterozygosity expected
Moose Creek	10.0	5.0 (0.6)	100.0	0.767 (0.088)	0.761 (0.037)
Russian River (late)	10.0	4.3 (1.2)	100.0	0.533 (0.176)	0.530 (0.180)
Skilak Lake (Outlet)	10.0	6.3 (1.2)	100.0	0.900 (0.058)	0.782 (0.059)
Yentna River	10.0	5.7 (0.0)	100.0	0.767 (0.088)	0.737 (0.063)

FIGURE 1. Cluster analysis (UPGMA) based on Nei's genetic distance from 52 RAPD loci in sockeye salmon.

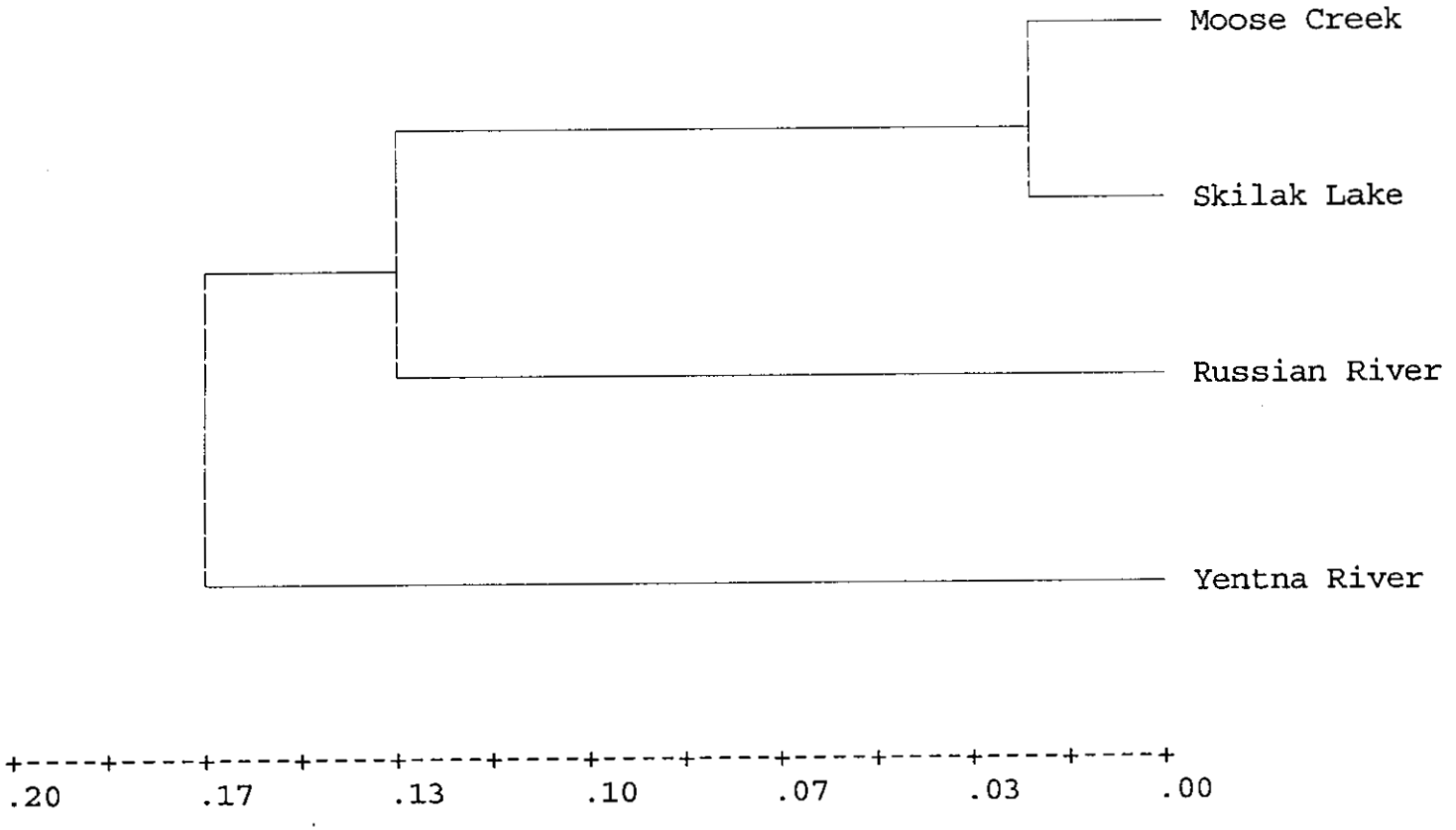
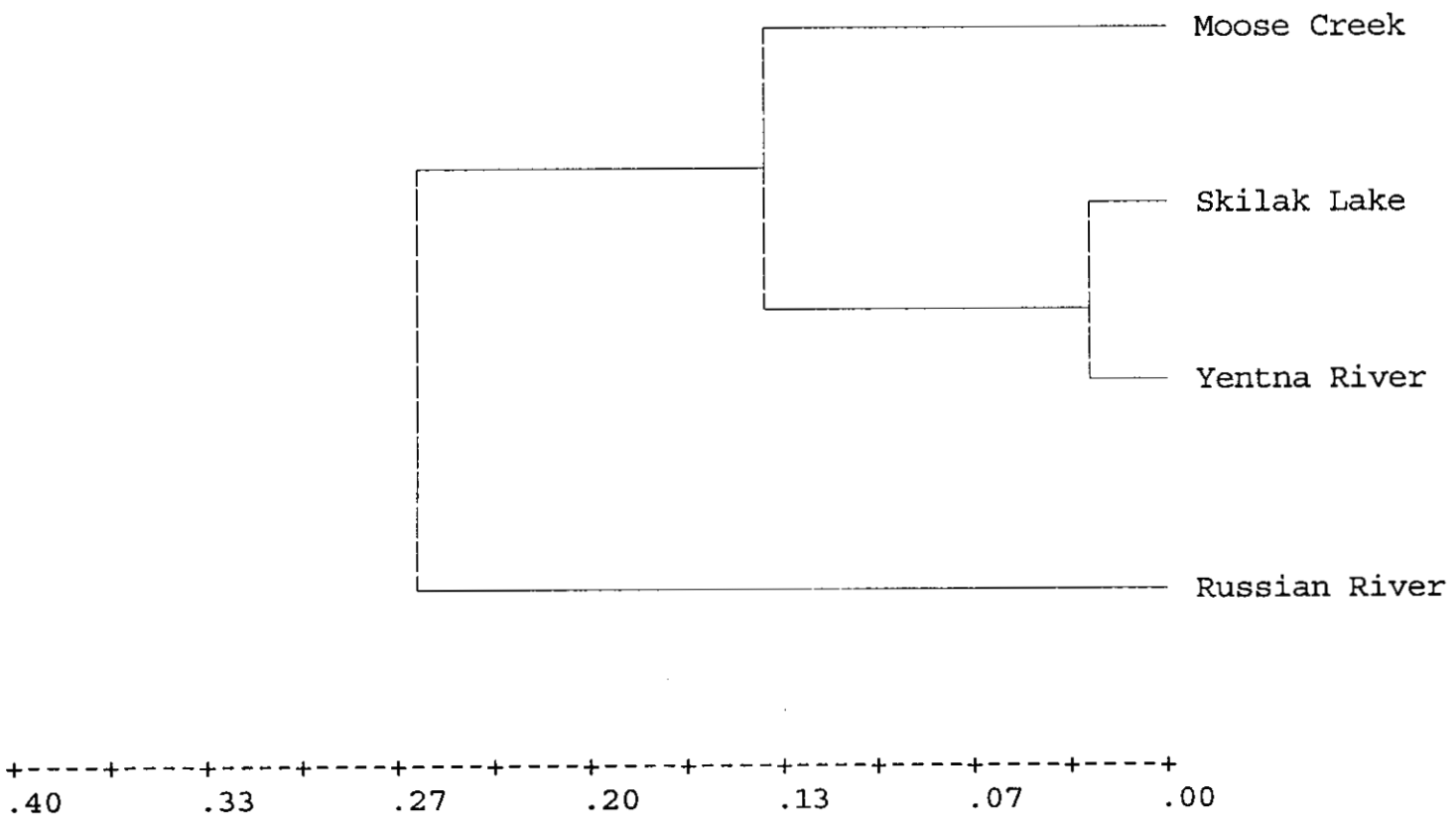


FIGURE 2. Cluster analysis (UPGMA) based on Nei's genetic distance from 3 microsatellite loci in sockeye salmon.



Appendix H. Final report, University of Alaska Fairbanks

Final Report

on

Exploration for Stock Identification RFLP's within mtdna of Cook Inlet sockeye salmon

prepared for

Dr. Jim Seeb
Alaska Department of Fish and Game
Genetics Lab ADF&G
333 Raspberry Road
Anchorage AK. 99518

by

A.K. Gray and A.J. Gharrett
Juneau Center
School of Fisheries & Ocean Sciences
University of Alaska Fairbanks
Fairbanks, Alaska 99775

7-18-94

A.K. Gray Date
Principal Investigator
(907) 465-6508

18 July 94

A.J. Gharrett, Professor Date
(907) 465-6445

15 July, 1994

Objective:

Our objective was to investigate restriction site variability in the displacement loop and cytochrome b regions (**D-loop/cyt b**) of the mitochondrial DNA (mtDNA) of Cook inlet sockeye salmon. To do this we examined eighty sockeye salmon, twenty each from four different Cook Inlet populations. The analysis included: 1) isolation of DNA from eighty sockeye salmon tissue samples provided by Alaska Department of Fish and Game (ADFG); 2) using oligonucleotides of sequences flanking the **D-loop/cty b** region to prime the polymerase chain reaction (PCR) amplification of each sample; and 3) digestion of the amplified products with thirteen 4 5, and 6 base recognizing restriction endonucleases (Table 1) selected by ADFG personnel to identify restriction length polymorphisms (RFLP's).

Results:

We could routinely observe fragments as small 200 base pairs. Variation involving smaller fragments was not resolved (Table 2). Two of the restriction endonucleases, *Dpn* II and *Rsa* I, each revealed a single variable site. We observed that variation in three of the four collections (Table 3).

Because of the presumed absence of recombination in mtDNA, the variation is considered as a combined haplotype. Although all four possible haplotypes were observed, the AB and BA haplotypes were by far the most prevalent (Table 4). Only one AA and two BB haplotypes were observed among the eighty samples. The Russian River (Kenai) collection had only the AB haplotype which was the more frequent form in the Sitka Creek (Kenai) and Nicolai Creek (Kasilof) samples. The Larson Creek (Susitna) had a somewhat higher level of BA haplotypes.

Although the sample size is small for statistical analyses, we used a Monte-Carlo method to determine the significance of log-likelihood ratios (*G*-tests). The data as a whole are heterogeneous ($G = 27.4$, 9 df). That *G*-statistic was not exceeded in any of 2000 iterations. Removing the Russian River (Kenai) collection from the analysis reduced the heterogeneity ($G = 8.6$, 6 df) and that statistic was exceeded in 298 of the 2000 iterations. The two Kenai collections were quite different ($G = 11.2$, 3 df), a statistic that was equalled or exceeded in only 11 of 2000 iterations ($P = 0.0055$). Treating the data as AB haplotype or not AB haplotype produced similar results, except that comparison among Nicolai Creek (Kasilof), Larson Creek (Susitna), and Sitka Creek (Kenai) approached being significant ($G = 5.878$, 2 df). Only 105 of 2000 iterations yielded larger statistics.

Photo copies of the raw data are attached.

Table 1. Recognition sequences of restriction endonucleases used to digest polymerase chain reaction (PCR) amplified mitochondrial DNA from sockeye salmon (*Oncorhynchus nerka*) sampled in Cook Inlet, Alaska streams. Commonly used isoschizomers are in parentheses.

Restriction enzyme	Recognition sequence
Apa I	GGGCC↓C
Ava I	C↓YCGRG*
Ban II (*Eco*24 I)	GRGCY↓C
*Bst*N I (*Eco*R II)	CC↓(A/T)GG
*Bst*U I	CG↓CG
Dde I	C↓TNAG
Dpn II (*Sau*3A I)	↓GATC
Dra I	TTT↓AAA
Hha I	GCG↓C
Hinc II (*Hind* II)	GTY↓RAC
Hinf I	G↓ANTC
Rsa I	GT↓AC
Taq I	T↓CGA

* R is any purine, Y is any pyrimidine, and N is any base.

Table 2. Estimated mitochondrial DNA fragment sizes [in base pairs (bp)]. Fragments result from restriction endonuclease digests of the displacement loop and cytachrome b regions of mitochondrial DNA. This region was amplified by polymerase chain reaction (PCR) using tissue from sockeye salmon (*Oncorhynchus nerka*) sampled in Cook Inlet, Alaska streams.

Restriction enzyme	Fragment size common	variant	Restriction enzyme	Fragment size common	variant
Apa I	2,500		*Dra* I	2,500	
Ava I	2,150		*Hinc* II	2,025	
	350			475	
Ban II	1,400		*Hinf* I	725	
	1,100			700	
				550	
*Bst*N I	975			275	
	525			250	
	400				
	225		*Hha* I	875	
	225?			700	
	150			500	
				275	
*Bst*U I	2,050			250	
	450				
			Rsa I	925	(525+400)
Dde I	650			800	800
	475			425	425
	375			350	350
	250				
			Taq I	950	
Dpn II	1,050	1,050		750	
	600	(475+125?)		700	
	575	575		175?	
	350	350			

Table 3. Variation at recognition sites of restriction endonucleases *Rsa* I and *Dpn* II for sockeye salmon sampled from Cook Inlet, Alaska. The nature of the variation is presented in Table 3. No other variation was observed. "A" denotes that the variable site was not cut and "B" that the site was cut.

		Restriction endonuclease				Restriction endonuclease	
Source	Sample	*Dpn* II	*Rsa* I	Source	Sample	*Dpn* II	*Rsa* I
Susitna River Larson Creek				Kasilof River Nikolai Creek			
	1	B	A		1	B	A
	2	B	A		2	A	B
	3	B	A		3	A	B
	4	B	A		4	B	A
	5	A	B		5	A	B
	6	B	A		6	A	B
	7	A	B		7	A	B
	8	B	A		8	A	B
	9	B	A		9	B	A
	10	A	B		10	A	B
	11	B	B		11	A	B
	12	B	B		12	A	B
	13	A	A		13	A	B
	14	B	B		14	B	A
	15	A	B		15	A	B
	16	B	A		16	B	A
	17	A	B		17	B	A
	18	B	A		18	A	B
	19	A	B		19	A	B
	20	A	B		20	A	B

Table 3 (continued).

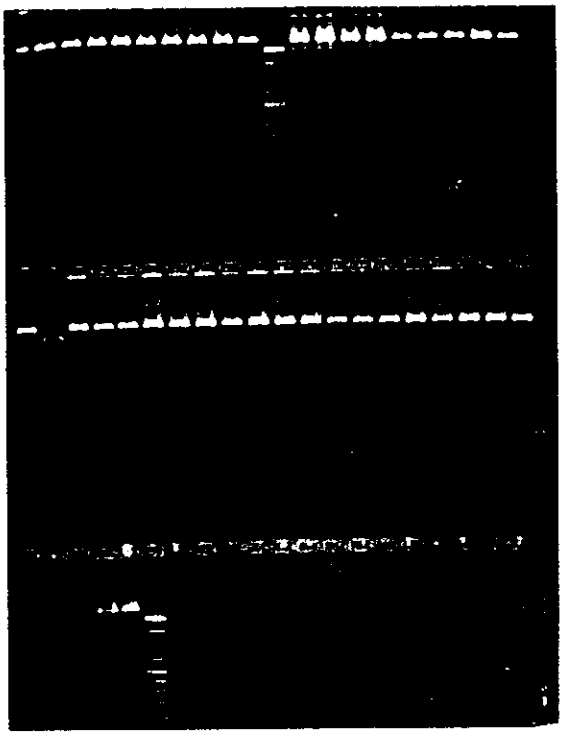
Source	Sample	Restriction endonuclease *Dpn* II	*Rsa* I
Kenai River Sitka Lake outlet			
	1	A	B
	2	A	B
	3	A	B
	4	B	A
	5	A	B
	6	A	A
	7	A	B
	8	B	A
	9	A	B
	10	B	A
	11	A	B
	12	A	B
	13	A	B
	14	A	B
	15	A	B
	16	A	B
	17	B	A
	18	B	A
	19	B	A
	20	A	B

Source	Sample	Restriction endonuclease *Dpn* II	*Rsa* I
Kenai River Russian River (late above falls)			
	1	A	B
	2	A	B
	3	A	B
	4	A	B
	5	A	B
	6	A	B
	7	A	B
	8	A	B
	9	A	B
	10	A	B
	11	A	B
	12	A	B
	13	A	B
	14	A	B
	15	A	B
	16	A	B
	17	A	B
	18	A	B
	19	A	B
	20	A	B

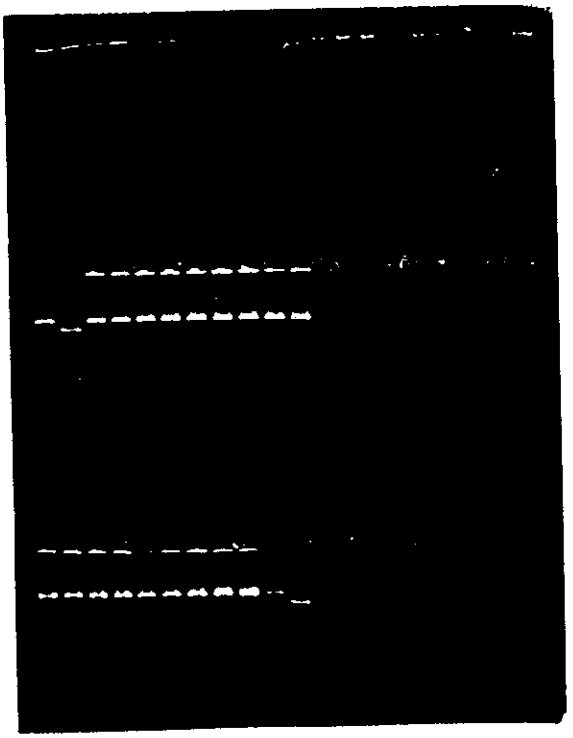
Table 4. Haplotype frequencies observed for restriction site variation of *Dpn* II and *Rsa* I in Cook Inlet sockeye salmon. In the haplotypes the *Dpn* II site is listed before the *Rsa* I site.

	Haplotype				
Source	AA	AB	BA	BB	Total
Susitna River					
Larson Creek	1	7	11	1	20
Kasilof River					
Nicolai Creek	0	14	6	0	20
Kenai River					
Sitka Creek outlet	1	13	6	0	20
Russian River					
(late above falls)	0	20	0	0	20

Cyt-b / D-loop cut with Apa I

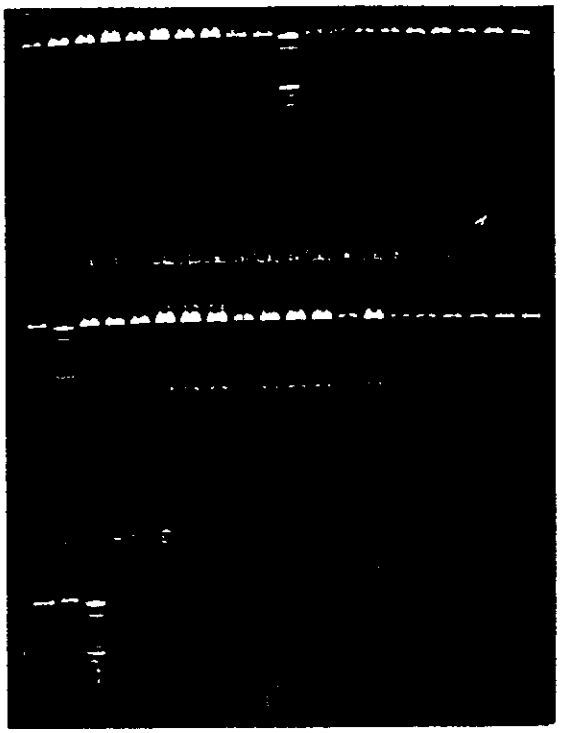


LLR1	LLR20	
2	100 bp ladder	
3	LLR1	
4	2	LLR19
5	3	20
6	4	100 bp ladder
7	5	
8	6	
9	7	
10	8	
100 bp ladder	9	
LLR11	10	
12	11	
13	12	
14	13	
15	14	
16	15	
17	16	
18	17	
19	18	

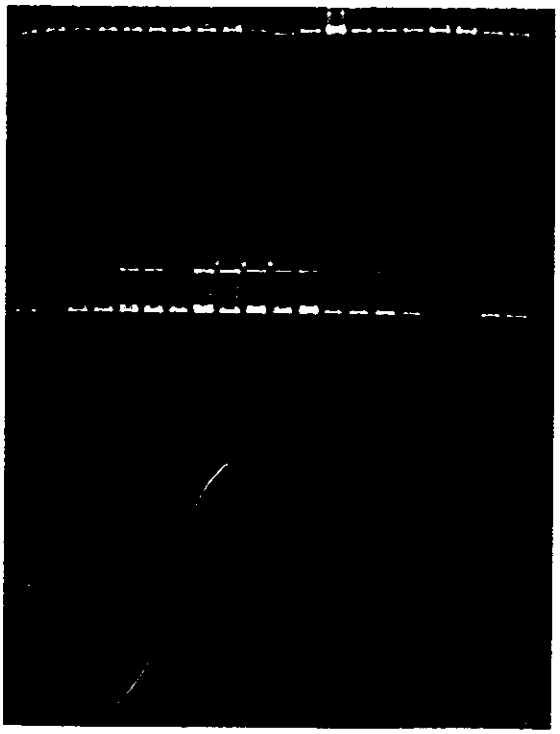


1	OS 1	21	OS-20	41	RR-11
2	2	22	100 bp	42	12
3	3	23	RR-1	43	13
4	4	24	2	44	14
5	5	25	3	45	15
6	6	26	4	46	16
7	7	27	5	47	17
8	8	28	6	48	18
9	9	29	8	49	19
10	10	30	9	50	20
11	100 bp	31	10	51	100 bp ladder
12	4	32			
13	12	33			
14	13	34			
15	14	35			
16	15	36			
17	16	37			
18	17	38			
19	18	39			
20	19	40			

Cyt-b / D-loop cut with AvaI

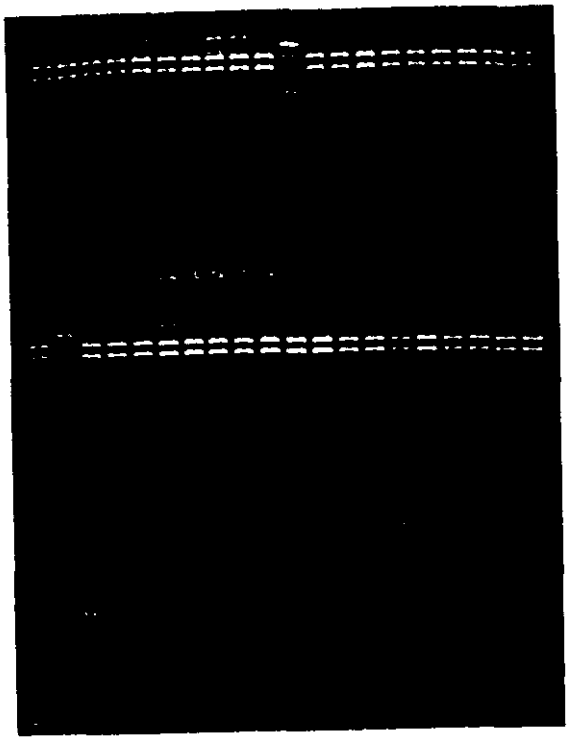


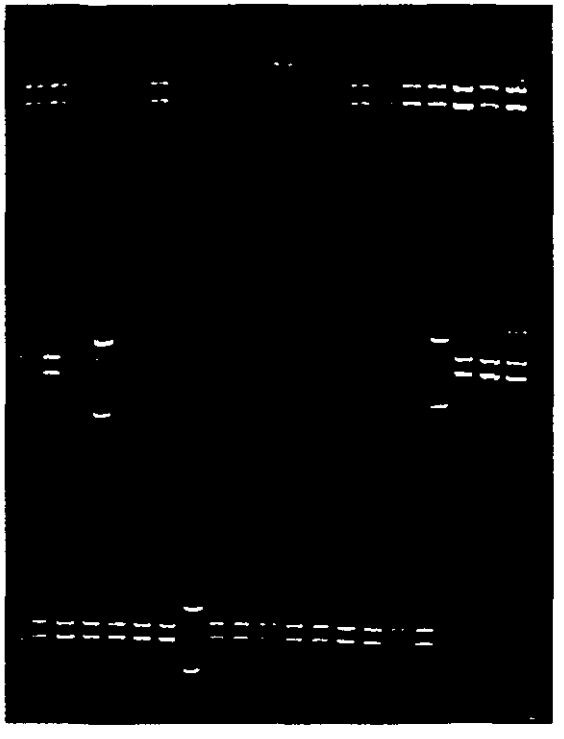
1	LCR 1	20	LCR-19	39	NCR-17
2	2	21	20	40	18
3	3	22	100bp ladder	41	19
4	4	23	NCR 1	42	20
5	5	24	2	43	100bp ladder
6	6	25	3	44	
7	7	26	4		
8	8	27	5		
9	9	28	6		
10	10	29	7		
11	100bp ladder	30	8		
12	11	31	9		
13	12	32	10		
14	13	33	11		
15	14	34	12		
16	15	35	13		
17	16	36	14		
18	17	37	15		
19	18	38	16		



1	OS-1				
2	2	21	OS-20	41	RR-19
3	3	22	100bp	42	RR-20
4	4	23	RR-1	43	
5	5	24	2	44	
6	6	25	3		
7	7	26	4		
8	8	27	5		
9	9	28	6		
10	10	29	7		
11	100bp ladder	30	8		
12	11	31	9		
13	12	32	10		
14	13	33	11		
15	14	34	12		
16	15	35	13		
17	16	36	14		
18	17	37	15		
19	18	38	16		
20	19	39	17		
		40	18		

Cyt-b / D-loop cut with BamII

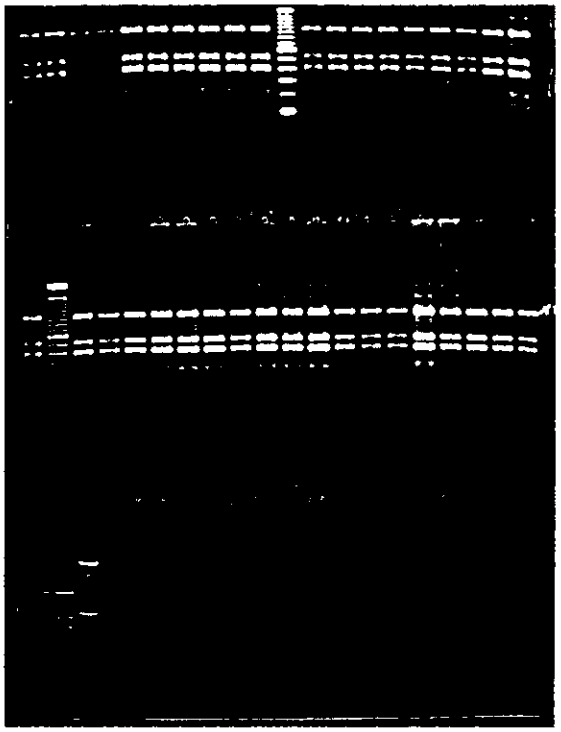




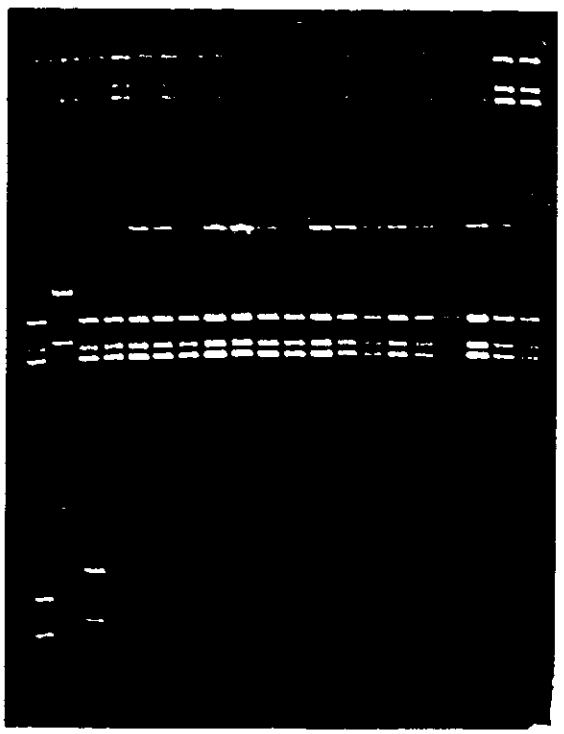
1	LCR-1		21	LCR-20		41	NCR-19
2	2		22	100bp ladder		42	20
3	3		23	NCR-1		43	100 bp ladder
4	4		24	2		44	
5	5		25	3		45	
6	6		26	4		46	
7	7		27	5		47	
8	8		28	6		48	
9	9		29	7		49	
10	10		30	8		50	
11	100bp ladder		31	9		51	
12	LCR-2	11	32	10		51	
13	3	12	33	11		52	
14	4	13	34	12		53	
15	5	14	35	13		54	
16	6	15	36	14		55	
17	7	16	37	15		56	
18	8	17	38	16		57	
19	9	18	39	17		58	
20	10	19	40	18			

1	05	1	21	05-19		41	RR-4
2	2		22	05-20		42	5
3	3		23			43	6
4	4		24	100bp ladder		44	7
5	5		25			45	8
6	6		26			46	9
7	7		27			47	10
8	8		28			48	100 bp ladder
9	9		29			49	RR-11
10	10		30			50	12
11	100bp ladder		31			51	13
12			32			52	14
13	05-11		33			53	15
14	12		34			54	16
15	13		35			55	17
16	14		36			56	18
17	15		37	100bp ladder		57	19
18	16		38	RR-1		58	20
19	17		39	2		59	
20	18		40	3		60	

Cyt-b / D-loop wt with BstNI

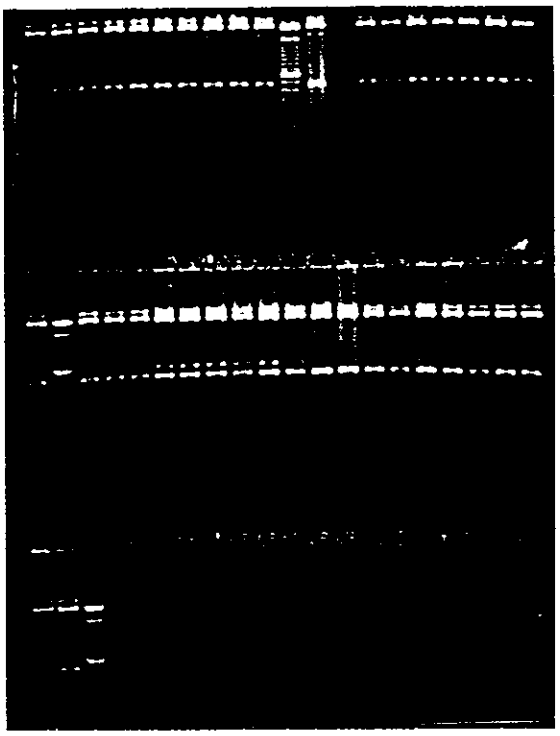


1	LCR-1	21	LCR-20	41	NCR-19
2	2	22	100bp ladder	42	20
3	3	23	NCR-1	43	100bp ladde
4	4	24	2	44	
5	5	25	3	45	
6	6	26	4		
7	7	27	5		
8	8	28	6		
9	9	29	7		
10	10	30	8		
11	100bp ladder	31	9		
12	NCR-11	32	10		
13	12	33	11		
14	13	34	12		
15	14	35	13		
16	15	36	14		
17	16	37	15		
18	17	38	16		
19	18	39	17		
20	19	40	18		

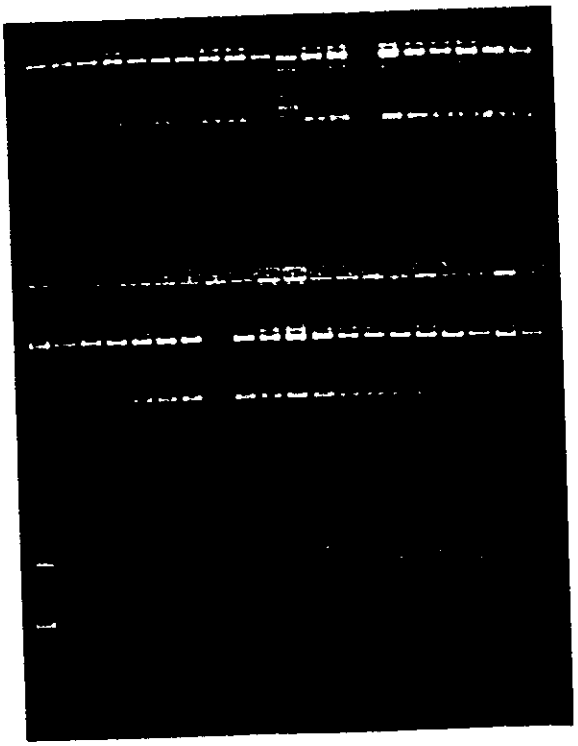


1	OS-1	21	OS-20	41	RR-19
2	2	22	100bp ladder	42	20
3	3	23	RR-1	43	100 bp ladd
4	4	24	2	44	
5	5	25	3	45	
6	6	26	4	46	
7	7	27	5	47	
8	8	28	6	48	
9	9	29	7	49	
10	10	30	8	50	
11	100bp ladder	31	9	51	
12	OS-11	32	10	52	
13	12	33	11	53	
14	13	34	12	54	
15	14	35	13	55	
16	15	36	14	56	
17	16	37	15	57	
18	17	38	16	58	
19	18	39	17	59	
20	19	40	18	60	

Cyt.-B/D-loop cut with BstU I

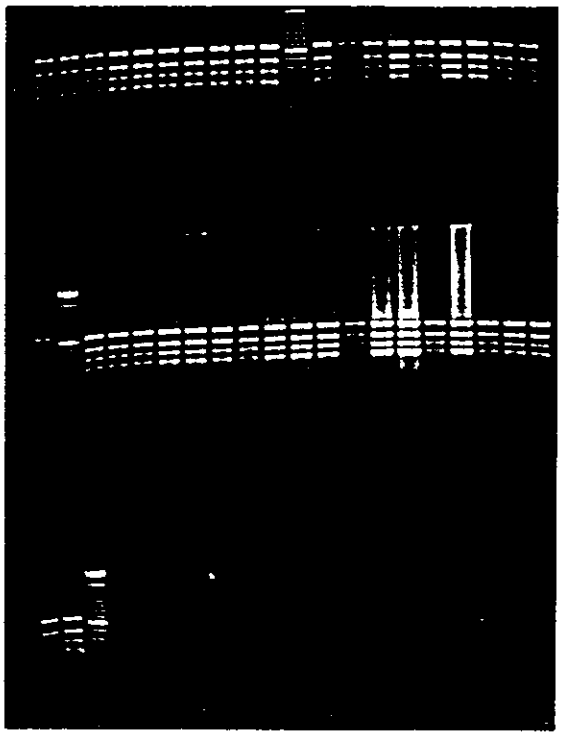


1	NCR-1	21	NCR-20	41	NCR-19
2	2	22	100bp ladder	42	20
3	3	23	NCR-1	43	100bp ladder
4	4	24	2	44	
5	5	25	3	45	
6	6	26	4	46	
7	7	27	5	47	
8	8	28	6	48	
9	9	29	7	49	
10	10	30	8	50	
11	100bp ladder	31	9	51	
12	11	32	10	52	
13	12	33	11	53	
14	13	34	12	54	
15	14	35	13	55	
16	15	36	14	56	
17	16	37	15	57	
18	17	38	16	58	
19	18	39	17	59	
20	19	40	18		

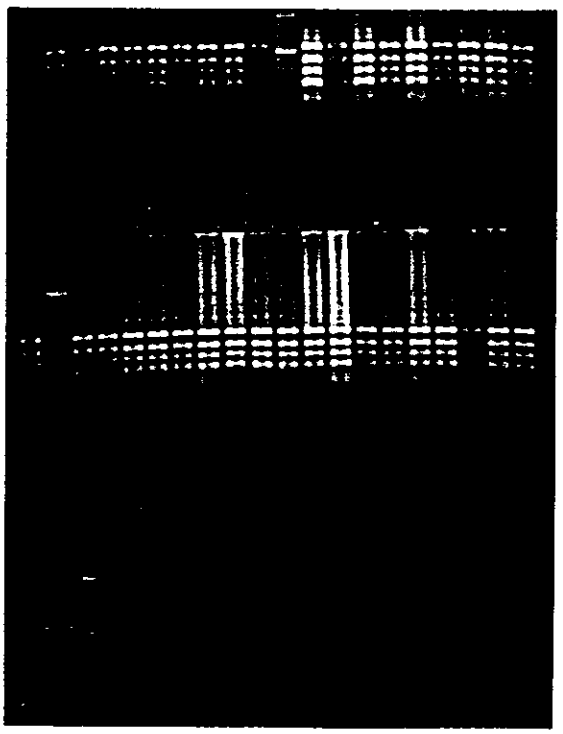


1	OS-1	21	OS-20	41	RR-19
2	2	22	100bp ladder	42	20
3	3	23	RR-1	43	100bp ladder
4	4	24	2	44	
5	5	25	3	45	
6	6	26	4		
7	7	27	5		
8	8	28	6		
9	9	29	7		
10	10	30	8		
11	100bp ladder	31	9		
12	11	32	10		
13	12	33	11		
14	13	34	12		
15	14	35	13		
16	15	36	14		
17	16	37	15		
18	17	38	16		
19	18	39	17		
20	19	40	18		

Cyt-B/D-loop cut with Dde I



1	LCR-1	21	ECR-20	41	NCR-19
2	2	22	100 bp ladder	42	20
3	3	23	NCR-1	43	100 bp ladder
4	4	24	2	44	
5	5	25	3	45	
6	6	26	4		
7	7	27	5		
8	8	28	6		
9	9	29	7		
10	10	30	8		
11	100 bp ladder	31	9		
12	11	32	10		
13	12	33	11		
14	13	34	12		
15	14	35	13		
16	15	36	14		
17	16	37	15		
18	17	38	16		
19	18	39	17		
20	19	40	18		

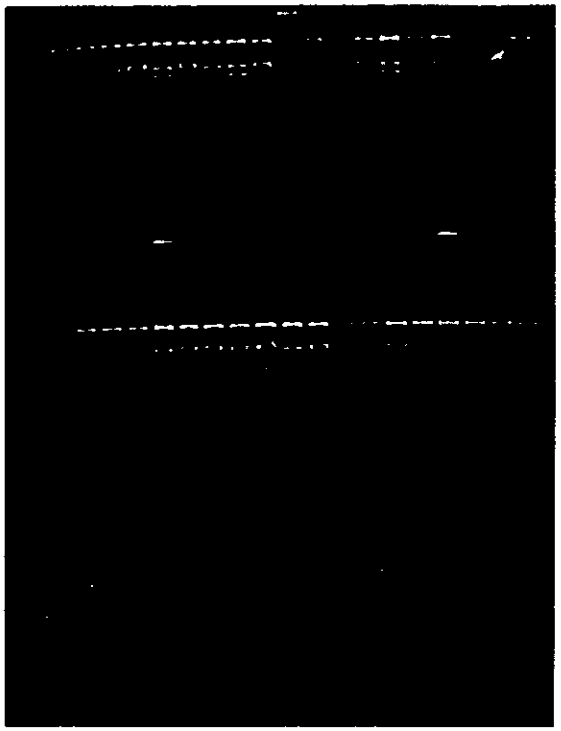


1	OS-1	21	OS-20	41	BR-19
2	2	22	100bp ladder	42	20
3	3	23	BR-1	43	100 bp ladder
4	4	24	2	44	
5	5	25	3	45	
6	6	26	4		
7	7	27	5		
8	8	28	6		
9	9	29	7		
10	10	30	8		
11	100bp ladder	31	9		
12	11	32	10		
13	12	33	11		
14	13	34	12		
15	14	35	13		
16	15	36	14		
17	16	37	15		
18	17	38	16		
19	18	39	17		
20	19	40	18		

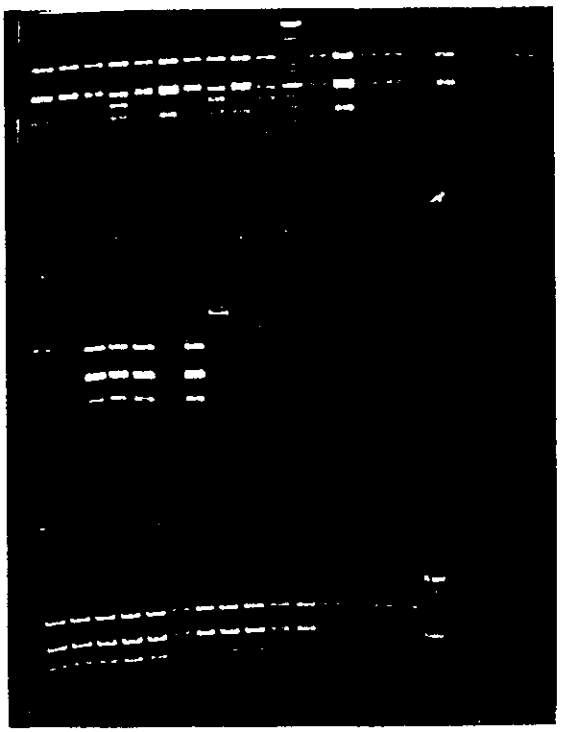
Cyt-B/D-loop cut with DpN II

4/13

LCR= 40/60 RR= 10/0.0
NCR= 70/.30
OS = 70/.30

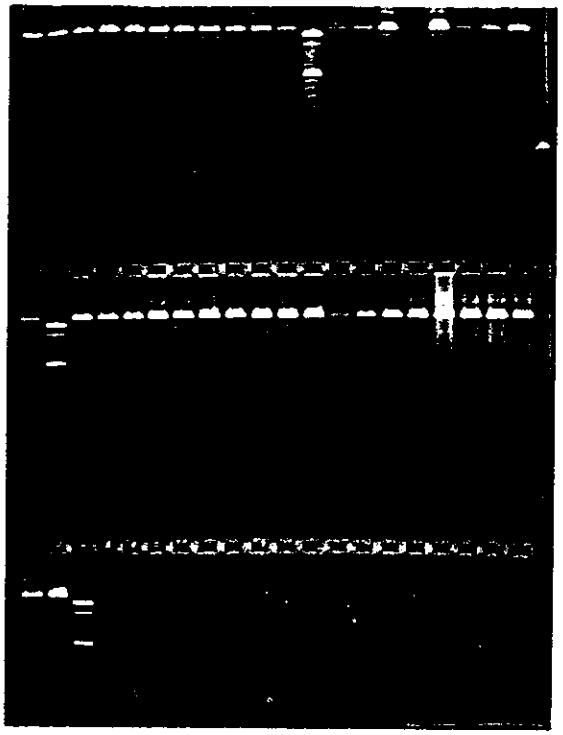


1	LCR-1	21	LCR 20	41	NCR-19
2	2	22	100 bp ladder	42	20
3	3	23	NCR-1	43	100bp ladder
4	4	24	2	44	
5	5	25	3		
6	6	26	4		
7	7	27	5		
8	8	28	6		
9	9	29	7		
10	10	30	8		
11	100bp ladder	31	9		
12	12	32	10		
13	12	33	11		
14	13	34	12		
15	14	35	13		
16	15	36	14		
17	16	37	15		
18	17	38	16		
19	18	34	17		
20	19	40	18		

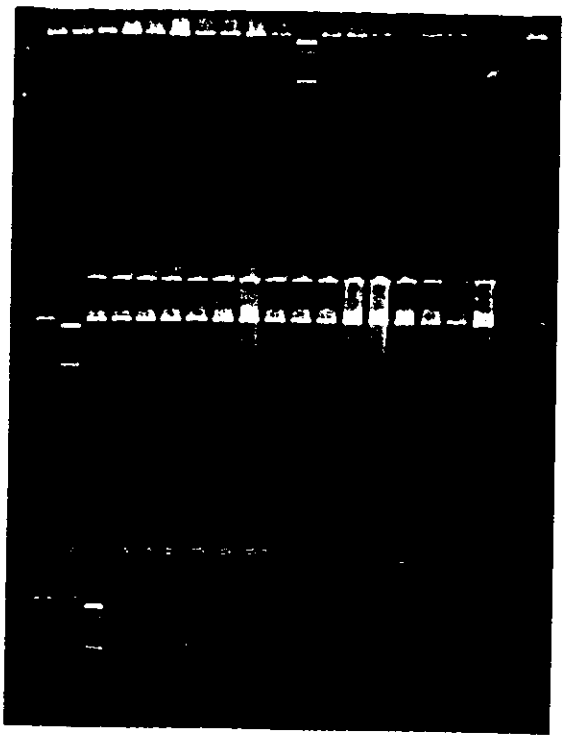


1	OS-1	21	OS-20	41	RR-6
2	2	22		42	7
3	3	23	RR-1	43	8
4	4	24	2	44	9
5	5	25	3	45	10
6	6	26	4	46	11
7	7	27	5	47	12
8	8	28	100 bp ladder	48	13
9	9	29		49	14
10	10	30		50	15
11	100 bp ladder	31		51	16
12	11	32		52	17
13	12	33		53	18
14	13	34		54	19
15	14	35		55	20
16	15	36		56	100 bp ladder
17	16	37		57	
18	17	38		58	
19	18	34		59	
20	19	40		60	

Cyt-B/D-loop cut with Dra I

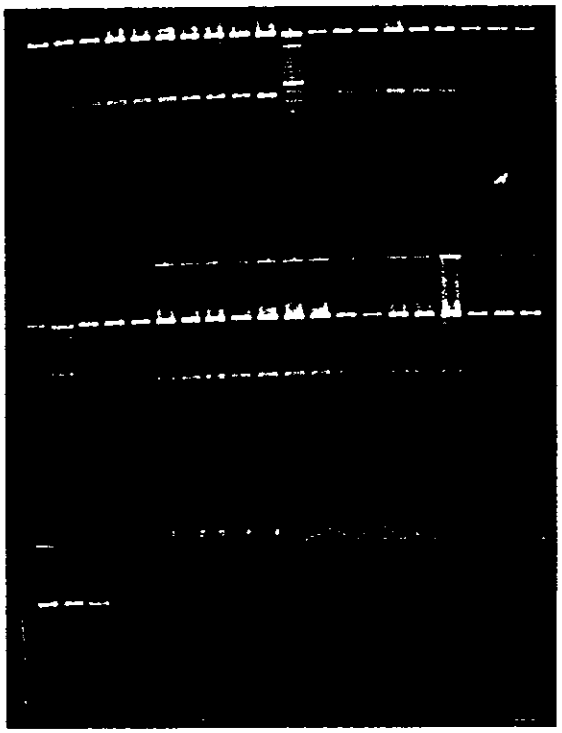


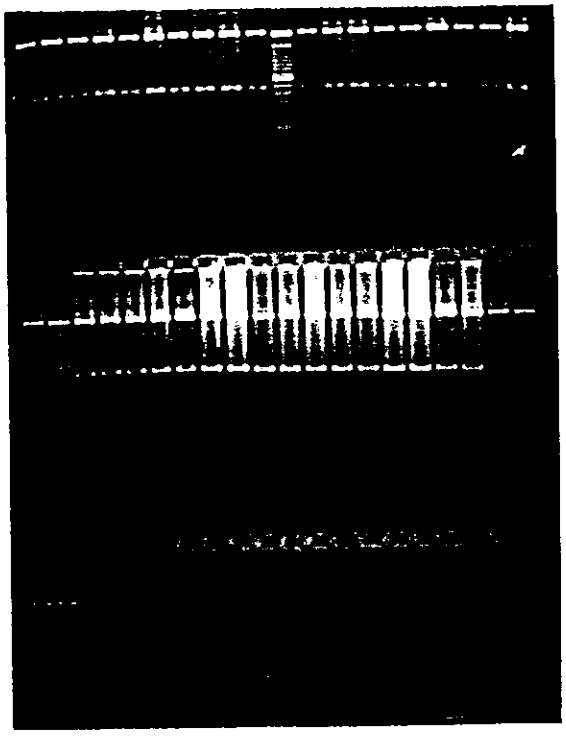
1	LCR-1	21	LCR-20	41	NCR-19
2	2	22	100bp ladder	42	20
3	3	23	NCR-1	43	100bp ladder
4	4	24	2	44	
5	5	25	3	45	
6	6	26	4	46	
7	7	27	5		
8	8	28	6		
9	9	29	7		
10	10	30	8		
11	11	31	9		
12	100bp ladder	32	10		
13	12	33	11		
14	13	34	12		
15	14	35	13		
16	15	36	14		
17	16	37	15		
18	17	38	16		
19	18	39	17		
20	19	40	18		



1	OS-1	21	OS-20	41	RR-19
2	2	22	100bp ladder	42	20
3	3	23	RR-1	43	100bp ladder
4	4	24	2	44	
5	5	25	3	45	
6	6	26	4		
7	7	27	5		
8	8	28	6		
9	9	29	7		
10	10	30	8		
11	100bp ladder	31	9		
12	11	32	10		
13	12	33	11		
14	13	34	12		
15	14	35	13		
16	15	36	14		
17	16	37	15		
18	17	38	16		
19	18	39	17		
20	19	40	18		

Cyt-B/D-100p cut with HincII

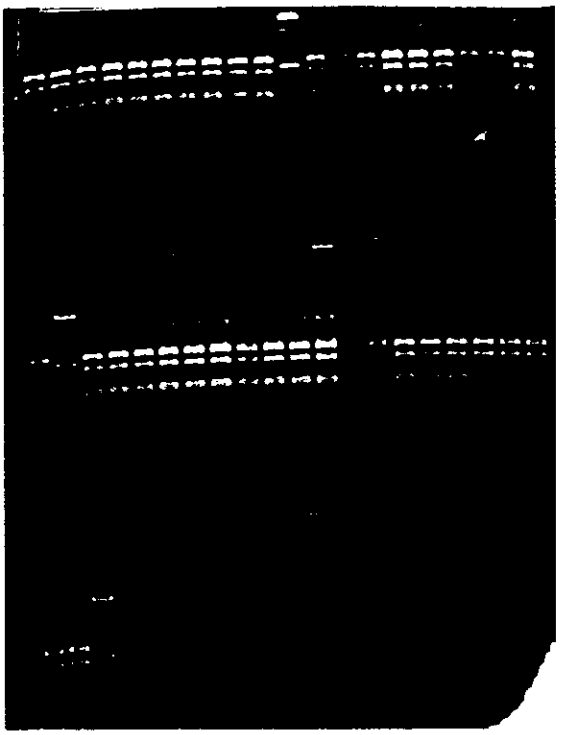




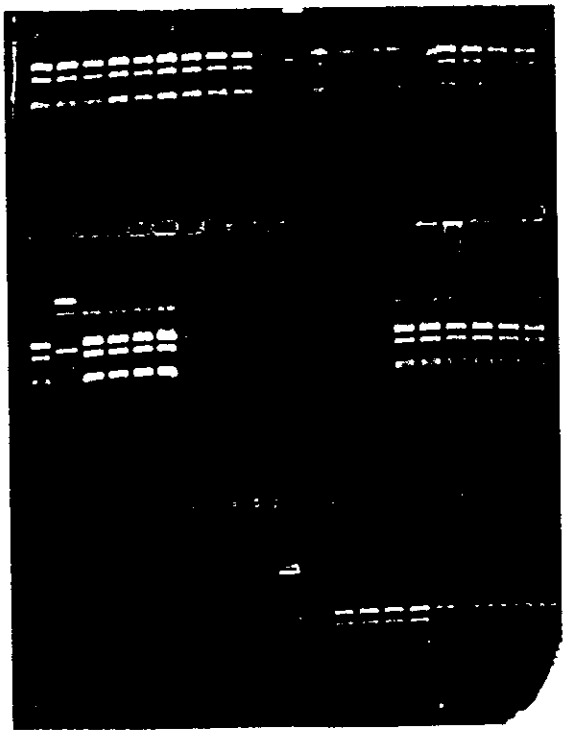
1	LCR-1		21	LCR-20	41	NCR 19	
2	2		22	100bp ladder	42	20	
3	3		23	NCR-1	43	100bp ladder	
4	4		24	2	44		
5	5		25	3	45		
6	6		26	4			
7	7		27	5			
8	8		28	6			
9	9		29	7			
10	10		30	8			
11	100bp ladder		31	9			
12	11		32	10			
13	12		33	11			
14	13		34	12			
15	14		35	13			
16	15		36	14			
17	16		37	15			
18	17		38	16			
19	18		39	17			
20	19		40	18			

1	OS-1		21	OS-20	41	RR-19	
2	2		22	100bp ladder	42	20	
3	3		23	RR-1	43	100bp ladder	
4	4		24	2	44		
5	5		25	3	45		
6	6		26	4			
7	7		27	5			
8	8		28	6			
9	9		29	7			
10	10		30	8			
11	100bp ladder		31	9			
12	11		32	10			
13	12		33	11			
14	13		34	12			
15	14		35	13			
16	15		36	14			
17	16		37	15			
18	17		38	16			
19	18		39	17			
20	19		40	18			

Cyt-B/D-loop cut with HinfI

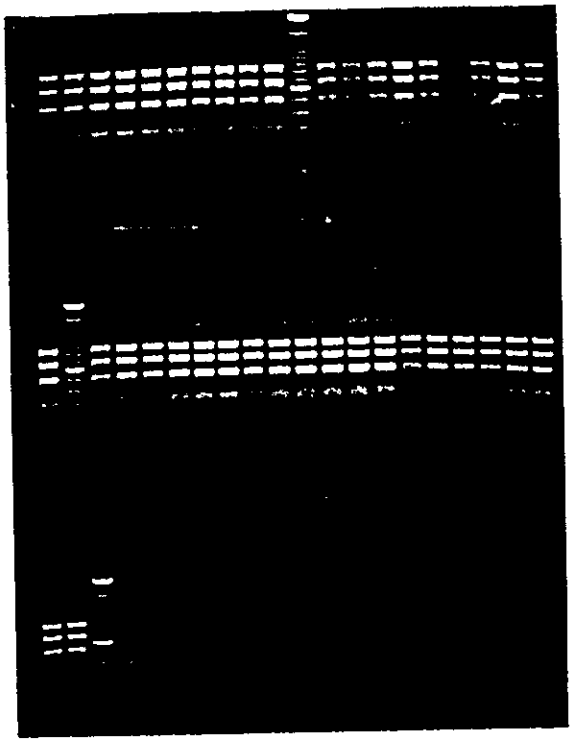


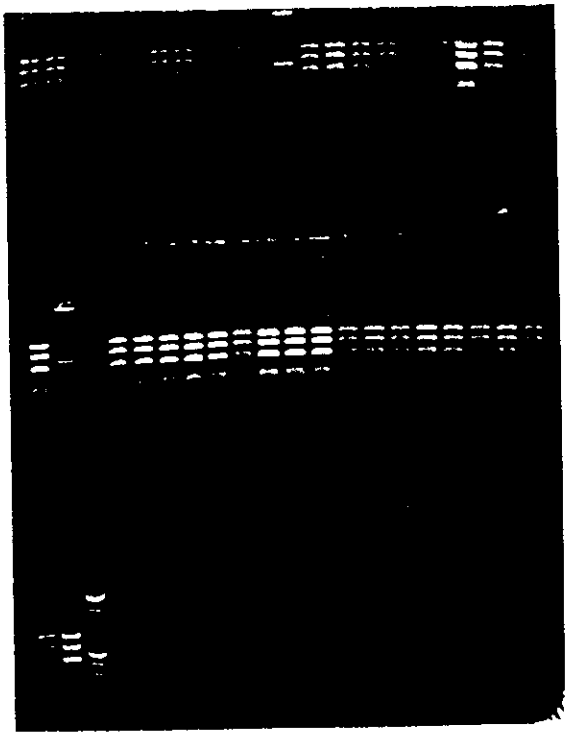
1	LCR-1		21	LCR-20		41	NCR-19
2		2	22	100bp ladder		42	20
3		3	23	NCR-1		43	100bp ladder
4		4	24		2	44	
5		5	25		3	45	
6		6	26		4		
7		7	27		5		
8		8	28		6		
9		9	29		7		
10		10	30		8		
11	100bp ladder		31		9		
12		11	32		10		
13		12	33		11		
14		13	34		12		
15		14	35		13		
16		15	36		14		
17		16	37		15		
18		17	38		16		
19		18	39		17		
20		19	40		18		



1	OS-1		21	OS-20		41	
2		2	22	100bp ladder		42	
3		3	23	RR-1		43	
4		4	24		2	44	
5		5	25		3	45	
6		6	26		4	46	
7		7	27			47	
8		8	28			48	
9		9	29			49	100bp ladder
10		10	30			50	RR-11
11	100bp ladder		31			51	~~100bp ladder~~
12		11	32			52	RR-12
13		12	33			53	13
14		13	34	~~RR-5~~		54	14
15		14	35	RR-5		55	15
16		15	36		6	56	16
17		16	37		7	57	17
18		17	38		8	58	18
19		18	39		9	59	19
20		19	40		10	60	20

Cyt B / D-loop cut with HhaI

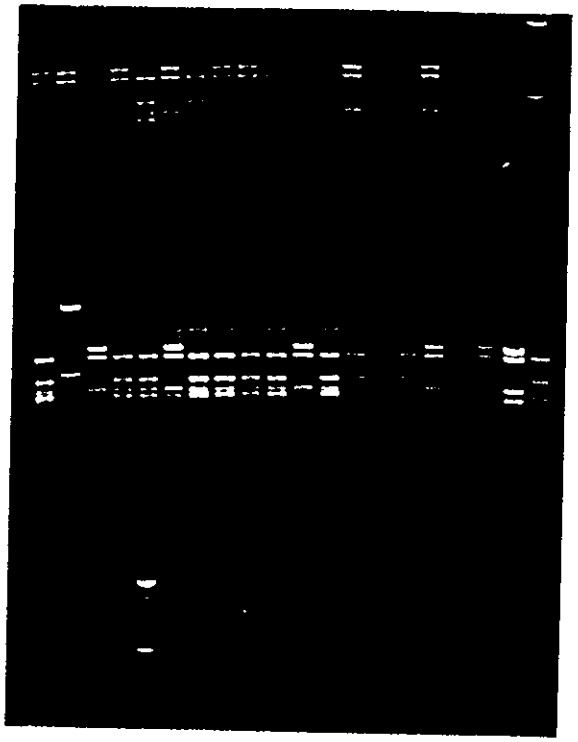




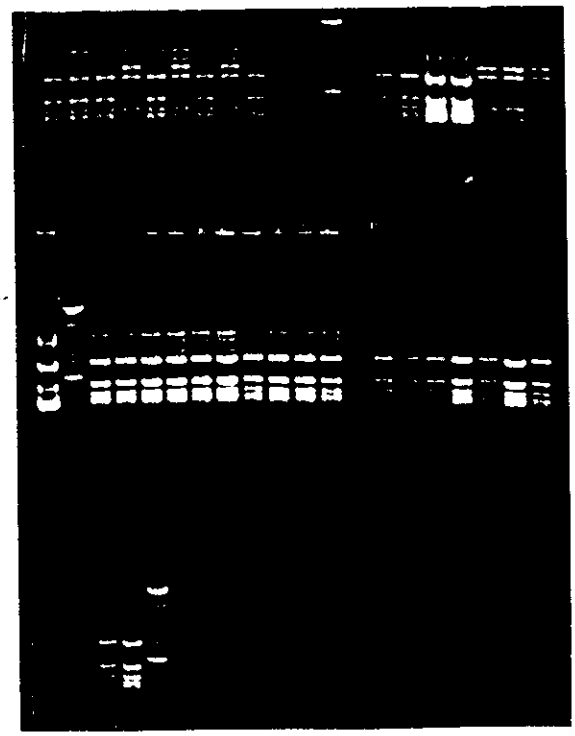
1	LCR-1	21	LCR-20	41	NCR-19
2	2	22	100bp ladder	42	20
3	3	23	NCR-1	43	100bp ladder
4	4	24	2	44	
5	5	25	3	45	
6	6	26	4		
7	7	27	5		
8	8	28	6		
9	9	29	7		
10	10	30	8		
11	100bp ladder	31	9		
12	11	32	10		
13	12	33	11		
14	13	34	12		
15	14	35	13		
16	15	36	14		
17	16	37	15		
18	17	38	16		
19	18	39	17		
20	19	40	18		

1	OS-1	21	OS-20	41	RR-19
2	2	22	100bp ladder	42	20
3	3	23	RR-1	43	100bp ladder
4	4	24	2	44	
5	5	25	3	45	
6	6	26	4		
7	7	27	5		
8	8	28	6		
9	9	29	7		
10	10	30	8		
11	100bp ladder	31	9		
12	11	32	10		
13	12	33	11		
14	13	34	12		
15	14	35	13		
16	15	36	14		
17	16	37	15		
18	17	38	16		
19	18	39	17		
20	19	40	18		

Cyt.B/D-loop cut with RsaI

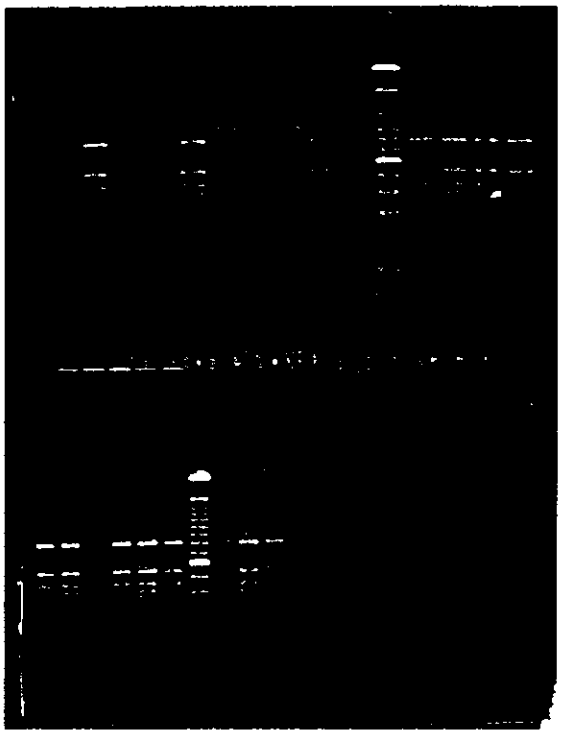


1	LCR- 1	21	LCR- 20	41	
2	2	22	100bp ladder	42	
3	3	23	LCR- 1	43	NCR-19
4	4	24	2	44	20
5	5	25	3	45	100bp ladder
6	6	26	4	46	
7	7	27	5		
8	8	28	6		
9	9	29	7		
10	10	30	8		
11	11	31	9		
12	12	32	10		
13	13	33	11		
14	14	34	12		
15	15	35	13		
16	16	36	14		
17	17	37	15		
18	18	38	16		
19	19	39	17		
20	100bp ladder	40	18		



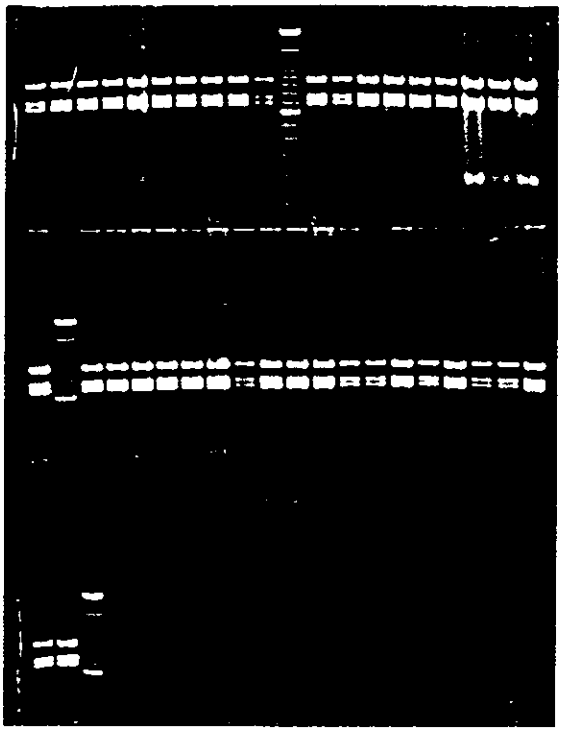
1	OS- 1	21	OS- 20	41	~~RR-19~~
2	2	22	100bp ladder	42	
3	3	23	RR- 1	43	RR-19
4	4	24	2	44	20
5	5	25	3	45	100bp ladder
6	6	26	4	46	
7	7	27	5		
8	8	28	6		
9	9	29	7		
10	10	30	8		
11	11	31	9		
12	100bp ladder	32	10		
13	OS- 12	33	11		
14	13	34	12		
15	14	35	13		
16	15	36	14		
17	16	37	15		
18	17	38	16		
19	18	39	17		
20	19	40	18		

Cyt B/ D-loop Re-cut with RS7

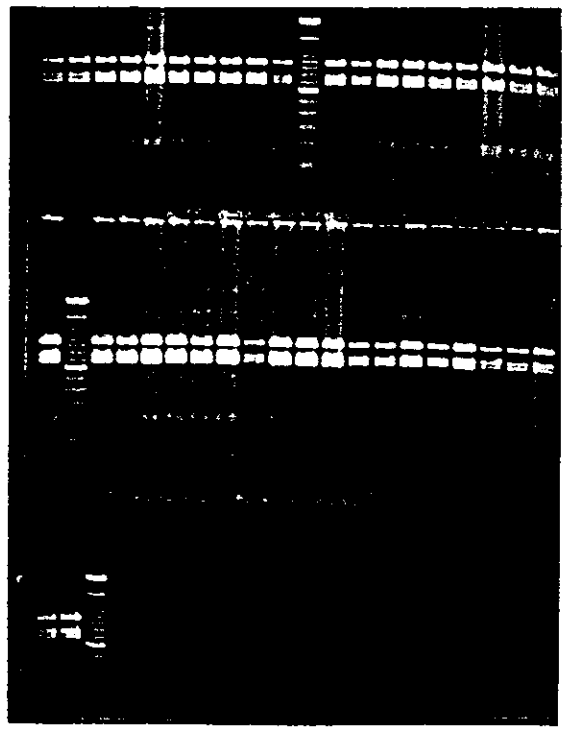


1	OS-1	16	RR-5
2	2	17	6
3	3	18	7
4	4	19	8
5	5	20	9
6	6	21	10
7	7	22	100bp ladder
8	8	23	OS-14
9	9	24	OS-15
10	10	25	OS-20
11	100bp ladder	26	LCR-3
12	RR-1		
13	2		
14	3		
15	4		

Cyt B / D-loop cut with Taq

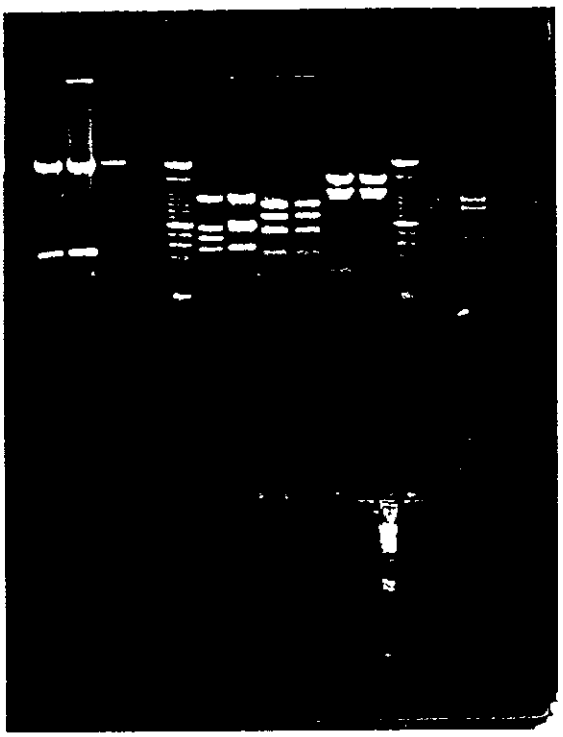


1	LCR-1	21	LCR-20	41	NCR-19
2	2	22	100bp ladder	42	20
3	3	23	NCR-1	43	100bp ladder
4	4	24	2	44	
5	5	25	3	45	
6	6	26	4		
7	7	27	5		
8	8	28	6		
9	9	29	7		
10	10	30	8		
11	100bp ladder	31	9		
12	11	32	10		
13	12	33	11		
14	13	34	12		
15	14	35	13		
16	15	36	14		
17	16	37	15		
18	17	38	16		
19	18	39	17		
20	19	40	18		



1	OS-1	21	OS-20	41	RR-19
2	2	22	100bp ladder	42	20
3	3	23	RR-1	43	100bp ladder
4	4	24	2	44	
5	5	25	3	45	
6	6	26	4		
7	7	27	5		
8	8	28	6		
9	9	29	7		
10	10	30	8		
11	100bp ladder	31	9		
12	11	32	10		
13	12	33	11		
14	13	34	12		
15	14	35	13		
16	15	36	14		
17	16	37	15		
18	17	38	16		
19	18	39	17		
20	19	40	18		

Cyt B / D-loop restr samples



1 RR-15 AvaII 16
2 16 AvaII 17
3 19 AvaII 18
4 20 AvaII 19
5 100bp ladder 20
6 LCR12 DpnII 21
7 LCR20 DpnII 22
8 RR-1 NheI 23
9 RR-2 NheI 24
10 OS-11 BamHI 25
11 OS-15 BamHI 26
12 100bp ladder 27
13 LCR-3 RsaI 28
14 LCR-14 RsaI 29
15 30: λ HindIII
31 λ PstI
32
33
34
35