

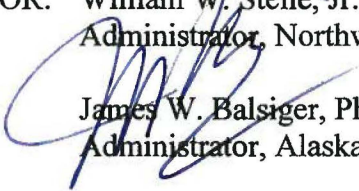


UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

April 5, 2012

MEMORANDUM FOR: William W. Stelle, Jr.
Administrator, Northwest Region

FROM:  James W. Balsiger, Ph.D.
Administrator, Alaska Region

SUBJECT: 2011 Annual Report for the Alaska Groundfish Fisheries Chinook
Salmon Incidental Catch and Endangered Species Act Consultation

We are providing to you the 2011 annual report on salmon incidental catch in the Alaska groundfish fisheries. This report fulfills one of the terms and conditions of the December 2, 2009, and the January 11, 2007, supplements to the November 30, 2000, Biological Opinion (BiOp) regarding Authorization of the Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA) Groundfish Fisheries. In addition, a supplemental Biological Opinion was issued on January 9, 2012, on the reinitiation of Endangered Species Act (ESA) section 7 consultation on incidental catches of Chinook salmon in the GOA groundfish fisheries, which concluded that the GOA groundfish fisheries are not likely to jeopardize the continued existence of the listed salmon Evolutionarily Significant Units (ESUs). This memorandum and attachments provide the latest information regarding salmon incidental catch in the Alaska groundfish fisheries and the progress on developing management measures to reduce the take of salmon in the groundfish fisheries. Issues addressed include the 2011 incidental catch of salmon, the Coded-Wire Tag (CWT) recoveries, genetic studies, and the development and implementation of new management measures to reduce salmon incidental catch in the Bering Sea and GOA pollock fisheries. Each issue is detailed below.

Incidental Catch of Salmon in the Alaska Fisheries and the Incidental Take Statement for Chinook Salmon

The amount of Chinook salmon incidental catch in the Alaska groundfish fisheries in 2011 was below the incidental take statement amounts for both the BSAI and GOA groundfish fisheries. Attachment 1 provides updated sector specific information regarding salmon incidental catch in the BSAI and GOA groundfish fisheries for the years 2004 through December 31, 2011. Approximately 90% of this incidental catch occurred in the pollock pelagic trawl fishery.



The amount of Chinook salmon incidental catch in the BSAI groundfish fisheries in 2011 is estimated at 26,672 fish (Attachment 2) This table provides data from 1991 to present. The numbers in tables may vary slightly because of the time when data was accessed for generating the tables. The Catch Accounting System is a dynamic system that is continuously being updated. The BSAI fishery incidental take amount for 2011 was revised in accordance with Amendment 91 (NMFS 2009a) as a result of the 2009 supplemental BiOp specifications. For the GOA groundfish fisheries in 2011, the estimated incidental catch of Chinook salmon was estimated at 20,733 fish (Attachment 2). This is below the incidental take statement of 40,000 fish in the 2012 supplemental BiOp.

Observer Program Bycatch Sampling

The North Pacific Groundfish Observer Program (Observer Program) is responsible for the collection of fisheries data used by managers for stock assessment and inseason monitoring of the commercial groundfish fisheries occurring in federal waters off Alaska. Fisheries data collected by observers deployed on commercial vessels provides the best available scientific information for managing fisheries and developing measures to minimize incidentally caught species, including salmon. Data collected by observers are used by managers to monitor quotas, manage groundfish and prohibited species catch, and document interactions with protected resources. The methods used to estimate the number of incidentally caught salmon in the Alaska federal groundfish fisheries vary by area and fishery.

Observers are deployed in the field for up to three months at a time and debrief with Fisheries Monitoring and Analysis Division (FMA) staff following their deployment. The data are not finalized until all observers return from the field for debriefing and their data are scrutinized following FMA quality control protocols. Generally, the observer data are finalized in late February to early March of the year following the fishery. Any catch information provided on 2011 is preliminary until the observer data are finalized after the fishing year is completed.

BSAI Non-pollock Fishery Sampling and Data Collection

The non-pollock fisheries in the BSAI, such as flatfish and Pacific cod trawl, contribute a smaller number of incidentally caught salmon in comparison to the Bering Sea pollock fishery. In these fisheries, the total number of incidentally caught salmon was obtained by using vessel observer at-sea species composition samples that are extrapolated to the vessel's total catch. Sampling protocols for observers in these non-pollock fisheries are different than those in the pollock fishery, and genetic tissue samples are not required to be collected. However, all salmon species encountered in the randomly collected at-sea species composition samples are checked for missing adipose fins indicating a potential CWT, and scale samples are collected to verify species identification.

In BSAI non-pollock fisheries in 2011, observers measured a total of 3 Chinook and 2 chum salmon of which none were missing an adipose fin (Table 1).

Bering Sea Pollock Fishery Sampling and Data Collection

The Bering Sea pollock fishery is one of the most heavily observed fleets in the nation. In August 2010, NMFS published regulations implementing Amendment 91 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (75 FR 53026). These regulations, effective January 1, 2011, require 100% observer coverage in the Bering Sea pollock fisheries regardless of vessel length, a census of all salmon species in every haul or fishing trip, and an expanded biological sampling program. Also, NMFS requires shoreside processors to provide a location from which the observer is able to view all sorting and weighing of fish, as well the storage area for salmon. A new sampling protocol for Chinook salmon in the Bering Sea pollock fishery was initiated at the start of the 2011 fishing year. This protocol was designed to conform with recommendations provided in Pella and Geiger (2009). This new protocol includes a complete census of salmon bycatch in the pollock fishery which is then sampled systematically by observers. On catcher processors and motherships, the vessel personnel are required to save all salmon in an approved storage container until the end of the haul, and electronic monitoring systems are used to ensure compliance with this rule. Before the start of the next haul, the observers count and identify every salmon retained. Observers implement a systematic sampling design for the identified Chinook and chum salmon by selecting every 10th Chinook and every 30th chum encountered. The selected fish are used to obtain a length measurement, a genetic tissue sample, and five scales to verify species identification. These fish are also checked for a missing adipose fin, indicating a potential CWT.

Chinook and chum salmon that are not selected using the systematic sample design are identified to species and counted but no additional biological data are collected. All other salmon species are identified, measured, counted, and checked for a missing adipose fin. Additionally, a separate scale collection is collected to verify the observer's identification skills.

Catcher vessel observers check every salmon encountered in their randomly collected at-sea composition samples for missing adipose fins and collect a scale sample to verify species identification. The catcher vessel observers monitor that no salmon are discarded at sea to the best of their ability. Total retained salmon numbers and related genetics samples are obtained from catcher vessel pollock deliveries at the processing facility.

Once the catch is delivered to the processing facility, the plant and vessel observers monitor the entire offload to ensure that all retained salmon are sorted and placed in an approved salmon storage container. The observers collect total salmon numbers and associated biological specimens following the same procedure outlined above for catcher processors and motherships.

In the 2011 Bering Sea pollock fishery, 2,591 Chinook and 6,691 chum salmon were measured for length. Of these fish, 2,513 Chinook and 6,105 chum were sampled for genetic tissue (Table 1). In addition, 13 Chinook, 3 chum, and 2 coho salmon were missing their adipose fin, and their heads were shipped to the Auke Bay Laboratories (Auke Bay Lab) to be scanned for CWT presence and analysis. It is important to note that every biological specimen such as genetic tissue samples or scale samples is associated with a length. For this reason the total number of lengths is expected to exceed the total number of any biological specimen.

Table 1. Number of length, genetic, and CWT samples collected from incidentally caught salmon in the 2011 Bering Sea/Aleutian Islands pollock and non-pollock fisheries.

| Area/fishery | Salmon species | Sample | | |
|------------------|----------------|--------|------------------|------------------|
| | | Length | Genetic tissue | CWT ¹ |
| BS pollock | | | | |
| | Chinook | 2,591 | 2,513 | 13 |
| | Chum | 6,691 | 6,105 | 3 |
| | Coho | 26 | n/a ² | 2 |
| | Pink | 40 | n/a | 0 |
| | Sockeye | 25 | n/a | 0 |
| | subtotal | 9,373 | 8,618 | 18 |
| BSAI non-pollock | | | | |
| | Chinook | 3 | n/a | 0 |
| | Chum | 2 | n/a | 0 |
| | Coho | 0 | n/a | 0 |
| | Pink | 0 | n/a | 0 |
| | Sockeye | 0 | n/a | 0 |
| | subtotal | 5 | n/a | 0 |
| Total | | | | |
| | | 9,378 | 8,618 | 18 |

¹ Salmon head collected from fish missing adipose fin.

² n/a = not part of sampling protocol

GOA Pollock Fishery Sampling and Data Collection

The GOA groundfish fleet requires 100% coverage for catcher vessels greater than 125 ft. length overall (LOA), while catcher vessels between 60 ft. and 125 ft. LOA require 30% coverage. In 2011, the Observer Program's biological salmon sampling protocols for the GOA pollock fishery were revised to be as consistent as possible with the changes implemented in the Bering Sea pollock fishery. Additionally, full discard of all salmon species was required in the GOA groundfish fisheries; therefore, vessel observers in the GOA could only collect data from salmon as they were encountered. This included salmon discarded at sea, salmon found within the randomly collected at-sea species composition samples, and salmon encountered while monitoring the vessel offload. Each Chinook or chum salmon encountered under each of these three situations was sampled for genetics, checked for a missing adipose fin, and a scale sample was collected to verify species identification.

Data collected from the observed vessels provide an indication of the relative numbers and species of salmon incidentally taken in the Alaska groundfish fisheries. The total number of

incidentally caught salmon was obtained using at-sea composition samples extrapolated to the vessel's total catch. The number of the salmon reported in observed pollock catcher vessel offloads was then extrapolated to all unobserved pollock catcher vessel offloads for an overall estimate of salmon incidental catch. In rare circumstances where the offload sample is not completed, NMFS Alaska Region used number of salmon in the at-sea samples to extrapolate to the entire vessel offload.

Total numbers of all other salmon species were collected following the Chinook and chum sampling protocols described above. Length measurements and biological data were only collected from salmon encountered within the at-sea composition sample or during the vessel offload.

In the 2011 GOA pollock fishery, 235 Chinook and 6 chum salmon were measured for length. Of these fish, 221 Chinook and 3 chum were sampled for genetic tissue (Table 2). In addition, 12 Chinook were missing their adipose fin, and their heads were shipped to the Auke Bay lab to be scanned for CWT presence and analysis. It is important to note that every biological specimen such as genetic tissue samples or scale samples is associated with a length. For this reason the total number of lengths is expected to exceed the total number of any biological specimen.

GOA Non-pollock Fishery Sampling and Data Collection

The non-pollock fisheries in the GOA, such as flatfish and Pacific cod trawl, contribute a smaller number of incidentally caught salmon in comparison to the pollock fishery. Observer coverage for groundfish vessels is the same for both pollock and non-pollock vessels with the exception of the rockfish fishery that requires 100% observer coverage.

In these non-pollock fisheries, the total number of incidentally caught salmon is obtained using the same methods as those used in the GOA pollock fishery, although there is no monitoring of the vessel's offload. All salmon numbers are obtained using at-sea species composition samples collected by vessel observers and extrapolated to the vessel's total catch. Observers' at-sea samples in these non-pollock fisheries are collected using the same methods as Bering Sea non-pollock fishery sampling protocols described above.

In the 2011 GOA non-pollock fisheries, observers measured a total of 62 Chinook and 25 chum salmon. Of these fish, 7 Chinook were missing an adipose fin (Table 2). Salmon heads were collected and shipped to the Auke Bay Lab to be scanned for CWT presence and analysis.

Table 2. Number of samples collected from incidentally caught salmon in the 2011 Gulf of Alaska pollock and non-pollock fisheries.

| Area/fishery | Salmon species | Sample | | |
|-----------------|----------------|--------|----------------|------------------|
| | | Length | Genetic tissue | CWT ¹ |
| GOA pollock | | | | |
| | Chinook | 235 | 221 | 12 |
| | Chum | 6 | 3 | 0 |
| | Coho | 13 | 0 | 0 |
| | Pink | 1 | 0 | 0 |
| | Sockeye | 0 | 0 | 0 |
| | subtotal | 255 | 224 | 12 |
| GOA non-pollock | | | | |
| | Chinook | 62 | n/a | 7 |
| | Chum | 25 | n/a | 0 |
| | Coho | 6 | n/a | 0 |
| | Pink | 1 | n/a | 0 |
| | Sockeye | 0 | n/a | 0 |
| | subtotal | 94 | n/a | 7 |
| <hr/> | | | | |
| Total | | 349 | 224 | 19 |

¹ Salmon head collected from fish missing adipose fin.

² n/a = not part of sampling protocol

Salmon Research in the Alaska Groundfish Fisheries

CWT Expansions

CWTs are an important source of information for the stock-specific ocean distribution of those Chinook salmon stocks that are tagged with CWTs and caught as bycatch in the BSAI and GOA groundfish fisheries. In 2010, the North Pacific Fishery Management Council (Council) contracted with Cramer Fish Sciences to compile a database of CWT release groups of ESA-listed west coast salmonids based on Mark Center information. In 2011, a new contract was implemented, and the database includes all production (counted and estimated, tagged and untagged) of both wild and hatchery components of each ESU on an annual basis, dating back to when each ESU was first defined by NMFS. Future CWT analyses in the BSAI and GOA will include a new summary table in the database on the annual production of stream type (spring run) Chinook salmon ESA-listed ESUs originating from Washington, Oregon, and Idaho.

Ideally, it would be preferable to calculate a total estimated contribution of Chinook salmon from ESA-listed ESUs harvested in the BSAI and GOA in order to determine the impact of groundfish fisheries on these stocks. Total estimated contributions for CWT recoveries can be calculated in

a two-step process involving a sampling expansion factor and a marking expansion factor (see Attachment 4 on Recovery Estimation Technique for a more detailed explanation).

Unfortunately, sampling expansion factors cannot be calculated for the CWT recoveries of ESA-listed ESUs in the BSAI and GOA because of data limitations. For most of the recoveries of CWTs in the Alaska groundfish trawl fisheries, it is unknown whether the CWTs were collected from inside or outside the sample. A sampling expansion factor can only be calculated from CWTs recovered from inside a sample where the total number of sampled fish is known. CWT recoveries from outside the sample (“select” recoveries where the total number of fish examined is unknown) cannot be used to calculate a sampling expansion factor.

However, marking expansions can still be calculated for each CWT recovery from the mark expansion factors for each tag code. Because not all fish in a tag release group are actually tagged with CWTs, marking expansion factors account for the fraction of each release group that is tagged (see Recovery Estimation Technique). Without being able to calculate total estimated contributions because of unknown sampling expansion factors, mark expansions offer the closest approximation to the contribution of Chinook salmon from ESA-listed ESUs for the CWTs recovered from the BSAI and GOA groundfish fisheries. Mark expansions should be considered a minimal estimate for the actual total contribution of Chinook salmon from ESA-listed ESUs in the BSAI and GOA groundfish fisheries.

Occurrence of ESA-listed Chinook salmon ESUs in the BSAI and GOA

Recoveries of CWTs from outside the sample (or from unknown sample origin) are still important for documenting occurrence of Chinook salmon from ESA-listed ESUs in the BSAI and GOA trawl fisheries. Chinook salmon from the Lower Columbia River (LCR), Upper Willamette River (UWR), and Upper Columbia River (UCR) Spring ESUs have been recovered in the Alaska groundfish fisheries. Since 1984, CWTs have been recovered from 23 LCR, 97 UWR, and 1 UCR Chinook salmon in the GOA trawl fishery, and from 9 LCR and 12 UWR Chinook salmon in the BSAI trawl fishery, both pre- and post-listing (Attachment 5, Tables 1 and 2). By applying mark expansion factors, the estimated numbers increase to 112 LCR, 275 UWR, and 1 UCR Chinook salmon in the GOA and 9 LCR and 62 UWR Chinook salmon in the BSAI (Attachment 5, Tables 1 and 2).

These numbers should be considered as minimum estimates of the number of ESA-listed ESUs in the GOA and BSAI groundfish fisheries. Until adequate numbers of CWTs are recovered from inside the observers’ samples, where the total number of fish sampled is known, and expansions made to account for unmarked wild fish, an estimate of total contribution of ESA-listed ESUs in the Alaska groundfish fisheries cannot be calculated accurately.

Research surveys have documented the occurrence of other ESUs of ESA-listed Chinook salmon in the GOA besides the LCR, UWR, and UCR. Small numbers of the Puget Sound (PS) Chinook ESU, the Snake River Spring/Summer (SRS/S) Chinook ESU, and the Snake River Basin (SRB) steelhead ESUs have also been recovered in the GOA. Since 1991, CWTs have been recovered from 3 LCR, 1 PS, 5 SRS/S, 4 UCR, 11 UWR Chinook salmon, and 1 SRB steelhead in domestic and foreign research surveys in the GOA (Attachment 5, Tables 3 and 4). By applying

mark expansion factors, the estimated numbers increase to 6 LCR, 1 PS, 9 SRS/S, 4 UCR, 72 UWR Chinook salmon, and 1 SRB steelhead. The purpose of providing these research CWT recoveries is to determine potential occurrence of these ESA-listed ESUs in Alaskan waters where groundfish fisheries occur. The bycatch of ESA-listed ESUs in the groundfish fisheries is not represented accurately by these CWT recoveries from research surveys because the research surveys target salmon with a different gear type and fish at shallower depths than the groundfish fisheries.

Salmon Research in the BSAI

Coded-Wire Tag Results in the BSAI

Recoveries of CWT Chinook salmon in the bycatch of the BSAI groundfish fisheries are summarized by state or province of origin (Attachment 6, Table 1). Expanded CWT proportions should not be taken as true proportions in the fishery because the rate of tagging from different regions is not proportional and there are relatively few wild fish actually tagged. Since 1995, most of the observed CWTs of Chinook salmon recovered from the BSAI fisheries have originated from British Columbia (36%) and Alaska (35%), followed by Oregon (16%), Washington (4%), Yukon Territory (3%), and California (<1%). When accounting for mark expansions for each tag code, British Columbia provided 61% of Chinook bycatch, followed by Alaska (23%), Oregon (10%), Washington (10%), Yukon Territory (1%), and California (1%).

Most of the Chinook salmon represented by CWTs and harvested in the BSAI originated from hatchery production (Attachment 6, Table 2). Overall since 1995, 97% of the Chinook salmon bycatch marked with CWTs was of hatchery origin, 2% from wild stocks, and less than 1% of mixed hatchery-wild stocks. For Alaska-origin CWT Chinook salmon however, wild stocks comprised 6% of the bycatch of Alaskan stocks in the BSAI since 1995, with hatcheries comprising the other 94%. For all the CWT Chinook salmon that have been released in Alaska from the 1992 brood onward, 87% were of hatchery origin and 13% were from wild stocks. For all the CWT Chinook salmon that have been released in all locations other than Alaska from the 1992 brood onward, 94% were of hatchery origin, 3% were from wild stocks, and 3% were from mixed stocks. Besides Alaska, Washington was the only other state of origin with a recovery of a wild stock in the BSAI.

The CWT Chinook salmon recovered in the BSAI were composed of a variety of run-types, and the percentage of each run-type varied by state or province of origin (Attachment 6, Table 3). The different designated run-types are determined by the tagging agency. Overall, the most prevalent run-type of CWT Chinook salmon in the BSAI was Fall (41%), followed by Spring (40%), Summer (18%), and small numbers of other run-types. Percent composition of different run-types varied by state or province of origin. For Alaska stocks, 99% of CWT recoveries were Spring run-type, followed by Summer (1%). For British Columbia, the most prevalent run-type was Fall (43%), followed by Summer (37%) and Spring (20%). Washington Chinook were predominantly Fall run-type (77%), followed by Spring (17%), Summer (4%), and Late Fall Upriver Brights (2%). Oregon Chinook were predominantly Fall (69%), followed by Spring (27%), Winter (3%), and Late Fall Upriver Brights (2%). For Yukon Territory, Spring was the most prevalent run-type (50%), followed by Summer (29%), Fall (14%), and Late Fall (7%).

The CWT Chinook salmon recovered in the BSAI from 1995 to 2010 (excluding Alaska stocks of origin) were composed of a number of age classes from age-2 to age-6. Almost half of the CWT recoveries were from age-3 fish (49%), followed by age-4 (34%), age-2 (10%), age-5 (7%), and age-6 (1%) (Attachment 7, Table 1). Ages of CWT recoveries were calculated by subtracting the brood-year of each CWT recovery from the recovery-year to come up with a total-age for each fish.

Genetic Analysis of Salmon Bycatch in the BSAI

In 2012, the NMFS Alaska Fisheries Science Center Auke Bay Lab reported genetic stock identification results for a subset of Chinook salmon bycatch samples collected in the Bering Sea from the bycatch of the 2010 groundfish trawl fisheries (Guthrie et al. 2012). Samples were genotyped for the 43 unlinked single-nucleotide polymorphism (SNP) markers represented in the Alaska Department of Fish and Game (ADF&G) genetic baseline. In 2010, the genetic samples were collected as part of the vessel observer's species-composition analysis; therefore, stock composition estimates apply to the sample set and may not represent the entire Chinook salmon bycatch. The majority of the 826 Chinook salmon bycatch samples taken in 2010 originated from Coastal Western Alaska (42%), with smaller contributions from Upper Yukon River (20%), North Alaska Peninsula (14%), and Middle Yukon River (11%) stocks. The remaining 14% comprised Washington, Oregon and British Columbia stocks. These estimates are similar to the 2005 to 2009 Chinook salmon bycatch estimates; however, there were higher proportions of Yukon River stocks and lower proportions of Coastal Western Alaska stocks in 2010 compared to the other years (Attachment 8). Temporal analysis of the samples revealed changes in Chinook salmon stock composition during 2010, with lower contribution of North Alaska Peninsula and Yukon River stocks and higher concentrations of U.S. Pacific Northwest and British Columbia Chinook salmon stocks during the B season of the groundfish fishery.

Caution must be used in comparisons across years and between seasons as there are differences in both the sampling rate and where/when genetic samples were collected from year to year. In addition, the extent to which any salmon stock is impacted by the bycatch of the Bering Sea trawl fishery is dependent on many factors including (1) the overall size of the bycatch, (2) the age of the salmon caught in the bycatch, (3) the age of the returning salmon, and (4) the total escapement of the affected stocks taking into account lag time for maturity and returning to the river. As such, a higher stock composition estimate one year does not necessarily infer greater impact than a smaller estimate in another year.

Amendment 91 requires that all salmon taken as bycatch in the Bering Sea pollock fishery be sorted by species and counted to ensure compliance with the salmon bycatch caps for the pollock fishery. This has provided additional opportunities for observers to provide representative samples from the salmon bycatch for genetic analysis, and improve the capability to characterize the origin of salmon taken as bycatch in the Bering Sea pollock fishery. In 2011, systematic random sampling was employed to take genetic samples from every tenth incidental caught Chinook salmon from the pollock trawl fishery.

Salmon Research in the GOA

Coded-Wire Tag Recoveries in the GOA

Recoveries of CWT Chinook salmon in the bycatch of the GOA groundfish fisheries are summarized by state or province of origin (Attachment 9, Table 1). Expanded CWT proportions should not be taken as true proportions in the fishery because the rate of tagging from different regions is not proportional and there are relatively few wild fish actually tagged. Since 1995, a total of 609 CWT recoveries from the GOA Chinook salmon bycatch have been analyzed and most of the observed CWTs of Chinook salmon in the GOA fisheries have originated from British Columbia (32%) and Alaska (32%), followed by Oregon (21%), Washington (15%), and Idaho (<1%). When accounting for mark expansions for each tag code, British Columbia provided 50% of Chinook bycatch, followed by Alaska (35%), Oregon (8%), Washington (7%), and Idaho (<1%). In 7 out of those 16 years, however, Alaska was the major provider of the year's CWT Chinook salmon bycatch in the GOA after accounting for mark expansions.

Most of the Chinook salmon represented by CWTs and recovered in the GOA groundfish fisheries originated from hatchery production (Attachment 9, Table 2). Overall since 1995, 95% of the CWT Chinook salmon bycatch was of hatchery origin, 3% from wild stocks, and 2% of mixed hatchery-wild stocks. For Alaska-origin CWT Chinook salmon however, wild stocks comprised 9% of the bycatch of Alaskan stocks in the GOA since 1995, with hatcheries comprising the other 91%. For all the CWT Chinook salmon that have been released in Alaska from the 1992 brood onward, 87% were of hatchery origin and 13% were of wild origin. For all the CWT Chinook salmon that have been released in all locations other than Alaska from the 1992 brood onward, 94% were of hatchery origin, 3% were from wild stocks, and 3% were from mixed stocks. In the last 2 years, 2009 and 2010, wild stocks have provided 25% of the Alaska-origin CWT Chinook salmon harvested in the GOA, with hatchery stocks providing the other 75%. Washington was the only other state of origin with recoveries of wild stocks in the GOA.

Chinook salmon represented by CWTs and recovered in the GOA groundfish fisheries were composed of a variety of run-types, and the percentage of each run-type varied by state or province of origin (Attachment 9, Table 3). The different designated run-types are determined by the tagging agency. Overall, the most prevalent run-type of CWT Chinook salmon in the GOA was Spring, followed by Fall, Summer, and small numbers of other run-types. Percent composition of different run-types varied by state or province of origin. For Alaska stocks, 100% of CWT recoveries were Spring run-type. For British Columbia, the most prevalent run-type was Summer (41%), followed by Fall (33%) and Spring (26%). Washington Chinook salmon were predominantly Fall run-type (57%), followed by Summer (26%), Spring (9%), Late Fall (5%), and Late Fall Upriver Bright (3%). Oregon Chinook salmon were predominantly Spring (55%), followed by Fall (43%) and Winter (2%).

The CWT Chinook salmon recovered in the GOA groundfish fisheries from 1995 to 2010 (excluding Alaska stocks of origin) were composed of a number of age classes from age-2 to age-5. Over half of the CWT recoveries were from age-3 fish (57%), followed by age-4 (30%), age-2 (8%), and age-5 (5%) (Attachment 7, Table 1). Ages of CWT recoveries were calculated

by subtracting the brood-year of each CWT recovery from the recovery-year to come up with a total-age for each fish.

Genetic Analysis of Salmon Bycatch in the GOA

While genetic and scale pattern derived stock composition analyses have been completed for available sample sets from the Chinook salmon Prohibited Species Catch (PSC) of the BSAI groundfish trawl fisheries (Myers and Rogers 1988; Myers et al. 2004; NMFS 2009a; Guyon et al. 2010a; Guyon et al. 2010b), limited sampling has precluded stock composition of the salmon PSC in the GOA pollock trawl fishery.

For the 2010 genetic analyses, approximately 116 Chinook salmon axillary process samples from the Western GOA, and 45 samples from statistical area 620 in the Central GOA were received by the NMFS Auke Bay Lab from the Alaska groundfish fisheries PSC. The overall fraction sampled was 0.4% and did not exceed 0.8% for any area. The lack of representative samples and small sample sizes preclude calculating statistically reliable stock composition estimates of the 2010 GOA Chinook salmon bycatch as a whole. The statistical area 610 sample set of 116 samples originated from 5 cruises from 34 offloads/hauls. The statistical area 620 sample set of 45 samples originated from 5 cruises (36 were from 1 cruise) from 9 hauls/offloads (Guyon et al. 2011). Samples were genotyped for 43 SNP markers represented in the ADF&G coastwide Chinook salmon baseline. The 2010 GOA samples were predominantly from Chinook salmon stocks from the U.S. Pacific Northwest, British Columbia, and coastal southeastern Alaska. For reasons discussed above, these results provide “presence” indicators of Chinook salmon stocks rather than relative abundance (Guyon et al. 2011).

Size and Weight of Chinook Salmon PSC in the GOA

Chinook salmon PSC in the GOA groundfish fisheries in the Central and Western GOA tend to be smaller fish, averaging just over 7.5 pounds based on observer samples taken during 2001 through 2010. Attachment 10, Figure 1 differentiates the average weight of GOA Chinook salmon PSC during the time periods of the GOA pollock seasons, in the Central and Western GOA. Because there is more observer coverage in the Central GOA groundfish fisheries, the number of samples for the Central GOA (2,299) is considerably higher than is available for the Western GOA (312). In the Central GOA, the average weight of Chinook salmon PSC varied from 6 to 9 pounds, depending on the time of year. The data indicate that Chinook salmon taken in the first half of the year are, on average, smaller than fish that are taken in the second half of the year. Attachment 10, Figure 2 shows the length frequency of Chinook salmon in GOA groundfish fisheries, for a longer time series (1987 through 2010), and compares the length frequency by quarter year. As above, the data indicate that fisheries occurring during the first half of the year may be catching smaller Chinook salmon than the fisheries operating in the second part of the year. An adult equivalency model has not been completed for Chinook salmon bycatch in the GOA.

Chinook Salmon Management Measures

Bering Sea Management Measures – Amendment 91

Amendment 91 is an innovative approach to managing Chinook salmon bycatch in the Bering Sea pollock fishery that combines a PSC limit on the amount of Chinook salmon that may be caught incidentally with an incentive plan agreement (IPA) and performance standard designed to minimize bycatch to the extent practicable in all years. Amendment 91 applies only to management of the Bering Sea pollock fishery and does not affect the management of pollock fisheries in the Aleutian Islands. Under Amendment 91, the pollock fleet is prevented from exceeding the 60,000 Chinook salmon PSC limit in every year. Each year, NMFS will allocate a portion of the 60,000 Chinook salmon PSC limit to the mothership sector, catcher/processor sector, inshore cooperatives, and Community Development Quota Program groups if an IPA is formed and approved by NMFS. The sector-level performance standard of 47,591 Chinook salmon is a tool to ensure that each sector does not fully harvest its Chinook salmon PSC allocation in most years. For a sector to continue to receive Chinook salmon PSC allocations under the 60,000 Chinook salmon PSC limit, that sector may not exceed its portion of 47,591 in any three years within seven consecutive years. If a sector fails this performance standard, it will permanently be allocated an annual fixed portion of the 47,591 Chinook salmon PSC limit. All vessels choosing to not participate in an IPA would fish under a portion of the —optbut” cap of 28,496 Chinook salmon PSC limit and would be ineligible to participate in management measures intended to offer flexibility to vessels harvesting pollock. For more information see http://www.fakr.noaa.gov/sustainablefisheries/bycatch/salmon/chinook/feis/eis_1209.pdf

With the IPA component and the performance standard, Amendment 91, as implemented by the final rule, will result in a greater reduction of Chinook salmon bycatch over time than the PSC limits. NMFS monitors all salmon bycatch by each vessel in the pollock fishery through a census, 100% observer coverage, and an expanded biological sampling program. Annual reports and the economic data collection program are designed to evaluate whether and how incentive plans influence a vessel’s operational decisions to avoid Chinook salmon bycatch. If information becomes available to indicate that Amendment 91 is not providing the expected Chinook salmon savings, NMFS will work with the Council to take additional actions to minimize Chinook salmon bycatch to the extent practicable. Amendment 91 applies only to management of the Bering Sea pollock fishery and does not affect the management of pollock fisheries in the Aleutian Islands.

Amendment 91 also removed from regulations the 29,000 Chinook salmon PSC limit in the Bering Sea, the Chinook Salmon Savings Areas in the Bering Sea, exemption from Chinook Salmon Savings Area closures for participants in the Voluntary Rolling Hotspot System Intercooperative Agreement (VHRS ICA), and Chinook salmon as a component of the VRHS ICA. The final rule did not change any regulations affecting the management of Chinook salmon in the Aleutian Islands or non-Chinook salmon in the BSAI. The Council is currently considering a separate action to modify the non-Chinook salmon management measures to minimize non-Chinook salmon bycatch in the Bering Sea. For more information see <http://www.alaskafisheries.noaa.gov/npfmc/bycatch-controls/BSChumBycatch.html>

Amendment 93 to the GOA FMP

In June 2011, the Council developed its preferred alternative for Amendment 93. If approved, Amendment 93 would establish Chinook salmon PSC limits in the Central and Western GOA reporting areas, which would close the directed pollock fishery in those areas, if reached. This action also would require retention of salmon in the Central and Western GOA pollock fisheries. Amendment 93 would increase observer coverage on vessels under 60 feet (18.3 m) length overall by January 2013, unless the restructured North Pacific Groundfish Observer Program is in place by this time. Observer restructuring is a randomized deployment of observers to yield unbiased estimates of total catch and catch composition. Under the restructuring program, the sampling percentage/coverage rates won't be in regulations but initially will be about 30% coverage, which will be subject to change year to year based on data needs. All vessels will have some level of observer coverage. An EA for this action is available at http://www.fakr.noaa.gov/analyses/observer/amd86_amd76_eairirfa0312.pdf.

Additional details on Chinook salmon PSC for the GOA groundfish fisheries are available in the EA/RIR/IRFA prepared for this action at <http://alaskafisheries.noaa.gov/sustainablefisheries/amds/93/amd93earirirfa0212.pdf>.

A notice of availability for the proposed amendment was published in the Federal Register on November 23, 2011 (76 FR 72384). The proposed rule was published on December 23, 2011, with the comment period ending on January 30, 2012. The Secretary of Commerce approved the FMP amendment on February 17, 2012. The proposed regulations specify the PSC limits and retention requirements will be effective in mid-2012.

This action applies only to the management of the pollock trawl directed fisheries in the Central and Western Reporting Areas of the GOA (Central GOA and Western GOA), which includes the federal fisheries in the waters of the EEZ (3 nm to 200 nm), and the waters of the State of Alaska (State) (0 to 3 nm) that are managed under a parallel fishery. Parallel fisheries in State waters are opened and closed by the State and are prosecuted under rules similar to those applying in the federal fisheries, with catch accrued against the federal catch limit (total allowable catch or TAC). The Council noted that the pollock fishery accounts for approximately 75% of Chinook salmon PSC in the GOA groundfish fisheries, based on the average Chinook salmon PSC levels from 2001 to 2010.

Under Amendment 93, the Chinook salmon PSC limits are based on the Council's recommended goal of limiting Chinook salmon bycatch in the Central and Western GOA pollock fisheries to no more than 25,000 salmon. This amount is below the 2007 Incidental Take Statement of 40,000 fish for Chinook salmon in the GOA groundfish fisheries. A component of Amendment 93 would require full retention of salmon species incidentally caught in the Central or Western GOA pollock fisheries, which is a necessary step to facilitate future stock of origin analyses. The Council also noted that further action will be taken to address Chinook salmon bycatch in the other fisheries of the GOA.

Reducing salmon incidental catch continues to be an important issue for the Council, Alaska Region, western Alaska communities, and the fishing industry. If you have any questions, please contact Mary Grady at mary.grady@noaa.gov or 907-586-7172.

Attachments

1. BSAI and GOA groundfish fisheries total Chinook salmon catch 2004–2011
2. Chinook salmon mortality in BSAI groundfish fisheries
3. Chinook salmon mortality in GOA groundfish fisheries
4. Recovery Estimation Technique
5. Observed Number and Mark Expansion of ESA-listed CWT Chinook salmon by ESU in BSAI trawl fisheries
6. Observed Number and Mark Expansion of CWT Chinook salmon recovered in the bycatch of the BSAI groundfish fishery by run year and state or province of origin, 1995–2010
7. Age structure of CWT Chinook salmon recovered in the bycatch of the BSAI and GOA groundfish fisheries, 1995–2010, excluding all stocks of Alaska origin
8. Comparison of yearly stock composition estimates (2008-2010) based on available genetic samples from the Bering Sea Chinook salmon bycatch
9. Observed Number and Mark Expansion of CWT Chinook salmon recovered in the bycatch of the GOA groundfish fisheries by run year and state or province of origin, 1995 through 2010
10. Average weight and length frequency of Chinook salmon prohibited species catch in the groundfish fisheries in the Western and Central GOA

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Literature Cited

- Guyon, J.R., Guthrie, C.M., and Nguyen, H. 2011. Genetic Stock Composition Analysis of Chinook Salmon Samples Collected from the Bycatch of the 2010 Gulf of Alaska Trawl Fishery. Report to the North Pacific Fisheries Management Council. (Juneau, AK, National Marine Fisheries Service, Alaska Fisheries Science Center, Auke Bay Laboratories), pp. 3.
- Guyon, J.R., Guthrie, C.M., and Nguyen, H. 2010a. Genetic Stock Composition Analysis of Chinook Salmon Bycatch Samples from the 2008 Bering Sea Pollock Fishery, Report to the North Pacific Fisheries Management Council. (Juneau, AK, National Marine Fisheries Service, Alaska Fisheries Science Center, Auke Bay Laboratories), pp. 32.
- Guyon, J.R., Guthrie, C.M., and Nguyen, H. 2010b. Genetic Stock Composition Analysis of Chinook Salmon Bycatch Samples from the 2007 “B” Season and 2009 Bering Sea Trawl Fisheries, Report to the North Pacific Fisheries Management Council. (Juneau, AK, National Marine Fisheries Service, Alaska Fisheries Science Center, Auke Bay Laboratories), pp. 10.
- Guthrie, C. M. III, H. T. Nguyen, and J. R. Guyon. 2012. Genetic stock composition analysis of chinook salmon bycatch samples from the 2010 Bering Sea trawl fisheries. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-232, 22 p.
- Johnson, K.J. 2004. Regional overview of coded wire tagging of anadromous salmon and steelhead in Northwest America: Regional Mark Processing Center, Pacific States Marine Fisheries Commission, Portland, Oregon.
- Myers, K.W., Walker, R.V., Armstrong, J.L., Davis, N.D., and Patton, W.S. 2004. Stock Origins of Chinook Salmon in Incidental Catches by Groundfish Fisheries in the Eastern Bering Sea, 1997–1999. North Pacific Anadromous Fish Commission Technical Report No 5, 74-75.
- Myers, K.W., and D.E. Rogers. 1988. Stock origins of chinook salmon in incidental catches by groundfish fisheries in the eastern Bering Sea. N. Am. J. Fish. Manage. 8: 161– 171.
- Nandor, G.F., Longwill, J.R., Webb, D.L. 2010. Overview of the coded wire tag program in the Greater Pacific Region of North America, in Wolf, K.S. and O'Neal, J.S., eds., PNAMP Special Publication: Tagging, Telemetry and Marking Measures for Monitoring Fish Populations—A compendium of new and recent science for use in informing technique and decision modalities: Pacific Northwest Aquatic Monitoring Partnership Special Publication 2010-002, chap. 2, p. 5–46.

- NMFS (National Marine Fisheries Service). 2012. Supplemental Biological Opinion on the Re-initiation of Endangered Species Act Section 7 Consultation on Incidental Catches of Chinook Salmon in the Gulf of Alaska Groundfish Fisheries. January 9, 2012. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Seattle, WA.
- NMFS. 2011. Secretarial Review Draft Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis for Chinook Salmon Prohibited Species Catch in the Gulf of Alaska Pollock Fishery. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Regional Office, Juneau, AK.
- NMFS. 2009a. Supplemental Biological Opinion Reinitiating Consultation on the January 11, 2007 Biological Opinion regarding Authorization of Bering Sea/Aleutian Islands (BSAI) Groundfish Fisheries. December 2, 2009. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Seattle, WA.
- NMFS. 2009b. Bering Sea Chinook salmon bycatch management–Volume 1, Final Environmental Impact Statement, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Regional Office, Juneau, AK.
- NMFS. 2007. Supplemental Biological Opinion Reinitiating Consultation on the November 30, 2000 Biological Opinion regarding Authorization of Bering Sea/Aleutian Islands Groundfish Fisheries. January 11, 2007. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Seattle, WA.
- Pella, J.J., and H.J. Geiger. 2009 Sampling considerations for estimating geographic origins of Chinook salmon bycatch in the Bering Sea pollock fishery. Alaska Department of Fish and Game, Special Publication No. 09-08, Anchorage.

Attachment 1

Table 1. BSAI groundfish fisheries total Chinook salmon catch compared against total groundfish catch: 2004–2011

| BSAI Chinook Count | | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|--------------------|-------------|--------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Trawl Gear | Pelagic | Pollock Target | 48,733 | 67,362 | 82,695 | 121,770 | 21,481 | 12,406 | 9,693 | 25,499 |
| | Non-Pelagic | Pacific Cod Target | 5,599 | 3,764 | 3,620 | 6,287 | 2,063 | 1,054 | 1,256 | 446 |
| | | Flatfish | 2,166 | 2,950 | 725 | 1,169 | 246 | 166 | 636 | 19 |
| | | Other Targets | 404 | 135 | 13 | 279 | 308 | 354 | 883 | 644 |
| Non-Trawl Gear | | All Targets | 57 | 56 | 31 | 74 | 10 | 11 | 12 | 62 |
| TOTAL | | | 56,960 | 74,266 | 87,084 | 129,579 | 24,107 | 13,990 | 12,479 | 26,670 |
| | | | | | | | | | | |
| BSAI Groundfish | | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| Trawl Gear | Pelagic | Pollock Target | 1,452,486 | 1,461,803 | 1,474,864 | 1,341,395 | 980,866 | 810,475 | 803,513 | 1,199,034 |
| | Non-Pelagic | Pacific Cod Target | 109,816 | 81,230 | 85,564 | 93,077 | 43,859 | 38,238 | 36,938 | 44,549 |
| | | Flatfish | 180,893 | 192,555 | 194,683 | 217,734 | 293,334 | 245,561 | 277,416 | 310,371 |
| | | Other Targets | 75,530 | 78,422 | 80,320 | 85,251 | 83,688 | 99,496 | 100,458 | 86,259 |
| Non-Trawl Gear | | All Targets | 160,425 | 167,103 | 146,677 | 122,831 | 144,323 | 143,798 | 136,863 | 178,038 |
| TOTAL | | | 1,979,151 | 1,981,113 | 1,982,108 | 1,860,289 | 1,546,070 | 1,337,568 | 1,355,187 | 1,818,251 |
| | | | | | | | | | | |
| BSAI Chinook Rate | | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| Trawl Gear | Pelagic | Pollock Target | 0.034 | 0.046 | 0.056 | 0.091 | 0.022 | 0.015 | 0.012 | 0.021 |
| | Non-Pelagic | Pacific Cod Target | 0.051 | 0.046 | 0.042 | 0.068 | 0.047 | 0.028 | 0.034 | 0.010 |
| | | Flatfish | 0.012 | 0.015 | 0.004 | 0.005 | 0.001 | 0.001 | 0.002 | 0.000 |
| | | Other Targets | 0.005 | 0.002 | 0.000 | 0.003 | 0.004 | 0.004 | 0.009 | 0.007 |
| Non-Trawl Gear | | All Targets | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |
| TOTAL | | | 0.029 | 0.037 | 0.044 | 0.070 | 0.016 | 0.010 | 0.009 | 0.015 |

*2011 data are preliminary

Source: NMFS Alaska Region Catch Accounting System: 2/29/2012

Table 2. GOA groundfish fisheries total Chinook salmon catch compared against total groundfish catch: 2004–2011

| Gulf of Alaska Chinook Count | | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|------------------------------|----------------|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|
| Trawl Gear | Pelagic | Pollock Target | 12,506 | 26,631 | 15,564 | 35,127 | 10,667 | 2,916 | 42,885 | 12,485 |
| | | Other Targets | - | 63 | 6 | 304 | 726 | 126 | 148 | 59 |
| | Non-Pelagic | Pollock Target | 908 | 41 | 882 | 624 | 436 | 111 | 435 | 1,351 |
| | | Pacific Cod Target | 2,800 | 2,853 | 1,909 | 2,654 | 2,804 | 3,784 | 7,750 | 4,485 |
| | | Flatfish | 885 | 387 | 263 | 1,732 | 1,514 | 1,181 | 1,448 | 1,042 |
| | | Other Targets | 646 | 1,296 | 380 | 50 | 30 | 278 | 1,893 | 1,347 |
| | Non-Trawl Gear | All Targets | 32 | - | - | 47 | - | - | - | - |
| TOTAL | | | 17,777 | 31,270 | 19,004 | 40,539 | 16,176 | 8,397 | 54,559 | 20,769 |
| | | | | | | | | | | |
| Gulf of Alaska Groundfish | | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| Trawl Gear | Pelagic | Pollock Target | 57,984 | 83,218 | 73,225 | 52,843 | 47,144 | 39,558 | 74,743 | 72,842 |
| | | Other Targets | 977 | 1,433 | 3,497 | 4,647 | 4,522 | 3,381 | 4,743 | 4,123 |
| | Non-Pelagic | Pollock Target | 16,785 | 12,443 | 11,403 | 13,606 | 22,857 | 8,736 | 17,230 | 13,941 |
| | | Pacific Cod Target | 20,449 | 29,622 | 41,313 | 42,573 | 47,036 | 52,052 | 42,619 | 44,809 |
| | | Flatfish | 26,094 | 21,884 | 22,148 | 20,337 | 20,467 | 22,579 | 24,203 | 20,463 |
| | | Other Targets | 7,195 | 897 | 3,259 | 1,351 | 3,556 | 1,921 | 2,994 | 9,246 |
| | Non-Trawl Gear | All Targets | 59,180 | 50,758 | 53,912 | 54,101 | 56,181 | 55,019 | 71,117 | 84,022 |
| TOTAL | | | 188,664 | 200,254 | 208,758 | 189,458 | 201,763 | 183,246 | 237,648 | 249,445 |
| | | | | | | | | | | |
| Gulf of Alaska Chinook Rate | | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| Trawl Gear | Pelagic | Pollock Target | - | 0.001 | 0.000 | 0.006 | 0.015 | 0.003 | 0.002 | 0.001 |
| | | Other Targets | 12.796 | 18.589 | 4.450 | 7.560 | 2.359 | 0.863 | 9.042 | 3.029 |
| | Non-Pelagic | Pollock Target | 0.054 | 0.003 | 0.077 | 0.046 | 0.019 | 0.013 | 0.025 | 0.097 |
| | | Pacific Cod Target | 0.137 | 0.096 | 0.046 | 0.062 | 0.060 | 0.073 | 0.182 | 0.100 |
| | | Flatfish | 0.034 | 0.018 | 0.012 | 0.085 | 0.074 | 0.052 | 0.060 | 0.051 |
| | | Other Targets | 0.090 | 1.445 | 0.117 | 0.037 | 0.008 | 0.145 | 0.632 | 0.146 |
| | Non-Trawl Gear | All Targets | 0.001 | - | - | 0.001 | - | - | - | - |
| TOTAL | | | 0.094 | 0.156 | 0.091 | 0.214 | 0.080 | 0.046 | 0.230 | 0.083 |

*2011 data are preliminary

Source: NMFS Alaska Region Catch Accounting System: 2/29/2012

Attachment 2

Table 1. Chinook salmon mortality in BSAI groundfish fisheries.

| Year | Annual with CDQ | Annual without CDQ | Annual CDQ only | A season With CDQ | B season Without CDQ | A season Without CDQ | B season CDQ only | A season Without CDQ | B season CDQ only |
|------|--------------------|-----------------------|--------------------|----------------------|-------------------------|-------------------------|----------------------|-------------------------|----------------------|
| 1991 | na | 48,880 | na | na | na | 46,392 | 2,488 | na | na |
| 1992 | 41,955 | na | na | 31,419 | 10,536 | na | na | na | na |
| 1993 | 46,014 | na | na | 24,688 | 21,326 | na | na | na | na |
| 1994 | 43,821 | 40,835 | 3,186 | 38,921 | 4,900 | 36,699 | 3,936 | 2,223 | 963 |
| 1995 | 23,436 | 21,430 | 2,006 | 18,939 | 4,497 | 18,284 | 3,146 | 655 | 1,351 |
| 1996 | 63,205 | 60,802 | 2,402 | 43,316 | 19,888 | 42,028 | 18,774 | 1,289 | 1,114 |
| 1997 | 50,530 | 48,050 | 2,481 | 16,401 | 34,129 | 14,905 | 33,144 | 1,496 | 985 |
| 1998 | 55,431 | 50,313 | 5,118 | 18,930 | 36,501 | 17,991 | 32,322 | 939 | 4,179 |
| 1999 | 14,599 | 12,937 | 1,662 | 8,794 | 5,805 | 8,205 | 4,732 | 589 | 1,073 |
| 2000 | 8,223 | 7,474 | 749 | 6,568 | 1,655 | 6,138 | 1,336 | 430 | 319 |
| 2001 | 40,547 | 37,986 | 2,561 | 24,871 | 15,676 | 23,093 | 14,893 | 1,778 | 783 |
| 2002 | 39,684 | 37,581 | 2,103 | 26,277 | 13,407 | 24,859 | 12,722 | 1,418 | 685 |
| 2003 | 53,571 | 50,858 | 2,713 | 40,044 | 13,527 | 38,249 | 12,609 | 1,795 | 918 |
| 2004 | 59,967 | 56,960 | 3,007 | 30,717 | 29,250 | 29,588 | 27,372 | 1,129 | 1,878 |
| 2005 | 74,267 | 72,225 | 2,042 | 33,636 | 40,631 | 32,334 | 39,891 | 1,302 | 740 |
| 2006 | 87,084 | 85,290 | 1,794 | 62,582 | 24,502 | 60,974 | 24,316 | 1,608 | 186 |
| 2007 | 129,567 | 123,914 | 5,653 | 77,108 | 52,459 | 74,004 | 49,910 | 3,104 | 2,549 |
| 2008 | 24,108 | 23,390 | 718 | 18,999 | 5,109 | 18,394 | 4,996 | 605 | 113 |
| 2009 | 13,991 | 13,488 | 503 | 11,075 | 2,916 | 10,661 | 2,827 | 414 | 89 |
| 2010 | 12,480 | 12,145 | 335 | 9,469 | 3,011 | 9,134 | 3,011 | 335 | 0 |
| 2011 | 26,872 | 25,908 | 764 | 7,651 | 19,021 | 7,221 | 18,687 | 430 | 334 |
| 2012 | 5,620 | 5,340 | 280 | 5,620 | 0 | 5,340 | 0 | 280 | 0 |

Table 2. Chinook salmon mortality in BSAI pollock directed fisheries.

| Year | Annual with CDQ | Annual without CDQ | Annual CDQ only | A season With CDQ | B season Without CDQ | A season Without CDQ | B season CDQ only | A season Without CDQ | B season CDQ only |
|------|--------------------|-----------------------|--------------------|----------------------|-------------------------|-------------------------|----------------------|-------------------------|----------------------|
| 1991 | na | 40,906 | na | na | na | 38,791 | 2,114 | na | na |
| 1992 | 35,950 | na | na | 25,691 | 10,259 | na | na | na | na |
| 1993 | 38,516 | na | na | 17,264 | 21,252 | na | na | na | na |
| 1994 | 33,136 | 30,593 | 2,543 | 28,451 | 4,686 | 26,871 | 3,722 | 1,580 | 963 |
| 1995 | 14,984 | 12,978 | 2,006 | 10,579 | 4,405 | 9,924 | 3,053 | 655 | 1,351 |
| 1996 | 55,623 | 53,220 | 2,402 | 36,068 | 19,554 | 34,780 | 18,441 | 1,289 | 1,114 |
| 1997 | 44,909 | 42,437 | 2,472 | 10,935 | 33,973 | 9,449 | 32,989 | 1,487 | 985 |
| 1998 | 51,322 | 46,205 | 5,118 | 15,193 | 36,130 | 14,253 | 31,951 | 939 | 4,179 |
| 1999 | 11,978 | 10,381 | 1,597 | 6,352 | 5,627 | 5,768 | 4,614 | 584 | 1,013 |
| 2000 | 4,961 | 4,242 | 719 | 3,422 | 1,539 | 2,992 | 1,250 | 430 | 289 |
| 2001 | 33,444 | 30,937 | 2,507 | 18,484 | 14,961 | 16,711 | 14,227 | 1,773 | 734 |
| 2002 | 34,495 | 32,402 | 2,093 | 21,794 | 12,701 | 20,378 | 12,024 | 1,416 | 677 |
| 2003 | 45,586 | 43,021 | 2,565 | 32,609 | 12,977 | 30,916 | 12,105 | 1,693 | 872 |
| 2004 | 51,696 | 48,733 | 2,963 | 23,093 | 28,603 | 21,964 | 26,769 | 1,129 | 1,834 |
| 2005 | 67,361 | 65,445 | 1,916 | 27,331 | 40,030 | 26,032 | 39,413 | 1,299 | 617 |
| 2006 | 82,895 | 80,954 | 1,741 | 58,391 | 24,305 | 56,806 | 24,149 | 1,585 | 156 |
| 2007 | 121,757 | 116,128 | 5,629 | 69,408 | 52,349 | 66,307 | 49,821 | 3,101 | 2,528 |
| 2008 | 21,482 | 20,841 | 641 | 16,640 | 4,842 | 16,035 | 4,806 | 605 | 36 |
| 2009 | 12,407 | 11,960 | 447 | 9,688 | 2,719 | 9,330 | 2,630 | 358 | 89 |
| 2010 | 9,694 | 9,359 | 335 | 7,626 | 2,068 | 7,291 | 2,068 | 335 | 0 |
| 2011 | 25,500 | 24,736 | 764 | 7,137 | 18,363 | 6,707 | 18,029 | 430 | 334 |
| 2012 | 4,898 | 4,618 | 280 | 4,898 | 0 | 4,618 | 0 | 280 | 0 |

Notes: Updated 3/1/12

Starting in 2011, the sampling method for salmon in BSAI pollock directed fisheries changed to census counts

Non-CDQ data for 1991-2002 from bsahalx.dbf

Non-CDQ data for 2003-2011 from akfish_v_gg_pscnq_estimate

CDQ data for 1992-1997 from bsahalx.dbf

CDQ data for 1998 from boatrate.dbf

CDQ data for 1999-2007 from akfish_v_cdq_catch_report_total_catch

CDQ data for 2008-2011 from akfish_v_gg_pscnq_estimate_cdq

A season - January 1 to June 10

B season - June 11 to December 31

Source: NMFS Alaska Region Catch Accounting System: 3/1/2012

Attachment 3

Table 1. Chinook Salmon Mortality in Gulf of Alaska Groundfish Fisheries

| Year | Annual Total | GOA Pollock Fisheries | | | | Other Fisheries | |
|------|--------------|-----------------------|----------------|---------------|----------------|-----------------|--------|
| | | First Quarter | Second Quarter | Third Quarter | Fourth Quarter | Annual | Annual |
| 1991 | 38,894 | 3,239 | 538 | 1,799 | 2,862 | 8,439 | 30,455 |
| 1992 | 16,787 | 2,289 | 2,663 | 1,457 | 1,801 | 8,210 | 8,578 |
| 1993 | 19,260 | 6,499 | 157 | 2,730 | 4,192 | 13,578 | 5,682 |
| 1994 | 13,615 | 3,685 | 88 | 1,973 | 1,474 | 7,219 | 6,396 |
| 1995 | 14,652 | 1,408 | 32 | 2,342 | 1,136 | 4,917 | 9,735 |
| 1996 | 15,761 | 4,802 | 57 | 6,421 | 100 | 11,380 | 4,381 |
| 1997 | 15,230 | 4,622 | 48 | 4,742 | 30 | 9,443 | 5,787 |
| 1998 | 16,984 | 1,672 | 1 | 8,550 | 4,005 | 14,228 | 2,755 |
| 1999 | 30,600 | 10,408 | 35 | 5,981 | 10,003 | 26,428 | 4,173 |
| 2000 | 26,729 | 4,298 | 2,313 | 9,744 | 2,058 | 18,413 | 8,317 |
| 2001 | 15,104 | 4,204 | 3,107 | 754 | 1,466 | 9,531 | 5,573 |
| 2002 | 12,920 | 1,505 | 640 | 553 | 2,463 | 5,161 | 7,758 |
| 2003 | 15,396 | 765 | 389 | 948 | 2,298 | 4,400 | 10,995 |
| 2004 | 17,777 | 3,632 | 2,176 | 2,207 | 5,137 | 13,152 | 4,625 |
| 2005 | 31,270 | 11,100 | 5,123 | 1,076 | 10,629 | 27,927 | 3,343 |
| 2006 | 19,004 | 2,918 | 4,292 | 4,859 | 3,875 | 15,944 | 3,060 |
| 2007 | 40,539 | 1,487 | 28,424 | 1,309 | 3,958 | 35,177 | 5,362 |
| 2008 | 16,176 | 578 | 7,682 | 387 | 2,048 | 10,696 | 5,480 |
| 2009 | 8,397 | 704 | 1,423 | 656 | 412 | 3,195 | 5,202 |
| 2010 | 54,559 | 4,963 | 2,045 | 4,841 | 32,929 | 44,779 | 9,780 |
| 2011 | 20,769 | 1,716 | 1,260 | 1,508 | 9,348 | 13,832 | 6,937 |
| 2012 | 2,972 | 2,901 | - | - | - | 2,901 | 71 |

1991 - 2002: Blend data. Week end date was used to determine quarters. Week end dates do not always match quarter dates.

2003 - Current: Catch Accounting System.

Due to changes in regulatory pollock season dates from 1991 to 2001 and to match current pollock season dates, data were grouped by quarter.

First Quarter Jan 1 - Feb 28

Second Quarter Mar 1 - May 31

Third Quarter Jun 1 - Sep 30

Fourth Quarter Oct 1 - Dec 31

Source: NMFS Alaska Region Catch Accounting System: 3/1/2012

Attachment 4

Recovery Estimation Technique

The total estimated contributions of ESA-listed salmon ESUs caught in the GOA and BSAI fisheries for each year can be estimated in a two-step process (Nandor et al. 2010). This procedure does not account for groups of fish from an ESU, mainly wild fish, that are not adequately represented by CWTs. The first step is to calculate a sampling expansion factor (a) for each fishery in each year (Johnson 2004):

$$a = (\text{total catch of each species by fishery by year}) / (\text{sampling catch of each species by fishery by year}).$$

However, a sampling expansion factor can only be calculated from CWTs recovered from *inside* a sample where the number of sampled fish is known. CWT recoveries from *outside* the sample (–select” recoveries where the total number of fish examined is unknown) cannot be used to calculate a sampling expansion factor.

For the sampled catch, the estimated total recoveries of tags for each release group from each ESU by fishery and year are calculated:

$$R_{Ti} = aR_{Oi};$$

R_{Ti} = estimated total recoveries of tags for the i^{th} release group;
 R_{Oi} = observed number of tags for the i^{th} release group;
 a = sampling expansion factor for each fishery in each year.

The second step is to account for the fraction of each release group of interest that was tagged (Johnson 2004):

$$C_T = \sum_{i=1}^n b_i R_{Ti};$$

C_T = the total estimated contribution for a given ESU;
 b_i = a marking expansion factor for the i^{th} release group = (total fish released)/
(total fish marked) for the i^{th} release group;
 R_{Ti} = estimated total recoveries of tags for the i^{th} release group.

These are the simplest forms of recovery expansion equations (Nandor et al. 2010).

For recoveries in high seas research cruises, because the total catch is usually sampled for tags, the sampling expansion factor (a) typically = 1.

Attachment 5

Table 1. Observed Number and Mark Expansion of ESA-listed CWT salmon by ESU captured in the bycatch of the GOA and BSAI trawl fisheries, summed over pre-listing and post-listing periods, 1984–2010.

| Listing Status | ESU Name | GOA | | BSAI | |
|----------------|-------------------------------------|-----------------|----------------|-----------------|----------------|
| | | Observed Number | Mark Expansion | Observed Number | Mark Expansion |
| Pre-listing | Lower Columbia River Chinook | 12 | 82.1 | 0 | 0.0 |
| | Upper Willamette River Chinook | 40 | 129.7 | 2 | 2.0 |
| Post-listing | | | | | |
| | Lower Columbia River Chinook | 11 | 29.8 | 9 | 9.1 |
| | Upper Willamette River Chinook | 57 | 145.4 | 10 | 59.9 |
| | Upper Columbia River spring Chinook | 1 | 1.0 | 0 | 0.0 |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

Attachment 5 continued

Table 2. Observed Number and Mark Expansion of ESA-listed CWT salmon bycatch of the GOA and BSAI groundfish fisheries by ESU by year.

| A. Lower Columbia River Chinook ESU | | | GOA | | BSAI | |
|-------------------------------------|------------------------------|----------|-----------------|----------------|-----------------|----------------|
| Listing Status | ESU Name | Run Year | Observed Number | Mark Expansion | Observed Number | Mark Expansion |
| Pre-listing | Lower Columbia River Chinook | 1984 | 5 | 14.1 | 0 | 0.0 |
| | | 1985 | 1 | 1.0 | 0 | 0.0 |
| | | 1986 | 0 | 0.0 | 0 | 0.0 |
| | | 1987 | 1 | 1.3 | 0 | 0.0 |
| | | 1988 | 0 | 0.0 | 0 | 0.0 |
| | | 1989 | 0 | 0.0 | 0 | 0.0 |
| | | 1990 | 1 | 1.0 | 0 | 0.0 |
| | | 1991 | 0 | 0.0 | 0 | 0.0 |
| | | 1992 | 1 | 1.6 | 0 | 0.0 |
| | | 1993 | 1 | 60.3 | 0 | 0.0 |
| | | 1994 | 2 | 2.8 | 0 | 0.0 |
| | | 1995 | 0 | 0.0 | 0 | 0.0 |
| | | 1996 | 0 | 0.0 | 0 | 0.0 |
| Post-listing | Lower Columbia River Chinook | 1997 | 0 | 0.0 | 0 | 0.0 |
| | | 1998 | 2 | 18.8 | 0 | 0.0 |
| | | 1999 | 4 | 5.9 | 0 | 0.0 |
| | | 2000 | 2 | 2.0 | 0 | 0.0 |
| | | 2001 | 2 | 2.0 | 1 | 1.0 |
| | | 2002 | 0 | 0.0 | 1 | 1.0 |
| | | 2003 | 0 | 0.0 | 0 | 0.0 |
| | | 2004 | 1 | 1.1 | 3 | 3.0 |
| | | 2005 | 0 | 0.0 | 3 | 3.1 |
| | | 2006 | 0 | 0.0 | 1 | 1.0 |
| | | 2007 | 0 | 0.0 | 0 | 0.0 |
| | | 2008 | 0 | 0.0 | 0 | 0.0 |
| | | 2009 | 0 | 0.0 | 0 | 0.0 |
| | | 2010 | 0 | 0.0 | 0 | 0.0 |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

Attachment 5, Table 2 continued

Table 2. Observed Number and Mark Expansion of ESA-listed CWT salmon bycatch of the GOA and BSAI groundfish fisheries by ESU by year.

| B. Upper Willamette River Chinook ESU | | | GOA | | BSAI | |
|--|--------------------------------|-----------------|------------------------|-----------------------|------------------------|-----------------------|
| Listing Status | ESU Name | Run Year | Observed Number | Mark Expansion | Observed Number | Mark Expansion |
| Pre-listing | Upper Willamette River Chinook | 1984 | 11 | 16.8 | 1 | 1.0 |
| | | 1985 | 0 | 0.0 | 0 | 0.0 |
| | | 1986 | 0 | 0.0 | 0 | 0.0 |
| | | 1987 | 0 | 0.0 | 0 | 0.0 |
| | | 1988 | 0 | 0.0 | 0 | 0.0 |
| | | 1989 | 0 | 0.0 | 0 | 0.0 |
| | | 1990 | 4 | 4.0 | 0 | 0.0 |
| | | 1991 | 1 | 13.3 | 0 | 0.0 |
| | | 1992 | 4 | 28.5 | 0 | 0.0 |
| | | 1993 | 14 | 52.1 | 0 | 0.0 |
| | | 1994 | 3 | 8.8 | 0 | 0.0 |
| | | 1995 | 2 | 4.9 | 0 | 0.0 |
| | | 1996 | 1 | 1.3 | 1 | 1.0 |
| Post-listing | Upper Willamette River Chinook | 1997 | 1 | 7.5 | 0 | 0.0 |
| | | 1998 | 4 | 30.7 | 0 | 0.0 |
| | | 1999 | 20 | 49.3 | 1 | 1.0 |
| | | 2000 | 16 | 16.6 | 1 | 1.0 |
| | | 2001 | 7 | 7.1 | 1 | 1.0 |
| | | 2002 | 1 | 1.0 | 2 | 12.4 |
| | | 2003 | 1 | 5.3 | 0 | 0.0 |
| | | 2004 | 1 | 5.8 | 1 | 7.9 |
| | | 2005 | 0 | 0.0 | 2 | 10.9 |
| | | 2006 | 1 | 1.0 | 0 | 0.0 |
| | | 2007 | 0 | 0.0 | 0 | 0.0 |
| | | 2008 | 1 | 6.5 | 0 | 0.0 |
| | | 2009 | 1 | 1.8 | 1 | 10.2 |
| | | 2010 | 3 | 12.8 | 1 | 15.5 |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

Attachment 5, Table 2 continued

Table 2. Observed Number and Mark Expansion of ESA-listed CWT salmon bycatch of the GOA and BSAI groundfish fisheries by ESU by year.

| C. Upper Columbia River spring Chinook ESU | | | GOA | | BSAI | |
|---|-------------------------------------|-----------------|------------------------|-----------------------|------------------------|-----------------------|
| Listing Status | ESU Name | Run Year | Observed Number | Mark Expansion | Observed Number | Mark Expansion |
| Pre-listing | Upper Columbia River spring Chinook | 1984 | 0 | 0.0 | 0 | 0.0 |
| | | 1985 | 0 | 0.0 | 0 | 0.0 |
| | | 1986 | 0 | 0.0 | 0 | 0.0 |
| | | 1987 | 0 | 0.0 | 0 | 0.0 |
| | | 1988 | 0 | 0.0 | 0 | 0.0 |
| | | 1989 | 0 | 0.0 | 0 | 0.0 |
| | | 1990 | 0 | 0.0 | 0 | 0.0 |
| | | 1991 | 0 | 0.0 | 0 | 0.0 |
| | | 1992 | 0 | 0.0 | 0 | 0.0 |
| | | 1993 | 0 | 0.0 | 0 | 0.0 |
| | | 1994 | 0 | 0.0 | 0 | 0.0 |
| | | 1995 | 0 | 0.0 | 0 | 0.0 |
| | | 1996 | 0 | 0.0 | 0 | 0.0 |
| Post-listing | Upper Columbia River spring Chinook | 1997 | 0 | 0.0 | 0 | 0.0 |
| | | 1998 | 1 | 1.0 | 0 | 0.0 |
| | | 1999 | 0 | 0.0 | 0 | 0.0 |
| | | 2000 | 0 | 0.0 | 0 | 0.0 |
| | | 2001 | 0 | 0.0 | 0 | 0.0 |
| | | 2002 | 0 | 0.0 | 0 | 0.0 |
| | | 2003 | 0 | 0.0 | 0 | 0.0 |
| | | 2004 | 0 | 0.0 | 0 | 0.0 |
| | | 2005 | 0 | 0.0 | 0 | 0.0 |
| | | 2006 | 0 | 0.0 | 0 | 0.0 |
| | | 2007 | 0 | 0.0 | 0 | 0.0 |
| | | 2008 | 0 | 0.0 | 0 | 0.0 |
| | | 2009 | 0 | 0.0 | 0 | 0.0 |
| | | 2010 | 0 | 0.0 | 0 | 0.0 |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

Attachment 5 continued

Table 3. Observed Number and Mark Expansion of ESA-listed CWT salmon captured in GOA research surveys, post-listing, 1991-2010. No ESUs were ever captured in GOA research surveys pre-listing, and no ESA-listed CWT salmon have ever been recovered in BSAI research surveys.

| Listing Status | ESU Name | GOA | |
|----------------|-------------------------------------|-----------------|----------------|
| | | Observed Number | Mark expansion |
| Post-listing | Lower Columbia River Chinook | 3 | 6.5 |
| | Puget Sound Chinook | 1 | 1.0 |
| | Snake River spring/summer Chinook | 5 | 9.2 |
| | Upper Columbia River spring Chinook | 4 | 4.1 |
| | Upper Willamette River Chinook | 11 | 72.0 |
| | Snake River Basin steelhead | 1 | 1.0 |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

Table 4. Observed Number and Mark Expansion of ESA-listed CWT salmon captured in GOA research surveys by ESU, by run year, post-listing, 1991-2010. No ESUs were ever captured in GOA research surveys pre-listing, and no ESA-listed CWT salmon have ever been recovered in BSAI research surveys.

| A. Lower Columbia River Chinook ESU | | | GOA | |
|-------------------------------------|------------------------------|----------|-----------------|----------------|
| Listing Status | ESU Name | Run Year | Observed Number | Mark expansion |
| Post-listing | Lower Columbia River Chinook | 1997 | 0 | 0.0 |
| | | 1998 | 1 | 4.5 |
| | | 1999 | 1 | 1.0 |
| | | 2000 | 0 | 0.0 |
| | | 2001 | 1 | 1.0 |
| | | 2002 | 0 | 0.0 |
| | | 2003 | 0 | 0.0 |
| | | 2004 | 0 | 0.0 |
| | | 2005 | 0 | 0.0 |
| | | 2006 | 0 | 0.0 |
| | | 2007 | 0 | 0.0 |
| | | 2008 | 0 | 0.0 |
| | | 2009 | 0 | 0.0 |
| | | 2010 | 0 | 0.0 |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

Attachment 5, Table 4 continued

Table 4. Observed Number and Mark Expansion of ESA-listed CWT salmon captured in GOA research surveys by ESU, by run year, post-listing, 1991-2010. No ESUs were ever captured in GOA research surveys pre-listing, and no ESA-listed CWT salmon have ever been recovered in BSAI research surveys.

| C. Snake River spring/summer Chinook ESU | | | GOA | |
|---|-----------------------------------|-----------------|------------------------|-----------------------|
| Listing Status | ESU Name | Run Year | Observed Number | Mark expansion |
| Post-listing | Snake River spring/summer Chinook | 1992 | 0 | 0.0 |
| | | 1993 | 0 | 0.0 |
| | | 1994 | 0 | 0.0 |
| | | 1995 | 0 | 0.0 |
| | | 1996 | 0 | 0.0 |
| | | 1997 | 0 | 0.0 |
| | | 1998 | 1 | 2.9 |
| | | 1999 | 0 | 0.0 |
| | | 2000 | 0 | 0.0 |
| | | 2001 | 0 | 0.0 |
| | | 2002 | 1 | 1.1 |
| | | 2003 | 3 | 5.3 |
| | | 2004 | 0 | 0.0 |
| | | 2005 | 0 | 0.0 |
| | | 2006 | 0 | 0.0 |
| | | 2007 | 0 | 0.0 |
| | | 2008 | 0 | 0.0 |
| | | 2009 | 0 | 0.0 |
| | | 2010 | 0 | 0.0 |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

| D. Upper Columbia River spring Chinook ESU | | | GOA | |
|---|-------------------------------------|-----------------|------------------------|-----------------------|
| Listing Status | ESU Name | Run Year | Observed Number | Mark expansion |
| Post-listing | Upper Columbia River spring Chinook | 1999 | 1 | 1.0 |
| | | 2000 | 2 | 2.1 |
| | | 2001 | 0 | 0.0 |
| | | 2002 | 0 | 0.0 |
| | | 2003 | 1 | 1.0 |
| | | 2004 | 0 | 0.0 |
| | | 2005 | 0 | 0.0 |
| | | 2006 | 0 | 0.0 |
| | | 2007 | 0 | 0.0 |
| | | 2008 | 0 | 0.0 |
| | | 2009 | 0 | 0.0 |
| | | 2010* | 0 | 0.0 |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

Attachment 5, Table 4 continued

Table 4. Observed Number and Mark Expansion of ESA-listed CWT salmon captured in GOA research surveys by ESU, by run year, post-listing, 1991-2010. No ESUs were ever captured in GOA research surveys pre-listing, and no ESA-listed CWT salmon have ever been recovered in BSAI research surveys.

| E. Upper Willamette River Chinook ESU | | | GOA | |
|---------------------------------------|--------------------------------|----------|-----------------|----------------|
| Listing Status | ESU Name | Run Year | Observed Number | Mark expansion |
| Post-listing | Upper Willamette River Chinook | 1998 | 2 | 2.3 |
| | | 1999 | 0 | 0.0 |
| | | 2000 | 0 | 0.0 |
| | | 2001 | 5 | 33.6 |
| | | 2002 | 3 | 26.6 |
| | | 2003 | 1 | 9.5 |
| | | 2004 | 0 | 0.0 |
| | | 2005 | 0 | 0.0 |
| | | 2006 | 0 | 0.0 |
| | | 2007 | 0 | 0.0 |
| | | 2008 | 0 | 0.0 |
| | | 2009 | 0 | 0.0 |
| | | 2010 | 0 | 0.0 |

| F. Snake River Basin steelhead ESU | | | GOA | |
|------------------------------------|-----------------------------|----------|-----------------|----------------|
| Listing Status | ESU Name | Run Year | Observed Number | Mark expansion |
| Post-listing | Snake River Basin Steelhead | 1991 | 0 | 0.0 |
| | | 1992 | 0 | 0.0 |
| | | 1993 | 0 | 0.0 |
| | | 1994 | 0 | 0.0 |
| | | 1995 | 0 | 0.0 |
| | | 1996 | 0 | 0.0 |
| | | 1997 | 0 | 0.0 |
| | | 1998 | 1 | 1.0 |
| | | 1999 | 0 | 0.0 |
| | | 2000 | 0 | 0.0 |
| | | 2001 | 0 | 0.0 |
| | | 2002 | 0 | 0.0 |
| | | 2003 | 0 | 0.0 |
| | | 2004 | 0 | 0.0 |
| | | 2005 | 0 | 0.0 |
| | | 2006 | 0 | 0.0 |
| | | 2007 | 0 | 0.0 |
| | | 2008 | 0 | 0.0 |
| | | 2009 | 0 | 0.0 |
| | | 2010 | 0 | 0.0 |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

Attachment 6

Table 1. Observed Number and Mark Expansion of CWT Chinook salmon recovered in the bycatch of the BSAI groundfish fisheries by run year and state or province of origin, 1995 through 2010.

| | Alaska | | British Columbia | | California | | Oregon | | Washington | | Yukon Territory | | TOTAL | |
|--------------------------|-----------------|----------------|------------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|
| run_year | Observed Number | Mark Expansion | Observed Number | Mark Expansion | Observed Number | Mark Expansion | Observed Number | Mark Expansion | Observed Number | Mark Expansion | Observed Number | Mark Expansion | Observed Number | Mark Expansion |
| 1995 | 0 | 0.0 | 1 | 2.3 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 5.7 | 2 | 8.0 |
| 1996 | 2 | 5.7 | 20 | 261.8 | 0 | 0.0 | 5 | 6.7 | 0 | 0.0 | 0 | 0.0 | 27 | 274.2 |
| 1997 | 39 | 150.5 | 27 | 349.0 | 0 | 0.0 | 8 | 14.7 | 3 | 23.0 | 1 | 1.0 | 78 | 538.3 |
| 1998 | 26 | 82.0 | 28 | 220.3 | 2 | 16.4 | 1 | 1.0 | 2 | 11.1 | 2 | 5.2 | 61 | 335.9 |
| 1999 | 2 | 2.9 | 5 | 81.4 | 0 | 0.0 | 1 | 1.0 | 0 | 0.0 | 1 | 1.0 | 9 | 86.4 |
| 2000 | 2 | 190.3 | 1 | 1.7 | 0 | 0.0 | 1 | 1.0 | 0 | 0.0 | 1 | 1.0 | 5 | 194.1 |
| 2001 | 14 | 16.9 | 6 | 31.0 | 0 | 0.0 | 2 | 2.0 | 1 | 1.7 | 1 | 1.0 | 24 | 52.6 |
| 2002 | 27 | 32.7 | 18 | 284.8 | 0 | 0.0 | 21 | 42.8 | 12 | 31.2 | 1 | 1.0 | 79 | 392.5 |
| 2003 | 6 | 24.6 | 13 | 82.3 | 0 | 0.0 | 4 | 4.1 | 3 | 18.3 | 2 | 2.0 | 28 | 131.3 |
| 2004 | 16 | 37.2 | 21 | 122.3 | 0 | 0.0 | 11 | 115.8 | 6 | 7.7 | 2 | 2.0 | 56 | 285.1 |
| 2005 | 12 | 15.9 | 17 | 114.6 | 0 | 0.0 | 8 | 22.8 | 7 | 7.9 | 1 | 1.0 | 45 | 162.2 |
| 2006 | 16 | 38.8 | 8 | 93.7 | 0 | 0.0 | 6 | 12.9 | 5 | 5.2 | 1 | 1.0 | 36 | 151.5 |
| 2007 | 5 | 19.4 | 1 | 12.2 | 0 | 0.0 | 2 | 2.0 | 1 | 1.5 | 0 | 0.0 | 9 | 35.2 |
| 2008 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| 2009 | 0 | 0.0 | 3 | 4.8 | 0 | 0.0 | 1 | 10.2 | 0 | 0.0 | 0 | 0.0 | 4 | 15.0 |
| 2010 | 0 | 0.0 | 2 | 2.9 | 0 | 0.0 | 4 | 37.9 | 7 | 9.8 | 0 | 0.0 | 13 | 50.6 |
| TOTAL | 167 | 617.0 | 171 | 1665.2 | 2 | 16.4 | 75 | 274.8 | 47 | 117.6 | 14 | 21.9 | 476 | 2713.0 |
| mean | 10.4 | 38.6 | 10.7 | 104.1 | 0.1 | 1.0 | 4.7 | 17.2 | 2.9 | 7.3 | 0.9 | 1.4 | 29.8 | 169.6 |
| average % of total | 35% | 23% | 36% | 61% | 0% | 1% | 16% | 10% | 10% | 4% | 3% | 1% | 100% | 100% |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

Attachment 6, continued

Table 2. Observed Number of CWT Chinook salmon recovered in the prohibited species catch of the BSAI groundfish fisheries by state or province of origin, 1995 through 2010.

| Origin | Rearing Type | | | TOTAL |
|--------------------|--------------|----------|-----------|------------|
| | Hatchery | Mixed | Wild | |
| Alaska | 157 | 0 | 10 | 167 |
| British Columbia | 171 | 0 | 0 | 171 |
| California | 2 | 0 | 0 | 2 |
| Oregon | 75 | 0 | 0 | 75 |
| Washington | 45 | 1 | 1 | 47 |
| Yukon Territory | 14 | 0 | 0 | 14 |
| TOTAL | 464 | 1 | 11 | 476 |
| average % of total | 97% | 0% | 2% | 100% |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

Table 3. Percent run-type of CWT Chinook salmon recovered in the prohibited species catch of the BSAI groundfish fisheries by state or province of origin, 1995 through 2010.

| Origin | Run-type | | | | | | TOTAL |
|------------------|----------|--------|------|--------|-----------|-----------------------------|-------|
| | Spring | Summer | Fall | Winter | Late Fall | Late Fall Upriver Bright | |
| Alaska | 99% | 1% | 0% | 0% | 0% | 0% | 100% |
| British Columbia | 20% | 37% | 43% | 0% | 0% | 0% | 100% |
| California | 0% | 0% | 100% | 0% | 0% | 0% | 100% |
| Oregon | 27% | 0% | 69% | 3% | 0% | 1% | 100% |
| Washington | 17% | 4% | 77% | 0% | 0% | 2% | 100% |
| Yukon Territory | 50% | 29% | 14% | 0% | 7% | 0% | 100% |
| Mean | 40% | 18% | 41% | 1% | 0% | 1% | 100% |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

Attachment 7

Table 1. Age structure of CWT Chinook salmon recovered in the bycatch of the BSAI and GOA groundfish fisheries, 1995–2010, excluding all stocks of Alaska origin.

| Fishery | Age-2 | Age-3 | Age-4 | Age-5 | Age-6 | TOTAL |
|---------|-------|-------|-------|-------|-------|-------|
| BSAI | 10% | 49% | 34% | 7% | 1% | 100% |
| GOA | 8% | 57% | 30% | 5% | 0% | 100% |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

Attachment 8

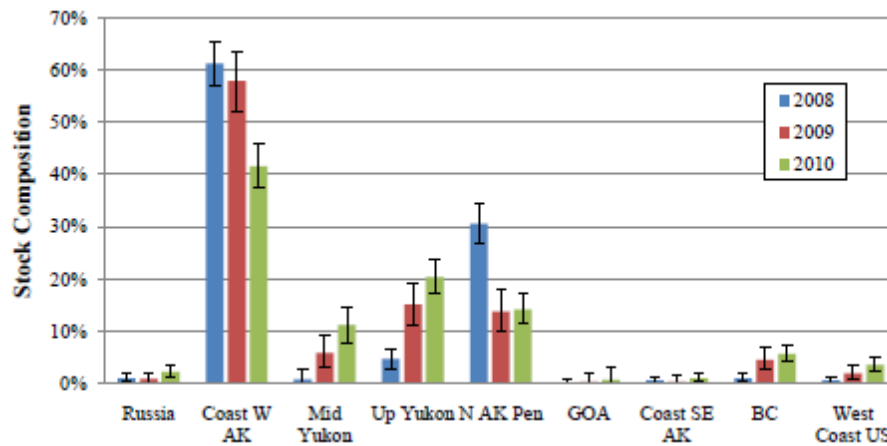


Figure 1. Comparison of yearly stock composition estimates (2008–2010) based on available genetic samples from the Bering Sea Chinook salmon bycatch. The same genetic baseline and general regional groupings were used in all analyses. GOA group consists of combined values for NW GOA, Copper, and NE GOA. BAYES 95% credible intervals are plotted for yearly estimates.

Source: Guthrie et al. 2012

Attachment 9

Table 1. Observed Number and Mark Expansion of CWT Chinook salmon recovered in the bycatch of the GOA groundfish fisheries by run year and state or province of origin, 1995 through 2010.

| | Alaska | | British Columbia | | Idaho | | Oregon | | Washington | | TOTAL | |
|--------------------|-----------------|----------------|------------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|
| run year | Observed Number | Mark Expansion | Observed Number | Mark Expansion | Observed Number | Mark Expansion | Observed Number | Mark Expansion | Observed Number | Mark Expansion | Observed Number | Mark Expansion |
| 1995 | 4 | 11.9 | 17 | 177.3 | 0 | 0.0 | 4 | 7.0 | 2 | 2.0 | 27 | 198.2 |
| 1996 | 14 | 92.4 | 10 | 152.9 | 0 | 0.0 | 3 | 3.5 | 2 | 2.0 | 29 | 250.7 |
| 1997 | 2 | 17.4 | 12 | 82.9 | 0 | 0.0 | 4 | 10.6 | 1 | 3.7 | 19 | 114.6 |
| 1998 | 30 | 157.8 | 50 | 585.3 | 1 | 1.0 | 10 | 55.2 | 9 | 19.0 | 100 | 818.3 |
| 1999 | 45 | 244.3 | 51 | 295.9 | 0 | 0.0 | 32 | 76.7 | 17 | 127.9 | 145 | 744.7 |
| 2000 | 24 | 224.9 | 18 | 38.1 | 0 | 0.0 | 32 | 50.0 | 10 | 16.2 | 84 | 329.1 |
| 2001 | 10 | 100.2 | 6 | 74.8 | 0 | 0.0 | 12 | 16.5 | 4 | 4.0 | 32 | 195.6 |
| 2002 | 10 | 47.2 | 5 | 113.0 | 0 | 0.0 | 4 | 4.3 | 3 | 3.7 | 22 | 168.2 |
| 2003 | 2 | 22.4 | 2 | 28.6 | 0 | 0.0 | 4 | 8.3 | 1 | 1.0 | 9 | 60.3 |
| 2004 | 3 | 30.5 | 4 | 22.0 | 0 | 0.0 | 5 | 16.9 | 1 | 1.1 | 13 | 70.6 |
| 2005 | 3 | 33.6 | 4 | 86.5 | 0 | 0.0 | 2 | 3.1 | 2 | 2.2 | 11 | 125.4 |
| 2006 | 10 | 58.3 | 7 | 158.3 | 0 | 0.0 | 2 | 2.1 | 5 | 14.5 | 24 | 233.1 |
| 2007 | 13 | 99.1 | 3 | 50.9 | 0 | 0.0 | 2 | 2.1 | 5 | 21.3 | 23 | 173.3 |
| 2008 | 6 | 52.3 | 1 | 1.0 | 0 | 0.0 | 3 | 9.3 | 12 | 12.9 | 22 | 75.5 |
| 2009 | 5 | 41.4 | 2 | 5.2 | 0 | 0.0 | 2 | 2.8 | 4 | 4.5 | 13 | 53.9 |
| 2010 | 11 | 93.1 | 4 | 4.0 | 0 | 0.0 | 9 | 24.8 | 12 | 23.7 | 36 | 145.6 |
| TOTAL | 192 | 1326.7 | 196 | 1876.7 | 1 | 1.0 | 130 | 293.2 | 90 | 259.6 | 609 | 3757.2 |
| mean | 12.0 | 82.9 | 12.3 | 117.3 | 0.1 | 0.1 | 8.1 | 18.3 | 5.6 | 16.2 | 38.1 | 234.8 |
| average % of total | 32% | 35% | 32% | 50% | 0% | 0% | 21% | 8% | 15% | 7% | 100% | 100% |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

Attachment 9, continued

Table 2. Observed Number of CWT Chinook salmon recovered in the prohibited species catch of the GOA groundfish fisheries state or province of origin, 1995 through 2010.

| Origin | Rearing Type | | | | TOTAL |
|--------------------|--------------|------------|-----------|-----------|------------|
| | Unknown | Hatchery | Mixed | Wild | |
| Alaska | 0 | 174 | 0 | 18 | 192 |
| British Columbia | 0 | 196 | 0 | 0 | 196 |
| Idaho | 1 | 0 | 0 | 0 | 1 |
| Oregon | 0 | 130 | 0 | 0 | 130 |
| Washington | 0 | 76 | 11 | 3 | 90 |
| TOTAL | 1 | 576 | 11 | 17 | 605 |
| average % of total | 0% | 95% | 2% | 3% | 100% |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

Table 3. Percent run-type of CWT Chinook salmon recovered in the prohibited species catch of the GOA groundfish fisheries by state or province of origin, 1995 through 2010.

| Origin | Run-type | | | | | | TOTAL |
|------------------|----------|--------|------|--------|-----------|-----------------------------|-------|
| | Spring | Summer | Fall | Winter | Late Fall | Late Fall Upriver Bright | |
| Alaska | 99% | 1% | 0% | 0% | 0% | 0% | 100% |
| British Columbia | 27% | 41% | 32% | 0% | 0% | 0% | 100% |
| Oregon | 54% | 0% | 45% | 2% | 0% | 0% | 100% |
| Washington | 8% | 30% | 54% | 0% | 4% | 3% | 100% |
| Mean | 48% | 20% | 31% | 0% | 1% | 1% | 100% |

Source: NMFS Alaska Fisheries Science Center Auke Bay Laboratories, Adrian Celewycz, 11/2011

Attachment 10

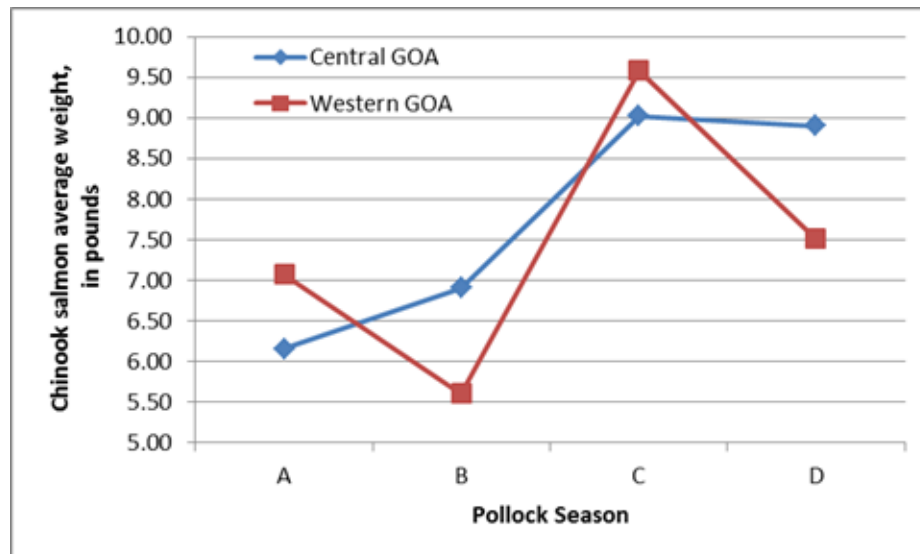


Figure 1. Average weight of Chinook salmon prohibited species catch in the groundfish fisheries in the Western and Central GOA, during the time period of the GOA pollock seasons, based on observer data from 2001 through 2010. Source: NMFS 2011.

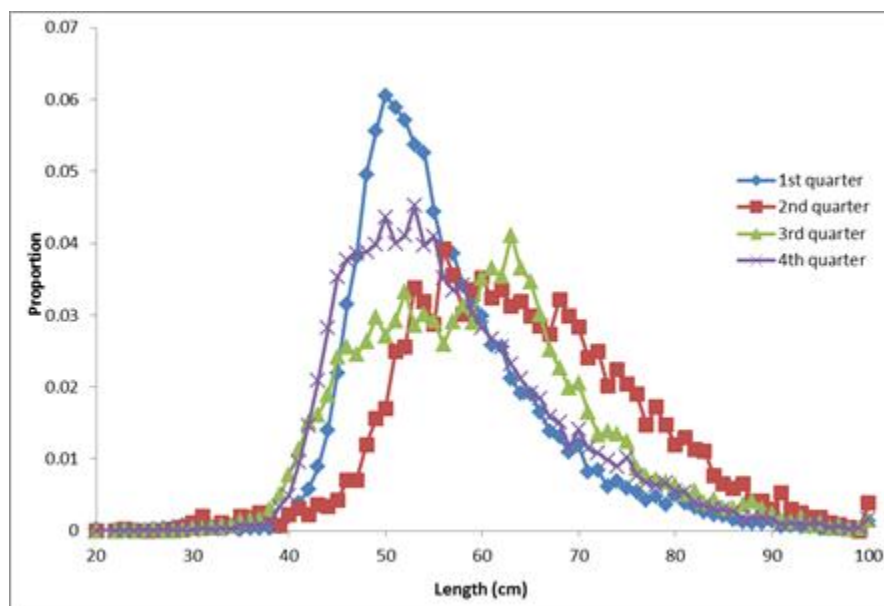


Figure 2. Length frequency of Chinook salmon prohibited species catch in GOA groundfish fisheries, by quarter (January–March, April–June, July–September, October–December), based on available observer samples from 1987 through 2010. Source: NMFS 2011.